Architectural Sciences and Recent Approaches and Trends in Urban and Regional Planning

Edited by Kübra Cihangir Çamur Şirin Gülcen Eren



November 2023

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Architectural Sciences and Recent Approaches and Trends in Urban and Regional Planning

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PREFACE

The editors of this book believe that a more livable world can be created by conducting interdisciplinary studies of spatial planning and design disciplines together under the umbrella of "Architectural Sciences". In this context, the "Journal of Architectural Sciences and Applications (JASA)," which is a pioneer in the collective studies of related disciplines was published for the first time in 2016. Afterwards, JASA Editors make significant contributions to the creation of various books containing original works and to bring the latest developments in the field to the reader.

This book named "ARCHITECTURAL SCIENCES AND RECENT APPROACHES AND TRENDS IN URBAN AND REGIONAL PLANNING" consists of ten chapters. Initially, we would like to thank the authors of the book chapters for sharing the qualified and valuable works they have prepared. We also would like to thank all those who contributed to the completion of the book, the referees of the chapters, IKSAD Publishing House and Professor Atila Gül, who is the General Coordinator of the Architectural Sciences book series.

We would like to present a special thanks to Assoc. Prof. Dr. Şirin Gülcen Eren, who has patiently taken care of the book's success from the editorial processes to the referee processes with great determination and stability. This book is published in English with 420 pages covering valuable and talented academic studies.

We hope that our book "ARCHITECTURAL SCIENCES AND RECENT APPROACHES AND TRENDS IN URBAN AND REGIONAL PLANNING" will be useful to readers.

> November 30, 2023 EDITORS Prof. Dr. Kübra Cihangir Çamur Assoc. Prof. Dr. Şirin Gülcen Eren

FOREWORD AND ACKNOWLEDGEMENTS

THE CHANGING MEANING OF URBAN PLANNING AND PLANNING PERSPECTIVES IN THE NEW ERA

Urban planning and planning perspectives have evolved significantly over time, reflecting changes in societal values, technological advancements, and environmental concerns. Understanding the changing meaning of the planning institution and its perspectives requires examining their development and how they have adapted to meet the challenges of different eras. Today's cities are a composition of their past and recent approaches can only be understood by changes and transformations experienced and still exercised in the meaning of planning and planning perspectives.

Three major transformations shaped and structured the cities with technological and digital developments:

- 1. Late 20th Century and Sustainable Planning:
- The environmental movement and energy crises of the 1970s prompted a shift toward sustainable planning.
- Planning perspectives expanded to consider environmental impacts, energy efficiency, and transit-oriented development.
- Concepts like New Urbanism promoted mixed land uses, walkability, and compact development.
- 2. Contemporary Planning (21st Century):

• The 21st century has witnessed a growing emphasis on smart cities, digital technologies, and data-driven decision-making.

• Planners are increasingly concerned with climate change mitigation and adaptation and disaster prone areas and regions, fostering resilience in cities.

• Equity and social justice have become central themes, addressing issues like affordable housing and inclusive development.

3. Post-COVID-19 Planning (2020s and beyond):

• The COVID-19 pandemic has raised new challenges for urban planning, including rethinking urban density, remote work, transportation, and public health considerations.

• Planners are exploring opportunities for more flexible and adaptable urban spaces.

• Migration to rural areas changed the notion of urbanization and urbanism.

Planning Perspectives:

• The changing meaning of planning has given rise to various planning perspectives, including rational planning, incrementalism, advocacy planning, and collaborative planning.

• Rational planning, based on data and analysis, dominated in the mid-20th century but was criticized for its top-down approach.

• Incrementalism emphasizes small, adaptive changes and is more inclusive of community input.

• Advocacy planning involves planners acting as advocates for specific social or environmental causes.

• Collaborative planning seeks to engage various stakeholders in decision-making, fostering inclusivity and consensus.

• Strategic planning supports competitive capabilities of the cities.

• Partial planning and development supported with urban expansion versus infill and compact city forms developing with neighborhood units are exercised.

In summary, the meaning of urban planning and planning perspectives has evolved over time, responding to societal needs, technological advancements, and environmental concerns. Contemporary urban and regional planning is marked by a focus on sustainability, equity, and resilience, with an emphasis on living quality, inclusivity, and community engagement.

The field of city and regional planning and other architecture related disciplines will likely continue to adapt to address emerging problems, potentials, challenges, and limitations in the future. The most important question at this point is how the planner and urban planning can serve as a tool in meeting the demands of the market and the cities and how they can prevent fragile and uncontrolled urbanization and spatial formation. This book should be considered as a proposition for providing insight into the current state and future of cities for urban planners and the planning profession.

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Architectural Sciences and Recent Approaches and Trends in Urban and Regional Planning

CHAPTER-1

Conceptualizations of Urban, Rural and Region in "Urban Age"

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1. Introduction

City and regional planning is a foundational aspect in theory and practice primarily concerned with the organization and development of settlement areas. This discipline is referred to by several names or sub-disciplines, including city planning, urban planning, urban and regional planning, regional planning, and rural planning. Upon closer examination of these concepts, it becomes evident that their fundamental meanings and scopes have remained relatively stable from the late 18th century to the recent past. However, while the sub-disciplines have been evolving and enriching, the terms "urban," "rural," and "region" have transformed, leading to the emergence of new definitions. Consequently, these revised definitions may entail conflicting, overlapping, or complementary interpretations.

According to Brenner and Schmid (2014), the 21st century is characterized by an "urban age discourse" that permeates academic, political, and journalistic domains. This discourse is derived from the declarations of the United Nations' two agencies' declarations (UN-Habitat, 2007, United Nations Population Fund (UNFPA), 2008; cited in Brenner & Schmid, 2014). Furthermore, the London School of Economics initiated a research program, named as "The Urban Age", focused on the urbanization dynamics of major cities experiencing a global agglomeration trend, such as Shanghai, London, Berlin, Johannesburg, Mumbai, São Paulo, Istanbul, Chicago, Hong Kong, Rio de Janeiro, and Delhi. In 2007, the UN-Habitat and the UNFPA declared that the world had become more urbanized than ever, with over 3.3 billion people residing in urban areas (UNFPA, 2007; UN-Habitat, 2007). The urban age discourse is taken its prominence from the assumption that more than half of the population of the world has begun to live in cities. The parallel arguments regarding the shift of the global population from rural to urban areas are also present in many other academic sources (Glissant, 1984; Castells, 2002; Ash et al., 2008; Burdett & Sudjic, 2010; McKinsey Global Institute, 2011; cited in Brenner & Schmid, 2014).

While academic discourse may witness debates concerning factual parameters or measurement methods regarding this declaration, there is an undeniable acknowledgment that the traditional concepts of urban, rural, and region have undergone changes, re-creation, or the emergence of entirely new forms. Therefore, the main research problems could be interpreted as;

- In the traditional planning epistemology, do the areas conceptualized as urban, rural, and regional still carry the same meanings and scopes? Is it possible to talk about a distinct distinction?

- If their meanings and scopes have transformed, what are the new conceptualizations?

Under the light of those questions, this chapter aims to describe the conceptual transformations of urban, rural, and regional notions by examining the literature providing clues about the insufficiency of traditional distinctive terminology.

Then this chapter subsequently introduces new discussions surrounding these newly conceptualized forms by examining relevant literature by focusing on planetary / extended urbanization and new rurality discussion fields. While numerous conceptualizations and perspectives exist concerning urban, rural, and regional aspects, the objective of this research

is to challenge the conventional viewpoints embraced by traditional outlook and to demonstrate the existence of fresh angles.

2. The Concept of "Urban"

The principal concept of settlement types, specifically the urban category, encompasses a complex and multidimensional notion extensively explored and defined within various academic disciplines, including sociology, geography, urban planning, and anthropology. Notably, Wirth (1938) made an early attempt to examine the distinctive characteristics of urban areas and the impact of city living on individuals and communities. Five key characteristics are identified as defining urban areas:

- Large population: Cities are characterized by a significantly higher concentration of people residing in close proximity compared to rural areas. This heightened population density fosters increased social interactions and interdependence among residents.
- Heterogeneity and diversity: Urban areas often exhibit greater ethnic, cultural, and social diversity, resulting in various social interactions. This diversity can have both positive and negative effects on community cohesion.
- Anonymity: Urban environments may induce a sense of anonymity among individuals, potentially leading to reduced connections with others and a diminished sense of responsibility towards the overall community.
- Formal institutions: Urban life heavily relies on formal institutions and bureaucratic structures to manage the complexities inherent in city living.

