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Research Article

Exploring potential strategies to develop buraydah as a 15-minute city for saudi vision 2030

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Abstract:

Buraydah's recognition as a UNESCO Creative City in gastronomy highlights its cultural and economic importance while drawing attention to challenges in achieving the '15-minute city' concept to enhancing food related mobility, tourism-driven urban form and its strategic use in hosting events or festival of creativity to promote sustainable urban development. The main fundamental obstacles include car dependency, limited public transportation, minimal mixed-use development, and urban sprawl, all of which reduce accessibility and neighborhood self-sufficiency. Additional barriers including uneven service distribution and harsh climatic conditions further discourage walking and cycling due to the inadequate climate-adaptive infrastructure. This study investigates various strategies and basic criteria for transforming the city into a 15-minute city by analyzing case studies, assessing current conditions, and identifying relevant urban design criteria, improving public transportation, developing pedestrian-friendly infrastructure, ensuring equitable service distribution, and repurposing underutilized land for mixed-use development. Using an inductive methodology, to review the literature on an urban design for a "15-minute city" and an analytical approach to examine case studies of global cities classified as "15-minute cities." Through conducting a questionnaire about Buraydah city, including both local residents and specialists; designers and urban planners, The findings reveal significant urban challenges, including reliance on cars and a lack of shaded walkways. Residents expressed a strong desire for obtaining an improved access to shops, parks, mosques, healthcare, and schools, while urban planners emphasized the importance of mixed-use development and climate-adaptive urban design. In conclusion, the current research proposed actionable strategies to align Buraydah with the '15-minute city' vision, promoting a more sustainable, inclusive, and accessible urban environment. Addressing these schemes will enhance residents' quality of life, bolster Buraydah's status as a UNESCO Creative City, tourism-driven urban form and provide a model for urban transformation in similar contexts.

1. Introduction

Saudi Arabia's Vision 2030 is transforming urban living, focusing on making cities more livable by increasing green spaces, enhancing access to nature, and promoting sustainable urban greening. These initiatives aim to improve air quality, support active lifestyles, and achieve a target population of 40% exercising weekly[1]. Saudi authorities are dedicated to transforming cities to enhance the standard of living for millions of citizens, acknowledging the significance of urban environments. Buraydah needs further development to align with the '15-minute city' model—a concept that emphasizes accessibility, sustainability, and opportunities within a short distance from home. Achieving this vision would make Buraydah more attractive for residents, businesses, and investors. A '15-minute city' concept involves creating neighborhoods with

easily accessible services, amenities, and green spaces. This study explores its features, methods to measure effectiveness, and examples of successful implementation. The goal is to create a mutual understanding of the "15-minute city" concept and leverage it to enhance Buraydah's urban landscape and overall livability. Exploring the feasibility of integrating and transforming the city of Buraydah into a "15-minute city", considering its status as one of the Saudi cities recognized by UNESCO as a Creative City in gastronomy, given its cultural and economic significance. The aim of this paper is to explore the potential for transforming Buraydah into a 15-minute city by analyzing case studies, assessing current conditions, and identifying relevant urban design criteria. The research depends on an inductive methodology to review the literature on an urban design for a "15-minute city" and an analytical approach to analyze case studies of global cities classified as "15-minute cities." One of the measurement tools utilized in the research is conducting a questionnaire in 2024 targeting 100 experts such as architects and urban planners to assess the extent to which the elements of a "15-minute city" are achieved in Buraydah.

2. Literature Review

2.1 15-minute city concept (urban walkability, sustainable urban design)

Chrono-urbanism, introduced in the late 1990s, ensures equitable access to public services while accommodating diverse urban lifestyles. It promotes proximity-based solutions that support local economies and foster spatial and temporal balance in cities. The **15-minute and 20-minute city** models emphasize easy access to essential services, reducing commuting times. Cities like Paris, London, and New York implement the **15-minute city.** These models enhance urban livability, flexibility, and health through mixed-use development and compact city planning. Modern economies have shifted urban patterns, leading to suburban areas that prioritize infrastructure over workplace proximity. Decentralization has driven the rise of business parks and secondary districts, creating new activity hubs. These trends highlight the **15-minute city's** potential to enhance sustainability, adaptability, and urban resilience [2]. Traditional urban planning has often resulted in monofunctional districts in peripheral areas, hence increasing reliance on private cars. However, modern lifestyles allow greater flexibility in organizing activities across time and space. Peripheral areas have the potential to become strategic hubs, attracting remote workers who prefer reduced commutes to urban centers. Despite this, the future form and direction of urban transformation remain unclear. The 15-minute city concept offers an alternative perspective by focusing on decentralizing activities into neighborhoods rather than directing people to travel to centralized hubs. This approach envisions neighborhoods that provide diverse housing, workplaces, public spaces, and essential services, enabling residents to live closer to their needs. For example, Moreno et al. proposed a model for Paris where residents could perform six key urban functions—living, working, shopping, accessing healthcare, education, and entertainment—within a 15-minute walk or bike ride. By mixing functions and reducing the need for long commutes, the 15-minute city promotes sustainability, convenience, and a higher quality of life. It encourages active transportation, strengthens community connections, and creates vibrant, self-sufficient neighborhoods that better align with the needs of modern urban dwellers [3].There are also many cities in the world that are considered 20 or 30 minute cities and are based on many urban features like the 15 minute city, for example: the 20-minute city concept was already part of mobility policies in cities like Melbourne, Portland, and Liverpool before COVID-19. It promotes easy access to shops, healthcare, schools, parks, and jobs using walking, cycling, or public transport. However, workplace accessibility received limited attention, as seen in Liverpool's shift to remote work during the pandemic. Meanwhile, The 30-minute city model, like in Los Angeles, prioritizes accessibility to diverse destinations over strict proximity. Key principles—proximity, walkability, and accessibility—support urban density, mixed-use development, and active transportation. Therefore, sustainable urban concepts such as thriving green neighborhoods and the 15-minute city aim to enhance mobility, health and community well-being and achieve higher urban advantages than similar cities [4].