- Specialization: Urban settings offer a broader array of specialized roles, occupations, and opportunities, leading to increased social differentiation and a division of labour.

Through systematic investigation and examination across academic disciplines, scholars have contributed to a comprehensive understanding of the multifaceted nature of urban settlements. These nuanced insights have helped shape our perception of urban areas and their distinctive characteristics.

When the term "urban" is linked to the concept of "city" or "civitas," another early conception to consider is Max Weber's work on "The City." According to Weber, the defining features of an urban community include (i) fortification, (ii) market, (iii) court/autonomous laws, (iv) association, and (v) partial autonomy. Over time, urban geographers and sociologists have presented diverse perspectives on various aspects of present-day cities, such as capital accumulation and agglomeration, community relations, culture, and identity.

During the 19th century, the rise of capitalism and the transition from mercantile to industrial cities led to notable observations by scholars like Marx, Weber, and Durkheim regarding urban phenomena. The Chicago School approach in the early 20th century emphasized urban growth through spatial competition. As suburban areas and metropolitan regions expanded, attention was drawn to the incoherence of the city as a spatial or economic entity in the 1960s. Subsequently, theoretical debates in the 1970s and 1980s explored changing geographies of production and consumption alongside emerging cultural forms like postmodernism while arguments shifted to globalization trends. Throughout these periods, the foundational terminology of urban and rural areas remained central to academic discussions while region comprises them.

Rather than delving into the historical evolution of academic definitions of cities and urban areas from the 19th century to the present, the focus now shifts toward introducing conceptual definitions of urban areas within the contemporary settlement system. These conceptual definitions aim to facilitate an understanding of the fundamental dynamics driving urbanization today.

In the realm of politics and administration, the classification of a piece of land as urban can vary based on different characteristics adopted by countries, institutions, or organizations. While diverse parameters exist, specific core attributes generally converge. Specifically, population size and density, calculated within administrative borders, are the primary basis for distinguishing urban areas. Many nations have established a threshold population of 5,000 inhabitants as a defining criterion for "urban" categorization. According to Deuskar (2015), around 101 countries rely on minimum population thresholds as the sole criteria or in combination with other factors to identify urban settlements. Among these, the most commonly utilized threshold values are 2,000 inhabitants (used by 23 countries) and 5,000 inhabitants (used by 21 countries). Nevertheless, it is essential to recognize that while these threshold values differ significantly across countries, the epistemological underpinnings of urban studies remain ambiguous.

Moreover, it is evident that the term "urban" extends beyond mere references to areas with high population density, encompassing a broad spectrum of social, economic, and spatial characteristics that set urban

areas apart from rural ones (Graham, 2008). In other words, the definition of urban is intrinsically interconnected with the complementary concept of "rural." This interrelation reinforces the complexity of defining urban spaces and highlights the need for a comprehensive understanding that goes beyond population-based criteria.

3. The Concept of "Rural"

"Rural" is primarily associated with non-urban or countryside areas, characterized by villages or small towns. On the other hand, the concept of "peasantry" refers to a historical phase with feudal connotations and is rarely observed in developed countries that have completed their transformation into industrial societies. According to Öztürk (2012), the term "peasant" is a vestige of the past, denoting a pre-modern society lacking universal education, suffrage, and human rights. Consequently, peasants are often depicted as uncultured, unworthy, and inherently backward.

Early studies on rural sociology, such as Tönnies (2022)'s work, "Gemeinschaft und Gesellschaft," present a conceptualization that highlights the contrast between the Gemeinschaft (communal society) and the Gesellschaft (associational society). In rural, peasant societies typifying Gemeinschaft, personal relationships are governed by traditional social norms (Encyclopedia Britannica, 2016). Gemeinschaft implies close ties to a particular geographic locale and is closely intertwined with deep and rich personal social relations, characterized by a form of meritocracy in both economic and emotional aspects. In contrast, Gesellschaft encompasses everything Gemeinschaft is not (Hillyard, 2007). These twin

and opposing concepts implicitly define the contrasting features of urban and rural areas.

The dichotomy between Gemeinschaft and Gesellschaft is an early framework in rural sociology to understand the inherent differences between urban and rural settings. However, it is essential to acknowledge that these concepts are not fixed and may evolve over time due to societies' dynamic nature and socioeconomic structures. As such, contemporary studies on rural areas require a nuanced approach considering the complexities and transformations occurring in modern rural societies.

A parallel perspective to Tönnies can be found in Durkheim's seminal work, "The Division of Labour in Society" (1984) [1893], where he introduces the conceptualization of mechanical and organic solidarity. In primitive societies, mechanical solidarity is based on shared beliefs and consensus rooted in the collective consciousness. On the other hand, advanced (capitalist) societies exhibit a new form of order characterized by organic solidarity, which is tied to differentiation and specialization within the modern economy (Hillyard, 2007). This conceptualization emphasizes the moral basis and social order as intermediaries to the means of production. While both Tönnies and Durkheim offer a perspective rooted in grand-social order, Weber's conceptualization further enriches the understanding of rural society by incorporating the notions of culture and locality.

Weber explores the relationship between the structure of rural communities and the historical development of society, focusing on disseminating the capitalist ethic. He perceives land not only as a means of agricultural production but also as a source of social status (Weber,

1970). In distinguishing urban and rural, Weber considers factors such as (i) population density, (ii) land value, (iii) strong differentiation, and (iv) the presence of organic and mechanical solidarity. Weber's evaluation of the peasant is centred on their role as laborers rather than viewing them as a backward societal unit.

The works of Tönnies, Durkheim, and Weber collectively contribute to understanding rural societies by offering complementary perspectives. They delve into the complex dynamics of social order, solidarity, differentiation, and cultural influences, all of which significantly shape rural communities and their development within the broader context of societal evolution. As such, these theoretical frameworks continue to inform contemporary studies on rural areas, allowing for a nuanced exploration of the complexities inherent in these societies.

Further studies during the modernism period can be regarded as a continuum of the bipolar conceptualization of Tönnies that, in sociospatial terms, rural, Gemeinschaft, characterized by relationships including emotional cohesion, depth, continuity, and fulfilment. In contrast, urban, Gesellschaft referred to the impersonal, the contractual, and the rational aspects of human association. Hillyard (2007) explains that studies of Simmel's (1971) [1903] 'The Metropolis and Mental Life,' Wirth's (1938) 'Urbanism as a Way of Life,' and Redfield's (1947) 'The Folk Society' all justify the urban and rural as counter-concepts involving a dichotomy.

In historical terms, the whole geography containing urban and rural areas of the modernist era is subjected to alterations. Defining urban and rural in pre-industrial societies having walled cities with surrounding agricultural

yards and countryside was easier to be conceptualized. Nevertheless, the interactions altered the inside and outside-based conceptualizations. Sectoral interactions are defined here as rural activities in urban areas (such as urban agriculture) and activities often classified as urban (such as manufacturing and services) in rural areas. A third type of sectoral interaction can be described as occurring in peri-urban areas, where many flows between rural and urban areas and, in many cases, rural industries are spatially concentrated around urban built-up areas. The sectoral interactions have occurred via societal interactions and personal mobility, creating a rigid distinction between urban culture and rural relations. In other words, there is a problem definition of rural and urban in addition to the question of where urban starts and ends.

Disputes surrounding the definitions of urban and rural have significant implications for models elucidating the relationship between these two categories, which often rely on an urban-rural dichotomy. Lipton (1977) succinctly captures this dichotomy, stating that the rural sector is home to much of the poverty and holds vast potential for low-cost development. In contrast, the urban sector possesses greater articulateness, organization, and power. During the 1950s and 1960s, small towns were perceived as playing a positive role in development, acting as centers from which innovation and modernization would permeate rural populations through a trickle-down effect. Consequently, spatial strategies were formulated to promote economic growth by stimulating development in designated centres, often called "growth poles."

The concept of "region," which has also experienced a degree of ambiguity, encompasses the inter-settlement network of core and

peripheral areas. These regions play a crucial role in understanding the spatial distribution of resources, economic activities, and development patterns within the broader urban and rural contexts.

These models and conceptualizations serve as vital tools in comprehending the intricate relationship between urban and rural areas, their disparities, and the potential for development. However, as definitions and conceptual boundaries continue to evolve, it is essential for scholars and policymakers to critically engage with these models and ensure that they accurately reflect the complex realities of urban-rural dynamics and regional development.

4. The Concept of "Region"

The term "region" can be understood as a spatial entity characterized by similar characteristics. In economic geography, a region represents a distinctive area delineated by specific economic attributes, activities, or features that distinguish it from its surrounding areas. Economic geographers study regions to gain insights into the spatial distribution of economic activities, available resources, and development patterns.

In the context of complex settlement systems on a global scale, regions can vary widely in size and scope. They can encompass local or subnational areas such as cities, metropolitan regions, industrial clusters, and larger territorial entities like states, provinces, and even transnational or global regions.

The regional development process can be explained as an ongoing series of mutual adjustments involving people and job opportunities at regional scales. When some individuals or firms relocate to a particular region, this movement attracts more people, further influencing the region's development. The new neoclassical urban economics provides a comprehensive general spatial equilibrium framework, wherein the locational decisions of firms, migration decisions of individual workers, and choices made by developers are jointly integrated (Glaeser & Gottlieb, 2009). This framework asserts that the interactions among workers, firms, and developers determine housing prices, wages, and city sizes. In essence, city regions develop concerning the amenities, costs, and equilibrium levels they offer, derived from a combination of factors.

Storper (2013) argues that the primary concern of economic geography, regional science, and urban economics is the examination of the geography of uneven economic development. While the global structure has been extensively discussed, nation-states play essential roles as formal and informal structures. Formal structures include property rights, fiscal-monetary policies, education, taxes, and border controls, while informal structures encompass language, traditions, social or economic networks, and other cultural factors. These formal and informal instruments both limit and enable countries to determine the degree of their openness. Consequently, countries establish barriers to trade and factor mobility, influencing regional development.

City regions share some similar characteristics with nation-states, as they act as sorting mechanisms for resources and guide the direction of regional development based on how those resources are utilized.

Economic geographers have analyzed the properties of spatial agglomerations to answer the question of what stimulates geographic development. It is claimed that cities in developed countries tend to specialize in services such as high technology, healthcare, software,

finance, and logistics (Fujita & Thisse, 2009; Krugman, 2011). In contrast, Storper (2013) points out that large cities in developing countries tend to be more diversified than specialized ones. However, some large cities in developed countries can also be characterized as diversified.

During the second half of the 1980s, a new paradigm approach emerged, advocating for local integration with the global. This led to a variation in the representation of space concerning international trade theories and macroeconomic paradigms. Krugman's works played a significant role in challenging the static neo-classical international trade theories. Further, they contributed to the rejection of the product life-cycle theory of Vernon and the comparative advantage theory of international trade by Heckscher-Ohlin.

These paradigm shifts and analytical advances have significantly enriched the field of economic geography, offering more nuanced and comprehensive perspectives on the complexities of global economic development and regional disparities.

The main focus of new economic geography is to investigate how the concentration and dispersion of industries impact city and regional development, particularly concerning the patterns of job distribution, population movement, and firm location. The central theory behind this approach is that regions with similar characteristics, including labor type and cost, capital availability, knowledge resources, and transportation access, can engage in trade if industries benefit from economies of scale by concentrating production in specific agglomerations. When transport and other costs are relatively high, concentration is more likely to occur rather than a spread-out pattern (Krugman, 1991). Lower trade costs,

increased efficiency, and greater product variety led to the emergence of larger market areas and agglomerations through trade among similarly developed economies.

The critical model in new economic geography is the Dixit-Stiglitz-Krugman (DSK) model, which incorporates three essential features: Labor mobility, product variety, and economies of scale. Storper (2013) distinguishes the new economic geography approach from classical theories by emphasizing critical thinking about city-region development. It is argued that new economic geography elucidates how transport and telecommunication technologies can reinvigorate economic development by promoting geographical specialization. Additionally, the approach highlights the role of rural in some terms that the uneven distribution of natural resources, climate, or proximity to coasts and rivers only partially determines concentration. Instead, it presents an "endogenous coreperiphery model," wherein concentration emerges due to intrinsic factors within the economic system. Fujita and Thisse (2009) introduce the three key features of the DSK model: Labor mobility, product variety, and economies of scale. However, the main challenge new economic geography models face lies in their application to real cities and city regions. Several criticisms have been raised against these models, including:

- (i) The non-linear relationship between trade costs and distance.
- (ii) The lack of overlapping grey zones of competition among places, which is more characteristic of the real world.
- (iii) The potential influence of pre-assumptions on cluster sizes and distances.

To enhance the new economic geography approach, suggestions have been made, such as revising the home market effect to consider transport costs more accurately, taking into account available income in the regional economy, and developing a more nuanced approach that can capture the intricacies of the spatial organization (Head & Mayer, 2004; Storper, 2013).

Gleaser (2011) and Puga (2010) emphasize the importance of sharing in agglomeration. Factors like negotiation, contracts (including face-to-face interactions), shared knowledge, job availability, and networks are seen as crucial drivers of agglomeration (Granovetter, 1995; Storper, 1995; Storper & Venables, 2004, cited in Storper, 2013).

However, it is worth noting that despite these insights, economic geography tools still struggle to predict precisely where these clusters will emerge (Storper, 2013). The intricate and dynamic interplay of factors influencing agglomeration poses challenges for researchers in understanding the spatial organization of economic activities in real-world cities and regions.

Regional development is conceptualized based on the city-regions concept, wherein urban areas act as centers operating and interacting with rural areas. The formation of city regions is driven by agglomeration and decentralization processes, and urban economists focus on studying various types and driving forces of deconcentration. Industries often decentralize to peripheral regions to achieve lower trade costs and economies of scale. Simultaneously, new agglomerations emerge in these peripheral areas (Storper, 2013). These dynamics occur locally and globally, and the product cycle models propose a similar pattern, where

agglomeration forces weaken with technological maturity. Nevertheless, deagglomeration is sector-specific, and every production chain has no single pathway.

In addition to product cycle-based theories, scholars also investigate the impact of innovation on agglomeration and deagglomeration processes. Duranton and Puga (2001) contribute to the product cycle theory by introducing the concept of "nursery cities," which serve as hubs for new product development and learning. Storper (2013) argues that research on agglomeration and deagglomeration offers valuable insights into the driving forces of settlement systems.

In summary, understanding the dynamics of agglomeration and deagglomeration is vital for comprehending regional development, as it sheds light on the forces shaping urban systems. While equilibrium-based economic models provide valuable insights, they may only partially capture uncertainties, externalities, and the intricate interplay of individual preferences that influence urban outcomes.

As a geographical scale of the economic system, cities and city regions are subject to complex economic development processes shaped by an infinite range of forces. Storper (2013) points out that attempting to meet all these challenges, including the complexities of human-technical interactions within the spatial economy, is considered unrealistic. In other words, no single "big-bang" theory can comprehensively explain all the dynamics of urban and regional development.

A primary ontological assumption of the neo-classical paradigm has been partially replaced with a new approach based on network sharing and

cooperation (Yeung, 1994). This shift is also reflected in a revolving urban-rural partnership to replace the traditional dichotomy.

In summary, cities and city regions undergo multifaceted and intricate economic development processes influenced by various forces. Acknowledging the complexity of human-technical interactions and embracing a more flexible approach is crucial for a comprehensive understanding of urban and regional dynamics, as there is no one-size-fitsall explanation for the intricacies of urban development.

5. Dichotomy Based Urban and Rural Areas of Regions

The dialectic of Hegel between slave and master is considered a preliminary point regarding recognition (Taylor, 1996). This perspective led to the assignment and recognition of "urban" and "rural" as opposed terms, with analytical categories constructed around the polarity of city/not city and then urban/rural.

Portugali (2000) argues that the challenges in defining the city arise from the attempt to fit them into classical categories. Instead, cities should be considered based on family resemblance, acknowledging the core and periphery structure in the rural-urban dichotomy.

The conceptualization of "urban" and "rural" has been shaped by historical and philosophical influences, leading to a traditional dichotomy that may not fully capture the complexities of contemporary urbanization and the interplay between urban and rural spaces. Modern global dynamics, environmental considerations, and the fluidity of socioeconomic systems have further challenged and expanded our understanding of urban and rural contexts. The transition from industrialized nation-states to a globalized information society has led to a critical examination of the conceptualization of urbanrural configurations based on a dichotomy. Angelo (2016) highlights that urban political ecology, American urban sociology, and postcolonial urban studies have focused on analysing 'nature,' the 'rural,' and the 'not yet' city as objects of urban analyses. This perspective, known as the "city lens," originated in the context of the 19th-century industrial metropolis and interpreted the world based on the assumption that the city can be defined in contrast to a non-urban outside. Social scientists in the 19th century were captivated by the human density, diversity, vibrancy, isolation, poverty, and anomie found in industrial cities, and they often described urban phenomena in terms of city/not-city dichotomies.