2.2 Dimension of the 15-minute city concept

Urbanization is rapidly reshaping the world's landscapes, bringing with it both significant challenges and valuable opportunities. As cities continue to grow to support expanding populations, sustainable urban development has emerged as a critical priority. This approach emphasizes the creation of communities that are environmentally responsible, economically sustainable, and socially inclusive. Integrating sustainability into urban planning is essential, requiring a balance between the immediate demands of urban growth and the long-term well-being of the planet and its people. In

the face of climate change, resource scarcity, and social inequality, sustainable urban development offers a roadmap toward resilient and prosperous cities.The global shift toward urbanization also presents a rare opportunity to reimagine cities that coexist harmoniously with natural ecosystems while advancing social justice and economic growth. Sustainable urban development goes beyond adding green areas or reducing carbon footprints—it is about building communities that are equitable, livable, and accessible. This vision includes designing cities with affordable housing, efficient public transit, renewable energy systems, and shared spaces that promote a high quality of life for all residents, regardless of income or social standing [5].A 15-minute walkable city is a sustainable urban plan that aims to improve quality of life by making sure that all necessary services and amenities are within easy walking or bicycling distance. Through theoretical studies, it has been shown that there are a number of key dimensions to create green and thriving neighborhoods, balancing urban mobility, environmental sustainability, and social well-being. Proximity ensures that homes, workplaces, schools, healthcare, and recreational spaces are within easy reach, reducing travel time and enhancing local connectivity. Walkability prioritizes pedestrian-friendly streets with safe crossings, shaded pathways, and lively public spaces that encourage social interaction. Cycling infrastructure supports protected bike lanes, ample parking, and integration with public transit, making cycling a safe and viable alternative to driving. Public transport access connects neighborhoods through efficient, affordable, and well-integrated transit systems, reducing reliance on private vehicles [6]. Mixed-use development promotes dynamic urban spaces by combining residential, commercial, and cultural zones, ensuring a balance between living, working, and leisure. Green spaces such as parks, urban forests, and rooftop gardens improve air quality, support biodiversity, and provide residents with areas for recreation and relaxation. Community engagement ensures that residents have a voice in shaping their neighborhoods, fostering a sense of ownership and belonging. Car dependency is minimized by prioritizing alternative transportation modes and designing compact, transit-oriented communities.Another urban dimension of a 15-minute city is that it includes equitable access to public places, housing and services for all, regardless of age, ability or socio-economic background. Environmental impact is managed through sustainable planning policies that focus on reducing pollution, emissions, and resource consumption. A complete neighborhood ensures that all essential needs work, education, shopping, mosques, and healthcare are available within walking or cycling distance. People-centered streets and mobility design prioritize pedestrians and cyclists, ensuring that streets are safe, accessible, and vibrant community spaces. A connected place integrates seamless mobility networks, linking neighborhoods with efficient transport options and digital infrastructure. A place for everyone promotes affordable housing and diverse, mixed-income communities that foster social equity. Clean construction focuses on low-carbon building techniques and the use of sustainable materials, while green building and energy promote energy-efficient buildings powered by renewable resources. Circular resources encourage waste reduction, recycling, and responsible material use in city design and daily life. Green and nature-based solutions integrate urban greenery, permeable surfaces, and water-sensitive design to enhance climate resilience and to mitigate environmental risks. Sustainable lifestyles promote eco-friendly behaviors, from reducing single-use plastics to using public transport and adopting renewable energy. Green economy supports businesses and job opportunities in sustainability sectors, driving long-term prosperity while minimizing environmental harm [7]. By integrating all previous interconnected dimensions, this framework ensures cities are livable, resilient, and sustainable, promoting vibrant, people-centered urban environments that prioritize well-being, environmental health, and economic inclusivity.

From the above, several dimensions can be deduced for the 15-minute city so that it can achieve Strategies framework for Sustainable and Inclusive Urban Development ,as shown in Table 1.

***Table 1**. Suggested strategies, providing an integrated framework for sustainable and inclusive urban development*

Strategies framework for Sustainable and Inclusive Urban Development	**Key Concepts**	**Dimension of "15-minute city" that Consistent with Sustainable and Inclusive Urban Development (22 dimensions)**
1. Complete neighborhood (*which benefit from the full range of services and facilities required for day-to-day life. This includes, for example, primary schools, local parks and shops within reasonable*	• Compactness and mixed use • Proximity and decentralization • Active Frontages • Adaptable spaces	Complete Neighborhood
		Connected Place
		A Place for Everyone
		Proximity of Essential Services
		Pedestrian -Friendly Infrastructure
		Mixed- Use Development

walking and cycling time from home).		Connectivity & Wayfinding
		Compact Urban Design
		Safety & Security
		Inclusivity & Accessibility
2. People-centered streets and mobility *(Reclaiming space for people not driving. Thriving neighborhood with vibrant main streets, where walking and cycling are the main ways of getting around).*	• Re-prioritizing Street space • Good street design • Tactical urbanism (an approach to neighborhood building and activation using short-term, low-cost, and scalable interventions and policies). • Zero emission vehicles	People-Centered Street & Mobility
		A Place for everyone
		Clean Construction
		Circular Resources
		Green and Nature -Based Solutions
		Sustainable Lifestyles
		Green Economy
		Pedestrian -Friendly Infrastructure
		Safe and Inclusive Streets
		Connectivity & Wayfinding
		Local Economic Hubs
		Safety & Security
		Inclusivity & Accessibility
3. Connected place ***(****physical/ digital locations equipped with networked sensors to give owners, occupants and managers their wayfinding).*	• physically connected • Digitally connected	Connected Place
		Safe and Inclusive Streets
		Connectivity & Wayfinding
		Safety & Security
		Inclusivity & Accessibility
4. A place for everyone	• Socially inclusive • Active community engagement • Cohesive communities • Equitable distribution of benefits	Complete Neighborhood
		Connected Place
		A Place for Everyone
		Sustainable Lifestyles
		Proximity of Essential Services
		Pedestrian -Friendly Infrastructure
		Mixed- Use Development
		Safe and Inclusive Streets
		Connectivity & Wayfinding
		Local Economic Hubs
		Social &Cultural Spaces
		Safety & Security
		Inclusivity & Accessibility
5. Clean construction *(The Clean Construction Forum supports cities in the transition to resource efficient and zero emission construction).*	• Optimize existing assets • Plan, design and build for the future with circularity • Use materials efficiently and switch to low-carbon options • Clean construction sites	Clean Construction
		Green Buildings & Energy
		Circular Resources
		Green and Nature -Based Solutions
		Sustainable Lifestyles
		Green Economy
		Climate-Adaptive Design
		Safety & Security
6. Green buildings and energy *(Efficient use of energy, water and other resources. Use of renewable energy, such as solar energy).*	• Minimize energy demand • Invest in energy infrastructure • Decarbonize energy supply	Clean Construction
		Green Buildings & Energy
		Circular Resources
		Green and Nature -Based Solutions
		Sustainable Lifestyles
		Green Economy
		Climate-Adaptive Design
		Public Green Spaces
		Safety & Security
7. Circular resources *(existing materials are repeatedly cycled instead of becoming waste; resource extraction is also minimized).*	• Minimize resource use • Avoiding waste • Promoting circularity	Circular Resources
		Green and Nature -Based Solutions
		Sustainable Lifestyles
		Green Economy
		Safety & Security
		Connected Place

8. Green and nature-based solutions *(an action to protect, sustainably use, manage, and restore nature or modified ecosystems, which address societal challenges, effectively and adaptively, providing human well-being and biodiversity benefits)*	• Multi-functional and accessible open green spaces • Creating healthy places • Building climate resilience	A Place for Everyone Clean Construction Green Buildings & Energy Green and Nature -Based Solutions Sustainable Lifestyles Green Economy Climate-Adaptive Design Safe and Inclusive Streets Public Green Spaces Social & Cultural Spaces Safety & Security Inclusivity & Accessibility
9. Sustainable lifestyles *(Sustainable Lifestyles are considered as ways of living, social behaviors and choices, that minimize environmental degradation "use of natural resources, CO2 emissions, waste and pollution").*	• Making sustainable choices easy • Service-based and sharing economy • Enabling behavior change	Connected Place A Place for Everyone Clean Construction Green Buildings & Energy Circular Resources Green and Nature -Based Solutions Sustainable Lifestyles Green Economy Public Green Spaces Connectivity & Wayfinding Local Economic Hubs Social &Cultural Spaces Safety & Security
10. Green economy *(it is an approach to sustainable urban design that creates eco-friendly cities by cutting waste and emissions, promoting the creation of green spaces, using sustainable construction materials)*	• Incubate green jobs • Transition to the Green Economy • Provide spaces for sustainable businesses	Green Buildings & Energy Circular Resources Green and Nature -Based Solutions Sustainable Lifestyles Green Economy Public Green Spaces Local Economic Hubs Safety & Security

Table 2*: Comparison Between Paris & Barcelona as 15-Minute Cities- Source: Author*

Dimension of "15-minute city"	**Paris**	**Barcelona**
1- Complete Neighborhood **2- Proximity of Essential Services**	Designed to ensure access to essential services (e.g., schools, healthcare, shops) within 15 minutes.	Focused on Superblocks to concentrate services and activities locally.
3- People-Centered Streets and Mobility	▪ Extensive pedestrian zones and bike lanes; restricted car zones to prioritize people over vehicles. ▪ Policies aim to reduce car usage via congestion charges and restricted zones. ▪ Over 1,000 km of bike lanes, promoting safe and efficient cycling across neighborhoods. ▪ Promotes decentralized neighborhoods with essential services within walking or cycling distance.	▪ Streets within Superblocks are car-free, emphasizing walking, cycling, and social interaction. ▪ Superblocks significantly reduce car traffic, prioritizing walking and cycling. ▪ Comprehensive cycling network integrated with public transport systems.
4- Connected Place	A dense public transportation network integrates neighborhoods and reduces reliance on cars.	Metro, buses, and trams connect Superblocks, ensuring mobility across the city.
5- A Place for Everyone	Policies prioritize inclusivity by ensuring equitable access to housing, services, and public spaces.	Focused on making public spaces accessible and enjoyable for all residents, promoting social cohesion.