In Europe, early in the century, binaries such as Gemeinschaft/ Gesellschaft, agrarian/industrial, and traditional/modern emerged as conceptual frames for understanding urban-rural dynamics. Gans (2009) explains that Wirth's study defines cities as large, dense, and heterogeneous and defines rural areas as lacking these characteristics.

This shift in focus within urban studies reflects a growing awareness of the complexity and interconnectivity between urban and rural spaces, challenging the traditional binary approach that defined urban areas against a presumed non-urban outside. The evolving field of urban studies now incorporates a broader range of perspectives, including considerations of nature, rural environments, and transitional zones between urban and rural spaces, which are essential to understanding the complexities of contemporary urbanization.

The city lens is known to create biases, and its most familiar effects have been discussed by Robinson (2011), Krause (2013), and Angelo (2016): (i) Romanticism: The city-lens often imagines nature to exist entirely outside the urban social context, and it is frequently paired with a normative ideal of community characterized by small-scale, homogeneous, and close-knit relationships in small towns.

(ii) Anachronism: The city-lens adopts dual ideas about Western modernity and European developmentalism, leading to an understanding of urban experience as 'modern' in contrast to folk/culture/tribal 'tradition.'
(iii) Universalism: Assumptions about the timeless and transposable nature of rural and urban binaries allow for fluid movement between various spaces and materials and across different periods.

Angelo (2016) also criticizes the romanticization of signs of 'nature' in the urban context, where any 'green' elements, such as urban agriculture, community gardens, and recreational parks, are interpreted as reinforcing the urban-rural binary. For instance, the greening attempts in Detroit, described by Gleaser (2011) as a prime example of urban decline, involve large investments for regeneration, and the presence of animals, plants, and 'feral' people in industrial landscapes is seen as nature 'reclaiming' the social. The literature on 'rural gentrifiers' or 'amenity migrants' is also seen as a product of such binary thinking, influenced by (i) developmentalism (city/not yet city), (ii) anthropocentrism (city/nature), and (iii) methodological cityism (contrasting the city with a putatively non-urban outside). These biases in the city lens limit our understanding of the dynamic interplay between urban and rural spaces and how nature and urbanity coexist.

Indeed, the blurring of distinctions between urban and rural is not limited to one side, and it is evident in various contexts. For instance, subsistence agriculture in squatter areas of developing countries is perceived as rural in urban settings, while suburbs or peripheral developments are seen as rural in urban areas. Krause (2013) has advocated for studying the 'ruralization' rather than the 'urbanization' of the world to counter the 'imperialism' of the urban and analyze contemporary socio-spatial transformations. It is argued that attributing all social problems to urbanization or considering the entire world as urbanized is a form of intellectual imperialism stemming from urban biases. In reality, the infrastructural issues, education gaps, sanitation problems, and food provisioning challenges faced by people experiencing poverty are the results of contemporary inequalities rather than remnants of rural life or the consequences of migration from the countryside (Angelo, 2016).

Technological innovations in exchange and communication systems have significantly impacted space and time relations and, consequently, the structure of settlement systems. Modernist-era innovations like railways, telegraphs, and private cars altered urban growth and decline patterns. Similarly, post-modernist technological advances such as computer systems, electronic sensing, and telecommunication technologies have radically changed space-time patterns and urban structures (Ergenekon, 2003). As a result, both the core-and-periphery structure on a global scale and in urban contexts have transformed. In the past, the city was considered the central or maestro of its surrounding areas. However, in the present, terms like "rural," "region," and "urban" no longer carry the same

meanings as they once did, given the evolving socio-spatial dynamics and the changing nature of settlements.

The impact of the globalized capital system has led to the integration of local economies into the global network, resulting in significant changes in cities' spatial and economic structures globally. The decentralization of industrial zones at the global level has resulted in the decline and vacancy of some essential industrial nodes. In addition to the globalization of production, real-estate investments have also become globalized, affecting global trade, business, and vacation centers.

Both centralization and decentralization processes characterize the growth pattern of city regions. Some functions that were traditionally concentrated in central business districts have now decentralized to areas outside the city center, giving rise to sub-centers within city regions. However, the tendency of agglomeration remains relevant as it offers various opportunities for employees and firms, such as increased variety, choices, and information sharing. Brenner (2014) highlights that the spatial parameters of urbanization are often represented and conceptualized through two major vectors: inter-city relations, which encompass exchange and communications networks, and city-suburban-hinterland relations, which involve flows of labor, food, energy, and materials.

During the 1970s, the failure of "growth center" policies and a paradigm shift in development led to the perception of urbanization as a parasitic process that caused underdevelopment and the neglect of agriculture. This view resulted in the development of differentiated two-sector-based conceptualizations, such as Integrated Rural Development Programmes (IRDP), which aimed to create urban functions or mini-centers in rural regions. However, sectoral strategies yielded disappointing results, prompting significant changes in macroeconomic policies and the global socio-economic context. As a result, rural-urban linkages have recently become the focus of renewed interest as policymakers seek to address the challenges and opportunities arising from the changing dynamics of urbanization and rural development.

The OECD classification is a widely used tool, including in Turkey, to categorize and compare rural and urban areas within and across countries. It is based on population density and describes the different types of areas based on their population characteristics. The classification includes the following categories:

(i). Predominantly rural areas: These are rural districts with a population density below 150 inhabitants/km², representing more than 50% of the total population in the province. This category is further differentiated into two subcategories:

- Wholly rural: In provinces where 100% of the districts have a population density below 150 inhabitants/km².
- Predominantly rural: In provinces where between 50 and 99.9% of the districts have a population density below 150 inhabitants/km².

(ii). Intermediate or significantly rural areas: These are rural districts with a population density below 150 inhabitants/km², representing between 15 and 49.9% of the total population in the province.

(iii). Predominantly urban areas: These are rural districts with a population density below 150 inhabitants/km², representing less than 15.0% of the province's total population.

As the differentiation of settlements into urban and rural categories and the description of regions become more complex, the conceptualization and differentiation of the new spatial organization of settlements have become controversial. Brenner and Schmid (2014) point out that thematic maps produced by the United Nations in 2012 use territorial and point representation to define urban areas. They argue that while population size and density can be significant indicators in determining urban areas, it may lead to misinterpretations in representing crowded areas like India and China and low-density geographies like Northern Europe. This highlights the need for more reasonable and appropriate criteria for determining urban areas.

Indeed, the exchange of goods between urban and rural areas plays a crucial role in understanding rural-urban linkages and their impact on regions. In contemporary spatial policies, market interactions are considered vital for rural development, aligning with the global trend toward market-led strategies. The "virtuous circle" model, initially developed by Evans (1992), posits that rural households earning higher incomes from producing agricultural goods for non-local markets create demand for food and consumer goods, creating non-farm jobs and diversifying urban activities.

Population movement models have traditionally assumed that migration primarily occurs from rural to urban areas due to income disparities. However, in developed countries and regions, a phenomenon known as "rural renaissance" emerged in the 1970s when the population of many rural areas unexpectedly grew. This trend continued into the 1980s, exemplified by the inward migration of retired individuals with relatively high incomes to rural areas in southern France, certain coastal regions of Spain and Portugal, and parts of Wales.

In light of these changes, it becomes necessary to re-describe and reposition the vision regarding the urban-rural dichotomy. As Angelo (2016) noted, the urban can no longer be simply represented as the familiar 'grey' of the city in contrast to a supposedly 'green' outside. Critical urban theorists, like Brenner and Schmid (2014) and Merrifield (2013), emphasize the need for sustained analysis and deconstruction of the ideological dimensions of urbanization. The socio-spatial organization is continuously reorganized, giving rise to new landscapes of urbanization with ambiguous, volatile, and confusing contours, which can lead to fetishized forms of narration, representation, and visualization.

In summary, the interplay between urban and rural areas and their socioeconomic dynamics requires a nuanced understanding beyond traditional dichotomies, necessitating critical exploration and deconstruction of urbanization processes.