6- Clean Construction	Encourages the use of low-emission construction techniques and sustainable materials in urban projects.	Advocates for eco-friendly building practices in Superblock transformations and renovations.
7- Green Buildings & Energy	Promotes energy-efficient buildings and renewable energy integration in new developments.	Focuses on retrofitting existing buildings and incorporating renewable energy in Superblocks.
8- Circular Resources	Implements waste reduction and recycling initiatives to promote circular economy practices.	Encourages recycling and resource efficiency within neighborhoods, aligning with circular economy goals.
9- Green and nature-based solutions	Expands parks, green roofs, and urban greenery to enhance biodiversity and combat climate change.	Converts streets into green spaces and integrates nature-based solutions within Superblocks.
10- Public Green Spaces		
11- Sustainable Lifestyles	▪ Encourages walking, cycling, and reduced consumption through local markets and community initiatives. ▪ It focuses on lowering emissions, increasing energy efficiency, and enhancing air quality.	▪ Promotes eco-friendly living through shared spaces, reduced car dependency, and localized services. ▪ Addresses pollution through car reduction and expanded urban greenery.
12- Green Economy	Supports local businesses and promotes job creation in sustainable industries.	Encourages local economic activities within Superblocks to strengthen the community's green economy.
13- Local Economic Hubs		
14- Pedestrian-friendly Infrastructure	High walkability with expanded pedestrian zones and street redesigns.	Superblocks concentrate services and amenities locally, enhancing accessibility.
15- Safe & Inclusive Streets		
16- Safety & Security		
17- Inclusivity & Accessibility	▪ Seeks to ensure equitable access to services for all residents. ▪ Dense Metro and bus networks ensure connectivity between neighborhoods.	▪ It aims to integrate diverse communities through improved public spaces and facilities. ▪ Metro, trams, and buses connect districts, emphasizing short travel times.
18- Climate-Adaptive Design	▪ Paris excels in dense, mixed-use neighborhoods with extensive pedestrian zones, ▪ It integrates permeable surfaces and green rooftops	▪ Barcelona's Superblocks prioritize car-free streets and green spaces for local mobility. ▪ It focuses on urban cooling with shaded corridors and Mediterranean vegetation.
19- Mixed-Use Development	Promotes mixed-use neighborhoods with residential, commercial, and leisure spaces.	Superblocks encourage mixed-use spaces to bring daily needs closer to residents.
20- Connectivity & Wayfinding	Paris offers an intricate yet intuitive street grid with extensive metro access.	Barcelona's orthogonal Eixample layout and Superblocks enhance walkability with clear sightlines and reduced traffic.
21- Social & Cultural Spaces	Focused on fostering local identity and neighborhood-level governance.	Encourages local participation in redesigning public spaces within Superblocks.
22- Compact Urban Design	Paris embodies a high-density, mixed-use urban fabric with narrow streets, mid-rise Haussmannian buildings, and a fine-grained network of public spaces that promote walkability. The city's historical layout ensures that essential services, shops, and transit are within close reach, fostering a pedestrian-friendly environment.	Barcelona's Eixample district balances density with spacious blocks, inner courtyards, and wide avenues for better airflow and light.

Through the theoretical part and the findings derived from the analysis in Table 1, there are 22 dimensions of the '15-minute city' that can contribute to achieve sustainable urban development strategies. Subsequently, these dimensions can be used to conduct a comparative analysis of the globally recognized cities of Paris and Barcelona, both classified as '15-minute cities' and redeveloped in the second decade of the third millennium. By the aim to examine how each dimension is formulated in shaping urban development.

3. Case studies

3.1 Paris as a 15-Minute city

Until 2016, every day, more than 40,000 cars crowded Paris's right bank of the Seine, causing severe air pollution and thousands of accidents each year. That year, the road was transformed into a car-free linear park, offering space for commuters and leisure activities. This was part of Paris's broader "15-Minute City" initiative to enhance sustainability and livability, focusing on reducing car dependency, improving public spaces, and fostering neighborhood-level accessibility[8]. Later, Paris adopted the "15-minute city" concept, aiming to ensure that essential services like work, schools, and shops are accessible within a short walk or bike ride as shown in Fig. 1. Since then, the city has been transformed, with 746 miles of protected bike lanes and more residents biking than driving. This initiative has prioritized reducing car use to lower pollution and improve accessibility. Unused spaces like offices and parking garages have been redeveloped into multiuse buildings, combining housing, coworking spaces, gyms, and other facilities. To increase green spaces, elementary school playgrounds have been redesigned with greenery and also opened to the public, while streets in front of schools have been pedestrianized to create over 200 mini-parks [9]. Paris city' mayor has advanced this vision in Paris by expanding local services, supporting bike lanes, and transforming public spaces [10]. The principal initiatives include banning cars on selected routes, converting school playgrounds into public parks, and designating pedestrian gathering spots, such as along the Seine. Although Urban sprawl, zoning restrictions, economic disparities, and varying employment patterns complicate efforts to ensure equity across neighborhoods. Strategic planning is essential to create self-sufficient communities with accessible housing, employment, recreation, and amenities, reducing dependency on cars while addressing the unique demands of different urban areas as shown in Fig. 2. [11].

3.2 Barcelona to dramatically expand its car-free 'Superblocks' initiative

Barcelona is expanding its **superblock** initiative, transforming its central grid into a pedestrian-friendly zone over the next decade. The plan will convert **21 streets** in the Eixample district into a "super-superblock," limiting car access and creating **21 new plazas**, as shown in Fig. 3. There are about 33.4 hectares of pedestrian zones and 6.6 hectares of green space will be added as part of the project. Building on the **2016 Superilla in Poblenou,** Barcelona aims to **expand the concept citywide**, though no fixed timeline is set [12]. Superblocks have converted street spaces into public squares, seating areas, and green avenues in Barcelona's dense urban landscape as shown in Fig. 4.Barcelona's ambitious new "superblock" project targets one of the city's most densely populated areas, therefore earning the title "Barcelona superblock." This larger-scale initiative is based on prior successes but faces greater challenges due to its location in bustling neighborhoods. To ease implementation, the plan will be introduced gradually, starting with the redesign of intersections along an east-west axis, including four new plazas on Carrer del Consell de Cent. The project, set to span 21 streets by 2030, will extend from an existing superblock near the Sant Antoni market. Specifications for the redesign include 80% tree shading in summer, permeable surfaces to improve flood resilience, and features like drinking fountains and safe spaces for children and elderly people. This effort is partially enabled by pandemic-driven shifts, such as reduced business district activity and the opportunity to rethink urban space use. Despite potential opposition from motorists, 70% of the road area should be made available for leisure and active travel, according to the project, significantly cutting air pollution, noise, and carbon emissions. Additional benefits include lower summer temperatures and improved public health. It is estimated that the entire 503-block design might avert 667 premature deaths every year [13]. As shown in Table 2, Paris and Barcelona are exemplars of the 15-minute city concept, yet they approach the vision with unique strategies tailored to their own urban landscapes. Paris emphasizes decentralized neighborhoods, ensuring that residents can access essential services within walking or cycling distances. It prioritizes energy-efficient buildings, green construction practices, and renewable energy integration to enhance sustainability. Paris also invests heavily in its extensive public transportation

network and people-centered streets, therefore promoting connectivity and inclusivity across its dense urban fabric. Green spaces, urban parks, and nature-based solutions are integral to Paris's vision of improving biodiversity and combating climate change. Barcelona, on the other hand, champions the Superblocks model, where clusters of streets are transformed into car-free zones. These Superblocks concentrate on essential services, amenities, and public spaces locally, making them accessible to all residents. Barcelona focuses on retrofitting existing buildings for energy efficiency and incorporates renewable energy solutions to align with its sustainability goals. Its green transformation includes turning streets into community-centric green spaces and promoting localized economic activities within these areas. The city ensures equitable access to public spaces, emphasizing inclusivity and social cohesion. Both cities emphasize the importance of circular economy practices, sustainable lifestyles, and promoting a green economy, demonstrating how urban areas can adapt the 15-minute city framework to their unique needs.

3.3 Buraydah city

Buraydah, the capital and largest city of Saudi Arabia's Al-Qassim Region, is centrally located in the Arabian Peninsula, equidistant from the Red Sea and the Persian Gulf. Known as the "city of dates," it hosts the world's largest dates festival, showcasing a wide variety of dates. Situated near Wadi Al-Rummah, it experiences a desert climate with hot summers, mild winters, and low humidity [14]. On November 8, 2021, SPA in Riyadh, UNESCO recognized Buraydah as a Creative City of Gastronomy, celebrating its culinary heritage and cultural significance. This milestone, announced on World Cities Day [15]. Buraydah, located in a vast agricultural region that accounts for 20% of Saudi Arabia's farming area, is renowned for its diverse natural landscapes and historical heritage, making it a popular tourist destination. The city's inclusion in the UNESCO Creative Cities Network highlights its commitment to promote creativity and sustainable development. The Creative Cities Network, established in 2004 [16], promotes the creativity of its members in seven areas: crafts and folk arts, media arts, film, design, gastronomy, literature, and music. With members from over 116 cities in 73 countries, the network aims to integrate culture into urban development and support the United Nations' 2030 Agenda for Sustainable Development. This recognition enhances Buraydah's global profile and highlights the role of culture in building sustainable cities. Agriculture remains the backbone of Buraydah's economy, with traditional oasis crops like dates, lemons, and oranges playing a vital role. The city has also excelled in wheat production, becoming one of Saudi Arabia's leading producers and contributing to the nation's status as a net exporter of cereals [17].The map of Buraydah City as shown in Fig.5. highlights its land use, transportation networks, and public services. The city is predominantly residential (marked in yellow), reflecting a focus on housing development. Industrial zones are located on the outskirts (in purple) to minimize the environmental impact on residential and commercial areas. Surrounding agricultural land and green spaces emphasize the city's reliance on agriculture, while commercial areas are strategically placed along major roads and intersections for accessibility. As the capital of Al-Qassim Province, Buraydah exhibits a blend of traditional and modern urban planning. Compact neighborhoods provide local amenities such as mosques, schools, and small shops within walking distance, aligning with the principles of centralized community services. Public parks and markets, like Al-Oqailat Park and local souks, enhance recreational and economic connectivity. However, while accessibility and services are strengths, the current urban design poses challenges in achieving the 15-minute city model, which emphasizes complete proximity to all essential services [16]. Buraydah's transportation network features a grid of major roads and peripheral highways that enhance connectivity and manage traffic efficiently, though additional roads may be needed to address congestion. The city is highly car-dependent due to its sprawling layout, extreme climate, and limited pedestrian and cyclist infrastructure. Urban sprawl separates residential areas from commercial and industrial zones, increasing reliance on vehicles. The lack of mixed-use development further isolates functions, while minimal public transportation options make accessibility difficult for those without private vehicles, underscoring the need for a more comprehensive transit system.Data collection involved a Likert scale questionnaire [19] in 2024 by using Google Form, distributed to 100 architects from local residents, urban planners or urban designers, to assess urban challenges, perceptions of accessibility, and development priorities. A Likert scale was used to measure opinions; it ranged from 1 (Strongly Disagree) to 5 (Strongly Agree). Interpretive observations were considered based on the quantitative findings from the questionnaires were analyzed statistically by EXCEL to identify patterns and actionable recommendations. The questionnaire, consisting of 22 dimensions, evaluated criteria such as Complete neighborhood, people-centered street & mobility, connected place,