6. New Conceptualizations of Settlement Patterns

"The city is dead even to those who seek to understand it most sympathetically. Nevertheless, the urban persists, existing in a state of dispersal and alienation, like a seed or virtuality. What the eye perceives, and analysis discerns in this landscape can, at best, be the fleeting shadow of a future object illuminated by a rising sun. Envisioning the reconstitution of the old city is impossible; only the construction of a new city, on a novel foundation, at a different scale, under distinct conditions, and within an alternative society can be considered. This entails neither returning to the past nor a headlong flight into an unformed and colossal agglomeration. The prescription is to embrace a different approach. The past, present, and future must not be separated; thought engages with a virtual object, calling for new procedures." (Lefebvre, 1967).

As an earlier attempt to rethink the urban-rural dichotomy and the concept of regions, Lefebvre (1970), cited in Merrifield (2013), suggests that the demarcation is no longer a definitive split between strict opposites. Instead, separation, or t, is intrinsic to capital accumulation, immanent within its secondary circuit of capital. Thus, "the frontier line does not pass between the city and the country, but is within the interior of the phenomenon of the urban."

Angelo (2016) argues that the notion of living in an urban age in the first decade of the 21st century has become a foundational ideology, similar to the entrenched urban-rural dichotomy rooted in post-colonial urban literature. Brenner and Schmid (2014) claim that the 50% global urban population threshold, which is said to have recently been crossed, has become a convenient metanarrative. A similar viewpoint is echoed by Burdett (2015), stating that the statistics asserting the world is more urban than rural and that the projection of reaching a 70% urban threshold by 2050 often masks profound differences in patterns of urban growth and change across the globe.

To address the challenges posed by the traditional dichotomy, Angelo (2016) highlights that scholar in the field have endeavoured to stretch, combine, or transcend the old binary categories by introducing the concept of 'hybridity' to unite the city with its traditional opposites. Meanwhile, Castells (1977, p.441) expresses scepticism about specific terms in the
scientific vocabulary of settlements, including 'urban,' 'city,' 'region,' and 'space.'

Gans (2009) also refers to the categorization problem and the new attempts of American/European urban sociology, which increasingly appears illogical based on urban-suburban-town-rural notions. As a response, scholars have invented adjectives to cope with the variations in the blurry 'rurban' spaces (Gans, 2009; p. 215).

The identified processes of urban-rural migration, globalization of capital, marketization of rural areas, and *rurbanization* offer partial insights into the changes in settlement patterns. While these perspectives are crucial, this study aims to recognize the new epistemological approach of planetary urbanization to gain a more comprehensive understanding of these transformations.

6.1. Planetary/Extended Urbanization and Grounding Urban Metabolism

The term 'planetary' is regarded by Merrifield as a vibrant and evolving concept. A similar new terminology proposed by Soja and Kanai (2006, p. 58; cited in Brenner, 2013) is "extended regional urbanization." This refers to the expansion of urbanism beyond historical central cities, spreading outward to create urban densities and new "outer" and "edge" cities in former suburban fringes and rural areas. The urbanization process has now extended to even larger regional scales, forming vast urban galaxies with population sizes and degrees of polycentricity that were unimaginable just a few decades ago. In some instances, city regions are merging into even larger agglomerations, a phenomenon called "extended regional urbanization."

Lefebvre (1970) discusses the theory of urban enlargement and the evolution of urban, rural, and regional areas, using the term "planet-scale urbanization." Planetary urbanization denotes the pervasive and allencompassing influence of urban processes on a global level. According to Lefebvre, urbanization is no longer confined to traditional cities and urban centers; it has expanded to encompass the entire planet. This process extends beyond physical urban areas and includes various social, economic, and cultural aspects. While there may be similarities in the dynamics, planetary urbanization is distinct from globalization trends. Lefebvre characterizes the process of planet-scale urbanization as an "implosion-explosion," which is not limited to any specific place, territory, or scale but rather connected to the uneven generalization of urbanization on a planetary scale.

Brenner (2013) emphasizes that in the early twenty-first century, the term 'urban' has become a floating signifier, lacking clear definitional parameters, morphological coherence, or cartographic fixity. It is now used to describe a vast range of contemporary socio-spatial conditions, processes, transformations, trajectories, and potentials. Amin and Thrift (2002, p.1) also describe this phenomenon, stating that the city is omnipresent and integrated into everything. In the urbanized world, metropolitan areas are connected by communication routes and corridors, such as airports, railways, highways, and information highways, blurring the boundaries between the city and other places like towns, villages, and the countryside. The city's footprints are now all over these areas due to city commuters, tourists, teleworking, media, and urbanized lifestyles.

Consequently, the traditional divide between the urban and rural has been perforated.

As a result of the changing socio-spatial dynamics, there has been a tendency to avoid using the terms 'urban' and 'rural.' Instead, substitutes like 'settlement' or 'aggregation' have been employed (Gans, 2009; Tekeli, 2016). Additionally, in response to the shifting physical and economic geographies and the evolving nature of the urban, new fundamental urban categories have been proposed for urban studies and social analysis (Angelo, 2016). These changes and the loss of the old meanings of 'urban' and 'rural' have led to a rethinking and reframing of the concepts used in understanding contemporary spatial realities.

The contemporary perspectives on urbanization go beyond traditional definitions that solely encompass metropolitan cores, urban centers, and rural areas. Instead, they encompass many interconnected elements, including vast accumulation and spatial regulation grids. These elements extend to intercontinental transportation corridors, large-scale infrastructural, telecommunications, and energy networks, free trade zones, transnational growth triangles, and international border regions (Brenner, 2013).

Furthermore, Brenner and Schmid (2011) argue that the conventional understanding of cityness, which was rooted in the morphologies of industrial and metropolitan urbanization during the nineteenth and twentieth centuries, provides only partial and one-sided depictions of the dynamic landscape of urbanization. The accelerated differentiation of urban landscapes renders these views' epistemological and ontological bases obsolete.

The urban can no longer be adequately grasped as a bounded and enclosed site of social relations contrasted against non-urban zones or conditions. The inherited assumptions concerning morphologies, territorializations, and socio-spatial dynamics must be challenged and deconstructed. Urbanization now encompasses a fluid and interconnected realm that transcends rigid spatial boundaries. Its complexity and interconnectedness characterize the contemporary understanding of urbanization and constantly changing nature. It demands a fresh epistemological approach recognizing the diverse and dynamic interactions between urban and nonurban elements. By questioning and discarding inherited assumptions, scholars can develop a more comprehensive and inclusive understanding of the multifaceted processes that shape our urbanized world.

Merrifield (2011) posits that the world's urbanization represents a simultaneous externalization of the urban into the countryside and an internalization of the rural into the city. This dynamic interplay blurs the traditional fault lines between urban and rural realms, challenging any straightforward urban-rural divide. Instead, centers and peripheries are immanent features within the capitalist system itself.

Rural areas have become integral to post-industrial production and financial speculation as they are assimilated into an expanding "urban fabric" that continually extends its borders, eroding agrarian life to maximize surplus value and accumulate capital. On the other hand, non-urban spaces should not be perceived as mere empty fields. As Brenner and Schmid (2014) noted, these areas have never been disconnected from the agglomeration process; instead, they have been deeply intertwined with the heartlands of urban concentration across the globe.

The territories designated as non-urban have been intricately woven into dense networks of labor, commodities, cultural expressions, energy, raw materials, and nutrients. These interconnected circuits radiate outward from the immediate zone of urban agglomeration, defying simplistic categorization and highlighting the complex web of economic, social, and ecological connections that shape the modern world. The distinction between urban and non-urban spaces has become increasingly blurred due to the intricate interplay between the city and the countryside. Both realms are deeply enmeshed within the dynamics of global capitalism, and the boundaries between them are continuously shifting and evolving. This necessitates a new epistemological approach that recognizes contemporary urbanization processes' multifaceted and interconnected nature.

The terms "urban" and "rural" no longer suffice to capture their previous meanings as they inherently embed ontological assumptions that no longer hold. Instead, a more accurate description of the contemporary pattern can be achieved by using the concepts of "settlement" and "agglomeration" (Tekeli, 2016). However, it is essential to note that the notion of agglomeration here differs significantly from the neo-classical economics-based interpretation. In this context, the objects and people agglomerating in space are not viewed as atomistic and isolated entities; instead, they are understood as having the potential to establish relational capabilities, suggesting a holistic and systematic dynamic.