a place for everyone, clean construction, green buildings & energy, circular resources, green and nature-based solutions, sustainable lifestyles, green economy, proximity of essential services, pedestrian-friendly infrastructure, climate-adaptive design, mixed-use development, safe and inclusive streets, public green spaces, connectivity & wayfinding, local economic hubs, social & culture spaces, safety & security, compact urban design, and inclusivity & accessibility as shown in Figs. (6-27). The findings reveal a significant level of disagreement on the dimensions of "15 minute", with responses ranging from 37% to 70% disagreement, indicating that Buraydah's current urban structure requires substantial redesign to align with the 15-minute city model.

Figure 1 *The quarter-hour city of Paris [11]*

Figure 2 *The street space distributed in a 15-minute city [11].*

Figure 3 *The new Barcelona superblock is a significant extension of the city's current car-free zones, including the majority of the downtown Eixample neighbourhood [13].*

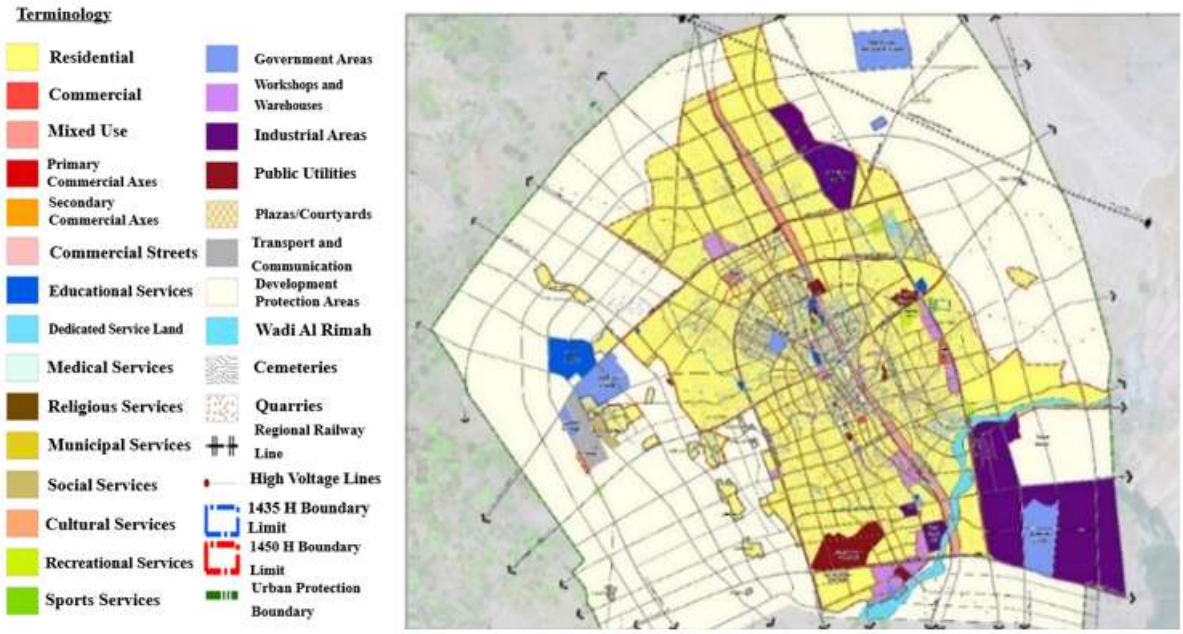

Figure 4 *Large-scale tree plantings along routes without cars will contribute to cooler summer temperatures[13].*

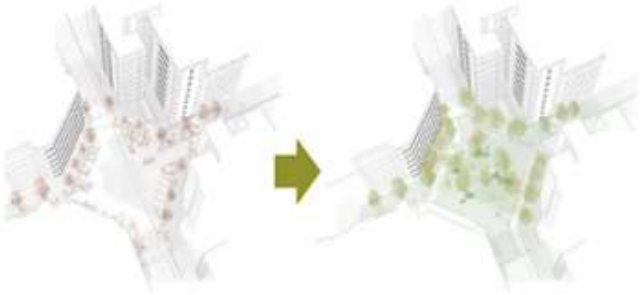

Figure 5 *Detailed local plan for the city of Buraydah [18]*

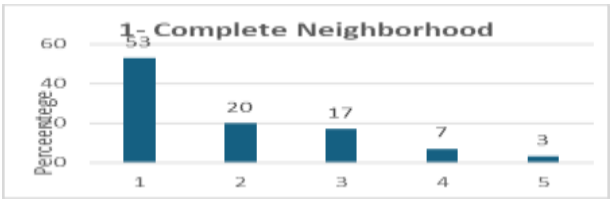

Figure 6 *Survey sample's satisfaction with "Complete Neighborhood" dimension*

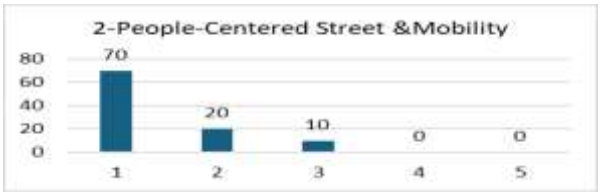

Figure 7 *Survey sample's satisfaction with "People Centered Street &Mobility" dimension*

Figure 8 *Survey sample's satisfaction with "Connected Place" dimension, Source: Author.*

Figure 9 *Survey sample's satisfaction with "A Place for everyone" dimension, Source: Author.*

Figure 10 *Survey sample's satisfaction with "Clean Construction" dimension, Source: Author.*

Figure 11 *Survey sample's satisfaction with "Green Building & Energy" dimension, Source: Author.*

Figure 12 *Survey sample's satisfaction with "Circular Resources" dimension, Source: Author.*

Figure 14 *Survey sample's satisfaction with "Green and Nature-Based Solutions" dimension, Source: Author.*

Figure 13 *Survey sample's satisfaction with "Sustainable Lifestyles" dimension, Source: Author.*

Figure 15 *Survey sample's satisfaction with "Green Economy" dimension, Source: Author.*

Figure 16 *Survey sample's satisfaction with "Proximity of Essential Services" dimension, Source: Author.*

Figure 17 *Survey sample's satisfaction with "Pedestrian-Friendly Infrastructure" dimension,*

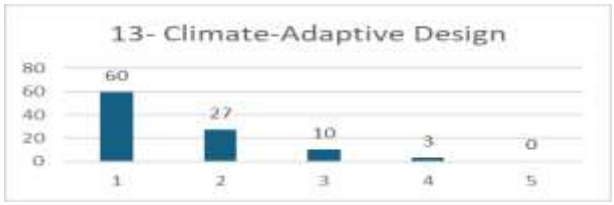

Figure 18 *Survey sample's satisfaction with "Climate-Adaptive Design" dimension, Source: Author.*

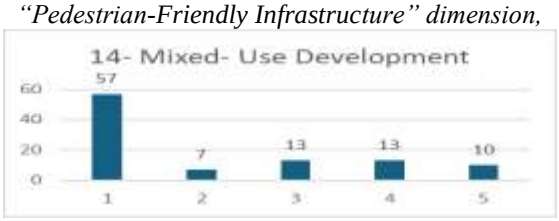

Figure 19 *Survey sample's satisfaction with "Mixed-Use Development" dimension, Source: Author.*

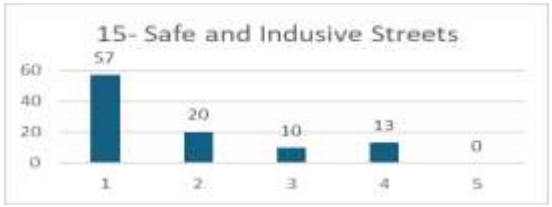

Figure 20 *Survey sample's satisfaction with "Safe and Inclusive Streets" dimension, Source: Author.*

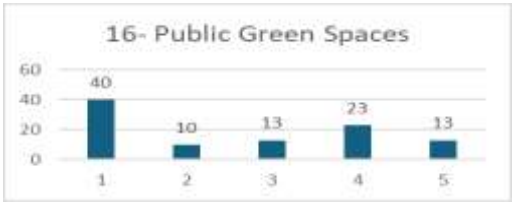

Figure 21 *Survey sample's satisfaction with "Public Green Spaces" dimension, Source: Author.*

Figure 22 *Survey sample's satisfaction with "Connectivity &Wayfinding" dimension.*

Figure 23 *Survey sample's satisfaction with "Local Economic Hubs" dimension, Source: Author.*

Figure 24 *Survey sample's satisfaction with "Social &Cultural Spaces" dimension, Source: Author.*

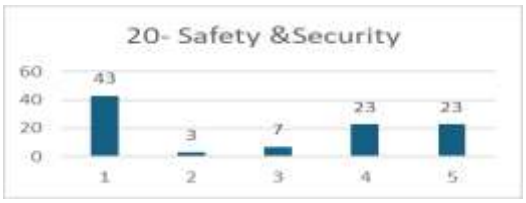

Figure 25 *Survey sample's satisfaction with "Safety & Security" dimension, Source: Author.*