Adopting a regional and relational perspective can be seen as the foundation for understanding urban metabolism. In social theory, the concept of metabolism was initially introduced within the framework of historical materialism, encompassing ontological and epistemological

dimensions. It posits that every metabolized entity embodies complex processes and heterogeneous relations from its past. As such, it becomes part of new assemblages of metabolic transformation uniquely, forming dynamic and heterogeneous circulatory processes that are predominantly open (Swyngedouw, 2006). This perspective emphasizes the interconnectedness and continuous exchange of materials, energy, and information within and between urban and non-urban spaces.

Consequently, the conventional terms "urban" and "rural" no longer adequately capture contemporary spatial configurations' intricate and dynamic patterns. The concepts of "settlement" and "agglomeration" offer a more comprehensive understanding, highlighting the interdependence and relational nature of the entities within the urban system. Moreover, adopting a regional and relational viewpoint through the concept of urban metabolism allows for a more nuanced analysis of the complex processes shaping modern urbanization.

Studies on urban metabolism have often uncritically followed the standard industrial ecology perspective, relying on input-output models to describe the flow of "things." However, they have failed to integrate formal, spatial, and material attributes fully. Conversely, attempts to interrogate the sociopolitical embeddedness of metabolic processes have largely overlooked their spatial registration. Moreover, limited empirical or theoretical work has explicitly aimed to theorize the interconnection between environmental change and urban change as fundamental and intertwined processes (Swyngedouw, 2006; Ibanez & Katsikis, 2014). In this context, the existing research on urban metabolism has primarily

focused on simplistic input-output models, disregarding the importance of

spatial and material characteristics in understanding the complexities of metabolic processes within urban settings. Likewise, theoretical inquiries into the sociopolitical aspects of urban metabolism need to pay more attention to its spatial aspects, failing to capture how these processes manifest within specific geographical contexts.

The critical point of consideration is the need for a comprehensive and integrated approach that examines the reciprocal relationship between environmental change and urban transformation. Bridging the gap between the socio-political embeddedness and spatial manifestations of urban metabolism is essential to developing a more profound understanding of how environmental changes are intrinsically linked to urban developments. This integration of formal, spatial, and material attributes within the context of urban metabolism can provide valuable insights into the interplay between human activities and the environment, shedding light on the complexities of contemporary urbanization processes.

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6.2. New Rurality, Urbanity and Regions

Rodriguez (2014; cited in UN-HABITAT, 2015) highlights that as urbanization increases, greater mobility and connectivity lead to intensified linkages between urban, peri-urban, and rural areas. Consequently, the distinctions between these areas are diminishing due to the augmented flow of knowledge, economic activities, and information between urban and rural regions. Moreover, rural areas are adopting more urbanized characteristics, while urban populations engage in activities traditionally associated with rural life, such as agriculture and livestock keeping.

The dynamics of the new rurality, as conceptualized by IICA (2000), encompass several key dimensions:

- Heightened production, productivity, and food security.
- The pursuit of poverty reduction in the interest of justice.
- Land conservation and a renewed focus on cultural values that strengthen national identity.
- Fostering a new agricultural and rural culture that promotes the conservation of biodiversity and natural resources.
- Increased levels of participation to bolster the development of democracy and rural citizenship.
- Efforts to raise visibility and encourage the involvement of women, indigenous groups, and young people in the process of national development.

These developments signify a transformative shift in the traditional perceptions of urban and rural areas as urbanization and ruralization processes converge, leading to a more interconnected and dynamic sociospatial landscape. The blurring of boundaries and the emergence of the new rurality concept call for a comprehensive understanding of the intricate linkages and interactions between urban and rural realms in the contemporary world.

From an epistemological standpoint, the concept of new rurality finds practical application in the field of new rurality studies. Noronha Vaz et al. (2006) argue that the traditional urban-rural distinction is gradually eroding as economic, ecological, and social relationships from urban areas extend into rural regions and vice versa. Rural areas are now characterized not only by traditional activities like agriculture and husbandry but also include non-farm activities, attracting entrepreneurs and populations from both rural and urban areas to produce and market goods. Thus, rural areas exhibit an extended urbanity, challenging the perception of them as hopeless, stagnant, inefficient, or merely places of emigration.

In developed countries, the linkages to the global system are more evident. As Friedman (2005) described in his work "The World is Flat," countries like Japan, India, and the United States exemplify how rural areas are not closed communities. However, instead, they are exposed to global influences. For instance, in India, villagers who watch advertisements for soap or shampoo on community TVs notice the products themselves and the lifestyle of the people using them, such as their motorbikes, clothing, and homes. This signifies those rural areas actively seek opportunities in urban centers, and the reverse is also true.

The increasing demand for food, jobs, and raw materials and the attraction of natural resources for recreational or touristic facilities highlight the necessity of viewing each part of the land as an opportunity, regardless of whether it is classified as urban or rural. Such evolving relationships between urban and rural domains underscore the importance of revisiting and reevaluating our understanding of these territories to address their contemporary dynamics and challenges.

Economic, political and ecological changes did not only affect agriculture and environment in geographical manner that the new global structure has a socio-spatial dynamic by creating new demands. IICA (2000) identifies that small and medium-sized agricultural producers, rural growers and peasants, and especially those groups that are most vulnerable, such as members of indigenous peoples and marginalized inhabitants of rural areas, find opportunities and important doors to economic and organizational development which can increase their level of economic, social and political organization and hence their standard of living.

The term of new rurality started to take its place in literature after the mid-1990s as 'Nueva Ruralidad' (Kay, 2008, p. 918). The terms grew for Latin American practice that Kay (2008) explains the phenomenon as a major structuring of Latin American rural economy and society due to the shift in the 1980s and 1990s away from an inward-directed import- substitution industrialization development strategy towards an outward- oriented strategy which integrated the agricultural sector to global network.

Although the term, new rurality, was grown in Latin America, some European studies also refers to it by different concepts such as; "part-time farming", pluriactivity", "multifunctionality" and "post-rural". The term part-time farming was firstly used in Europe in the late 1960s and 1970s to refer to small farmers obtaining a second income from non-agricultural sources, often from urban employment (Gasson & Himmighofen, 1983;

cited in Noronha Vaz et al., 2003). Also, pluriactivity started to be used more commonly in Europe in the 1980s to refer to the increasing diversification of farmers' activities especially the non-agricultural ones as handicrafts, rural tourism and other services. The multi-functionality term is referred in 2000s with respect to globalization and local development (Noronha Vaz et al., 2003).

The term "region" has been introduced to encompass the relationship between urban and rural areas, as explained by OECD (2016). This perspective views urban and rural areas as interconnected through various cross-sectional linkages, including demographic connections, economic transactions, innovation, the delivery of public services, the exchange of amenities, environmental goods, and multi-level governance interactions. observed Similar viewpoints are in European Union policy recommendations and in many national policies. These policies focus on promoting cohesion integrated development, through balanced sustainability, fostering development, ensuring innovation, and encouraging collaboration (Artmann et al., 2012). Bari and Munir (2014) also emphasize that rural-urban linkages involve a two-way movement of people, goods, capital, technologies, and social transactions, both functionally and structurally. This view represents a revision of the core role of the urban, acknowledging the importance of rural areas and comprehensively considering the entire region.

The United Nations report shows criticism towards the dichotomy of urban and rural conception and development incentives. It is noted that urban development often concentrates on urban areas' growth, overlooking its impact and reliance on rural regions. Conversely, rural development

policies focus solely on agriculture and related interventions, neglecting the interconnectedness with urban areas as if rural areas exist in isolation (UN, 2005). This highlights the need for a more integrated and inclusive approach that recognizes the interdependencies and dynamics between urban and rural areas within the broader region.

The traditional dichotomous terms of urban and rural have faced criticism, particularly concerning transition zones such as semi-rural or peri-urban areas. Lerner and Eakin (2011) argue that this binary understanding of urban and rural raises questions about the nature of the border between these two supposed extremes, with urban areas seen as modern, densely populated, and economic hotspots, while rural areas are perceived as obsolete except for agriculture. Defining a clear line that marks the rural-urban boundary has proven to be a practical challenge (Simon et al., 2006; White et al., 2008). As a result, the United Nations (2008) proposes supplementing the dichotomy with considerations of locality size and incorporating additional characteristics beyond population density.