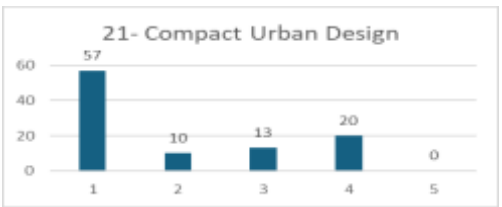

Figure 26 *Survey sample's satisfaction with "Comact Urban Design" dimension.*

Figure 27 *Survey sample's satisfaction with "Inclusivity &Accessibility" dimension, Source: Author.*

3. Results and Discussions

In 2024, data collection was conducted using a Likert scale questionnaire distributed via Google Form to 100 architects. The survey aimed to assess urban challenges, perceptions of accessibility, and development priorities in Buraydah. Respondents rated their agreement with 22 dimensions of urban quality on a scale from 1 (Strongly Disagree) to 5 (Strongly Agree). The data was analyzed statistically

using Excel, and interpretive observations were drawn from the quantitative patterns to inform actionable recommendations. The evaluated dimensions included aspects such as neighborhood completeness, mobility, sustainability, economic vitality, and inclusivity.In Figure 6 starting with more than 73% of respondents disagreed that Buraydah qualifies as a 'Complete Neighborhood', suggesting poor integration of essential services and amenities. About 'People-centered street and mobility' in Figure 7, over 90% did not agree, pointing to car-oriented planning and underdeveloped pedestrian infrastructure. 'Connected Place' in Figure 8 shows that over 65% believe the street network is inaccessible at the local level, indicating poor connectivity. In Figure 9 'A Place for Everyone', the community expressed that urban spaces in Buraydah do not adequately serve all groups, highlighting inclusivity concerns. 'Clean Construction' in Figure 10 reveals that about 80% of participants disagreed that construction practices in Buraydah are environmentally clean, while 'Green Buildings & Energy' in Figure 11 shows that 86% did not see the presence of green buildings or sustainable energy solutions. 'Circular Resources' in Figure 12 indicates that nearly 83% believe that practices are not applied, and in Figure 13 confirms that over half the respondents saw no implementation of 'Green and Nature-Based Solutions'. In Figure 14, 64% of respondents disagreed that 'Sustainable Lifestyles' are achievable in the city, while Figure 15 shows that 80% denied the existence of a strong green economy.Further, 'Proximity of Essintial Services' in Figure 16 reveals that 63% disagreed, which reflecting distribution inequalities. In Figure 17 'Pedestrian-Friendly Infrastructure', 73% expressed dissatisfaction with pedestrian infrastructure, citing walkability and safety issues. In Figure 18 demonstrates that 87% found Buraydah lacking in 'Climate Adaptive Design', including resilient infrastructure and green spaces. In Figure 19 , 64% disagreed with the effectiveness of 'Mixed-Use Development', suggesting inconvenient spatial segregation of urban functions.Regarding urban safety and public spaces, Figure 20 shows 77% disagreed that streets are safe and inclusive, while Figure 21 reveals that 50% questioned the adequacy of 'Public Green Spaces'. Figure 22 points out that 67% were dissatisfied with 'Connectivity & Wayfinding', highlighting navigational difficulties. In Figure 23, 60% reported dissatisfaction with the accessibility of local economic hubs. Similarly, Figure 24 indicates that half the respondents found social and cultural spaces inadequate, and 'Safety & Security' in Figure 25 reveals that 46% felt unsafe due to insufficient security measures.Finally, Figure 26 shows that 67% of respondents disagreed with Buraydah's urban form being compact, suggesting inefficient land use. Figure 27 reflects that 67% believed public spaces lack inclusivity and accessibility for diverse groups. Altogether, these results reflect widespread dissatisfaction across nearly all urban dimensions, underscoring critical challenges in spatial planning, infrastructure quality, sustainability, and inclusivity within Buraydah.

4. Conclusions

The research identifies key barriers and actionable strategies for aligning Buraydah with the '15-minute city' framework. By addressing transportation, infrastructure, and land use challenges, Buraydah can enhance its global identity as a UNESCO Creative City while fostering sustainable and inclusive urban growth. The research has identified a set of extracted dimensions -22 in total- that, when achieved, can qualify a city as a "15-minute city." These dimensions can also be used to assess existing cities in terms of their potential transformation into a 15-minute city, while identifying the required urban development aspects.For the time being, we may anticipate that these indicators and method will serve as reference tools for achieving the Buraydah "15-Minute City" Walk, which will seek to create favorable user experiences and establish the city's policy for the walk through future planning and design. Buraydah is not a 15-minute city due to its sprawling layout, car dependency, and limited public transit. However, aspects like compact community design in some areas and strong local markets show considerable potential. With strategic urban planning and investments in infrastructure, Buraydah could move toward becoming a more sustainable and accessible city in line with the 15-minute concept.

Author Statements:

- **Ethical approval:** The conducted research is not related to either human or animal use.
- **Conflict of interest:** The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper
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- **Data availability statement:** The data that support the findings of this study are available on request from the corresponding author. The data are not publicly available due to privacy or ethical restrictions.

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