Instead of relying on aerial representations to determine the boundaries of urban and rural areas, Schlesinger (2013) points out that urban and rural features tend to coexist within and beyond their conventional limits. The conventional definition of peri-urban based on a distance spectrum has also been criticized, as different types of transition zones suggest no singular type of rural-urban interface. In other words, scholars have adopted a process-based approach that considers location and dynamics when examining these transition areas (Simon et al., 2006; White et al., 2008). This shift towards a more nuanced and flexible approach aims better to capture the complex and multifaceted nature of rural-urban interactions.

The blurring distinction between urban and rural areas is being addressed by re-classifying rural regions based on their proximity to cities. Additionally, regional accessibility is being analyzed to understand ruralurban linkages better. The OECD (2014) has classified three rural profiles based on economic and spatial criteria rather than traditional boundaries:

- Rural territories within functional urban areas: These rural areas are part of the catchment area of the urban core, and their development is closely connected to that of the city. The main challenges these rural regions face include service delivery, as services tend to concentrate on the urban core, matching skills to the requirements of the labor market, and managing land-use policies due to increasing pressures from the urban core.
- Rural areas close to cities: This typology is common across OECD countries. These rural communities often enjoy a diverse industrial mix, contributing to their local economies' resilience. They may also be attractive to new residents. However, economic and social diversity can pose challenges, including competition for land and landscape due to economic activities and differing needs and visions between long-time and new residents.
- Remote rural regions: In these regions, primary activities play a significant role in the regional economy. Growth is achieved by capitalizing on areas of absolute and comparative advantage, improving connectivity to export markets, aligning skills with areas of comparative advantage, and enhancing the provision of essential services.

By adopting this approach, policymakers and researchers aim to gain a more nuanced understanding of rural areas based on their functional and economic characteristics, providing a better foundation for developing targeted and effective policies to address the specific challenges each type of rural region faces.

Von Braun (2007) presents a perspective on rural-based research that involves a gradual classification, encompassing various areas from remote farming regions to cities. This approach leads to varying sub-definitions, moving away from conceptualizing rural and urban as discrete and separate structures. The United Nations (2008) similarly acknowledges that a single definition of the urban-rural distinction may not universally apply across countries or regions, emphasizing the need for unique definitions tailored to specific country-based or regional contexts.

The challenge of conceptualization arises from the changing nature of urbanization. While 'urbanization' implies a concentration of settlements, much of the urban land expansion results from a shift from dense to more dispersed settlement patterns (Satterthwaite et al., 2010). Moreover, transition zones often exhibit dual characteristics of both urban and rural elements (Feng, 2004). These areas of overlap, such as semi-rural or the urban-rural continuum, have been conceptualized concerning the traditional dichotomy. Peri-urban development, for example, can be understood as a process where rural areas on the outskirts of established cities transform in physical, economic, and social terms piecemeal (Webster, 2002).

7. Conclusion

As one of the main question of the chapter "Whether traditional terms of urban, rural and region carry the same meanings could be answered as "not anymore". The traditional concepts of urban, rural, and region, rooted in 19th-century physics-based notions of time and space, no longer explain the intricacies of today's socio-spatial dynamics. However, they are not completely melted in a one pot. This study has delved into the paradigm shifts necessary to comprehend new ways of understanding urban, rural and their integration within the concept of region.

Transformative terms have emerged to replace traditional notions, such as extended urbanization and new rurality, both of which challenge the prevailing dichotomous urban epistemology and offer potential solutions for managing contemporary settlement patterns.

The disappearance of the traditional urban-rural distinction and the blurring of the core-periphery structure within regions demonstrate that economic, ecological, and social relationships now transcend urban and rural boundaries. Urban areas have extended their influence into rural territories, and rural regions are increasingly engaging in activities that were once confined to urban centers. These perspectives offer valuable insights into the evolving settlement patterns and the fluid nature of contemporary urbanism concerning nature and rural landscapes. However, it is essential to recognize that they are still rooted in the dichotomous urban epistemology, aiming to retrofit the 19th-century image of urban morphology into the present context.

As the second question by transformed meanings and scopes of urban, rural and region, what are the new conceptualizations has been shortly

answered by introducing new point of views as; planetary/extended urbanization as well as new rurality. Other concepts or approaches may exist that as a limit of the study, two of them are reviewed. However, a new epistemology is needed to be constructed by considering the conceptions. The main takeaway from this study is that the concepts of new rurality, rural-urban linkages, and city-region approaches need to be critically evaluated within the framework of extended urbanization. Instead of simply creating new terms or conceptions, revising the ontological assumptions and epistemological basis of settlement order is necessary. Empirical research is pivotal in redefining these concepts to align with contemporary spatial patterns' complex and interconnected reality.

Cities are no longer confined to traditional boundaries and that rural areas are not simply isolated spaces. Instead, they form part of a dynamic and interdependent network of socio-spatial relations. By embracing extended urbanization, planners and policymakers can adopt a more holistic and comprehensive perspective on regional development, recognizing the intrinsic links between various spatial patterns.

As a concept challenging the urban-rural dichotomy, new rurality highlights the transformation of rural areas into diverse and multifunctional spaces. It recognizes integrating urban elements and nonfarm activities into rural landscapes, redefining the traditional roles of urban and rural regions. This understanding of new rurality calls for formulating policies that cater to the evolving needs and visions of longstanding residents and newcomers in these dynamic regions.

In conclusion, the study emphasizes the need for a paradigm shift in understanding urban, rural, and regional dynamics. The limitations of the traditional concepts must be recognized, and the emerging approaches, such as extended urbanization and new rurality, need to be further explored and integrated into urban planning practices. Empirical research and critical evaluations will be pivotal in shaping a more comprehensive and inclusive perspective on contemporary settlement patterns. By redefining the ontological and epistemological foundations of city and regional planning, we can pave the way for sustainable and adaptable approaches that address the complex challenges of the 21st-century spatial order.

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Architectural Sciences and Recent Approaches and Trends in Urban and Regional Planning

CHAPTER-2

Interview with ChatGPT on Urban Issues: Role of Urban Planning and Education in the Future of Cities

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1. Introduction

Artificial intelligence (AI), the use of computers to mimic or enhance human intelligence, transforms the human experience and causes profound social, economic, and technical changes that affect us all. The ability to combine very large data sets and analyze them represents a potentially transformative era for the planning profession (Batty, 2023). This article used the artificial intelligence virtual assistant to create content on the selected research topic using OpenAI's ChatGPT. ChatGPT is a language model developed by OpenAI designed to generate human-like text. Can answer questions, write stories, and participate in conversations. The program's responses present an overview of a diplomatic and holistic topic, considering many different perspectives.

Some publications that measure the abilities and knowledge of artificial intelligence produce a story or a scientific work that focuses directly on a specific subject and is framed with a particular format and perspective (Robert, 2023a;b;c).

Some are in-depth interviews conducted by the researcher/author to reveal the level and depth of artificial intelligence's knowledge on a specific subject (Puttkamer, 2023). In this study, I asked questions to ChatGPT to understand the role of urban planning tools and education in the cities of the future. In the article, I quoted the answers given by ChatGPT in their own words.

I aim to assess how the problems experienced in cities today can be overcomed in the future. What issues should city and regional planning education focus on to solve these problems? For this, I tried to use a different tool instead of a literature study. I interviewed about urban planning issues and the future of cities with the artificial intelligence Chat GPT-3.5. I asked six questions. My first question was how to evaluate today's cities' problems. The second question is about the performance of urban planning in solving current problems. My third and fourth questions were about how to evaluate the predictions about future cities. My fifth question is whether there are cities that have progressed today as an example of the city model of the future. Finally, I asked an evaluation and discussion question about which subjects the planning discipline should focus on to build future cities. The answers are a direct copy and paste of what ChatGPT wrote. ChatGPT provided answers that consistently matched the problems that future cities will face with the issues that should come to the fore in city planning education.

Artificial intelligence and machine learning provide new opportunities to monitor, understand, and predict the development of urban areas. One of these opportunities is to facilitate literature research by providing customized rapid feedback. Artificial intelligence will play an important role in cities' future functioning and planning. As more and more data is generated around us, urban planners will increasingly use artificial intelligence to analyze and process this data to detect patterns, make predictions, and better understand city dynamics (Sanchez, 2023). The following interview reveals the performance of artificial intelligence in literature research focusing on one of its capabilities.

1.1. Identifying Problems

Q:1- What are the top 10 issues facing cities today?

A:-*From the perspective of the ChatGPT:* "Cities around the world face various challenges and problems. Here are ten important problems that cities often encounter:

- 1. Overpopulation: Rapid urbanization leads to increased population density, putting pressure on infrastructure, housing, and resources.
- 2. Traffic congestion: Growing populations and inadequate transportation systems contribute to traffic congestion, resulting in productivity losses, increased pollution, and decreased quality of life.
- 3. Housing affordability: Many cities struggle with providing affordable housing options, leading to issues of homelessness, gentrification, and social inequality.
- 4. Environmental sustainability: Urban areas are major contributors to carbon emissions, pollution, and resource depletion. Cities need to adopt sustainable practices to mitigate environmental damage.
- Inadequate infrastructure: Aging infrastructure or insufficient investment in infrastructure can result in poor water and sanitation systems, inadequate public transportation, and limited access to essential services.
- 6. Crime and public safety: High crime rates and inadequate law enforcement pose significant challenges to urban areas, impacting the safety and well-being of residents.
- Economic inequality: Cities often experience stark income disparities, with pockets of wealth alongside areas of poverty and limited economic opportunities.

- Social segregation: Urban areas can be divided along racial, ethnic, or socioeconomic lines, leading to social segregation and exclusion, exacerbating inequality, and hindering social cohesion.
- 9. Healthcare and public health: Cities face challenges in providing accessible and quality healthcare services, addressing public health issues, and managing outbreaks of infectious diseases.
- 10. Climate change resilience: Cities are vulnerable to the impacts of climate change, including extreme weather events, rising sea levels, and heat waves. They need to develop strategies to adapt and become more resilient.

It's important to note that the specific challenges faced by cities can vary depending on their location, size, and level of development. Additionally, new challenges may emerge over time as cities evolve and adapt to changing circumstances" (OpenAI, 2023).

1.2. The Role of Urban Planning in the Solution of Problems Encountered by Cities

Q:2- What do you think about the new developments in urban planning in the world? Can it really offer a solution to the problems of cities?

A:-*From the perspective of the ChatGPT:* "New developments in urban planning have the potential to offer solutions to many of the problems cities face. As cities continue to grow and evolve, innovative approaches in urban planning can help address various challenges and improve residents' overall quality of life. Here are a few ways new developments in urban planning can contribute to solving city problems:

1. Sustainable and resilient design: Urban planning can incorporate principles of sustainability and resilience, such as promoting

energy efficiency, reducing greenhouse gas emissions, integrating green spaces, and implementing climate adaptation strategies. This can help cities mitigate the impacts of climate change, enhance environmental sustainability, and improve residents' well-being.

- 2. Transit-oriented development: Planning cities around efficient and accessible public transportation systems reduces dependence on private vehicles, alleviates traffic congestion, and improves air quality. By prioritizing transit-oriented development, urban planning can encourage walkability, cycling, and the use of public transportation, leading to more livable and connected cities.
- 3. Mixed-use zoning and compact development: Implementing mixed-use zoning, where residential, commercial, and recreational spaces coexist, promotes vibrant urban environments. Compact development and higher population density around transportation hubs can reduce sprawl, preserve green areas, and encourage a sense of community while making better use of existing infrastructure.
- 4. Affordable housing strategies: Urban planning can incorporate mechanisms to ensure the availability of affordable housing, such as inclusionary zoning, social housing programs, and partnerships with the private sector. By addressing housing affordability, urban planning can contribute to reducing inequality and fostering diverse and inclusive communities.
- Participatory planning and community engagement: Engaging citizens in the planning process allows for more inclusive and representative decision-making. By involving residents,

community organizations, and other stakeholders, urban planning can reflect the needs and aspirations of the people who live and work in cities, fostering a sense of ownership and social cohesion. While new developments in urban planning hold great promise, it's important to recognize that challenges can persist due to various factors, including political and economic constraints, differing priorities, and the need for ongoing evaluation and adaptation. Additionally, each city has its own unique context and requires tailored approaches to address its specific challenges effectively. Overall, by embracing innovative urban planning practices and approaches, cities can make significant progress in tackling their problems and creating more sustainable, inclusive, and livable

environments for their residents" (OpenAI, 2023).

1.3. The Agenda of Future Cities

Q: 3-What is the most critical infrastructure in the cities of the future?

A:-*From the perspective of the ChatGPT:* "In the cities of the future, several types of infrastructure will play vital roles in supporting sustainable and efficient urban environments. While it's challenging to pinpoint a single most important infrastructure element, here are some key types of infrastructure that will be crucial:

 Digital Infrastructure: As cities become increasingly connected and smart, robust digital infrastructure is essential. This includes highspeed broadband networks, data centers, and sensor networks that enable various technologies like the Internet of Things (IoT), smart grids, and intelligent transportation systems.

- 2. Sustainable Transportation Infrastructure: Developing efficient and sustainable transportation systems will be critical. This includes investing in public transit networks, expanding bike lanes and pedestrian-friendly infrastructure, and promoting electric and alternative fuel vehicles. Integrated mobility solutions, such as mobility-as-a-service (MaaS), will also play a role in future cities.
- 3. Renewable Energy Infrastructure: Shifting towards renewable energy sources is crucial for sustainable cities. Infrastructure for generating and distributing renewable energy, such as solar and wind farms, microgrids, and energy storage systems, will be essential to reduce reliance on fossil fuels and mitigate climate change.
- 4. Green Infrastructure: Preserving and expanding green spaces is vital for urban well-being and environmental sustainability. Green infrastructure includes parks, urban forests, green roofs, and vertical gardens, which provide numerous benefits like improved air quality, temperature regulation, and recreational opportunities.
- 5. Resilient Water Infrastructure: As water scarcity and extreme weather events become more prevalent, resilient water infrastructure is crucial. This includes systems for efficient water supply, wastewater treatment and reuse, stormwater management, and flood prevention measures.
- 6. Smart and Integrated Waste Management Infrastructure: Effective waste management systems are necessary to promote sustainability and circular economy principles. Smart waste collection and recycling infrastructure, waste-to-energy facilities, and

composting systems can help reduce waste generation and enhance resource efficiency.

7. Social Infrastructure: Beyond physical infrastructure, social infrastructure is also vital for inclusive and resilient cities. This includes schools, healthcare facilities, community centers, and affordable housing that meet the needs of diverse populations and foster social cohesion.

It's important to note that the specific importance of each type of infrastructure will vary based on a city's context, priorities, and challenges. Integrated planning and coordination among different infrastructure systems will be crucial to create future cities that are sustainable, livable, and adaptable to evolving needs" (OpenAI, 2023).

1.4. Suggestions for Future Cities

Q:4- What are your suggestions for the cities of the future?

A:-*From the perspective of the ChatGPT:* "As an AI language model, I can provide some suggestions for the cities of the future. Here are a few key suggestions to consider:

- Embrace Sustainability: Future cities should prioritize sustainability in all aspects of urban life. This includes adopting renewable energy sources, promoting energy efficiency, implementing green building practices, prioritizing public transportation and active mobility, and fostering sustainable waste management systems.
- Foster Smart and Connected Infrastructure: Cities should leverage technology and data to create smart and connected infrastructure. This includes implementing smart grids, IoT-enabled systems for

efficient resource management, intelligent transportation systems, and utilizing data analytics to improve urban planning and decision-making processes.

- 3. Promote Compact and Mixed-Use Development: Future cities should prioritize compact, mixed-use development that reduces urban sprawl. This approach helps optimize land use, reduces the need for long commutes, and promotes vibrant, walkable neighborhoods with a mix of residential, commercial, and recreational spaces.
- 4. Enhance Resilience and Climate Adaptation: Climate change resilience should be a priority for future cities. This includes designing infrastructure and buildings that can withstand extreme weather events, implementing effective stormwater management systems, preserving green spaces, and promoting climateconscious urban planning strategies.
- 5. Prioritize Community Engagement and Inclusive Planning: Inclusive and participatory planning processes are essential to ensure that the needs and aspirations of all residents are considered. Future cities should prioritize community engagement, involve diverse stakeholders, and ensure that urban planning decisions are transparent, equitable, and reflect the aspirations of the people who live in the city.
- 6. Promote Health and Well-being: Future cities should prioritize the health and well-being of their residents. This includes creating walkable neighborhoods, prioritizing green spaces and recreational

areas, ensuring access to healthcare facilities and services, and promoting a healthy and active lifestyle.

- 7. Embrace Digital Transformation and Innovation: Cities should embrace digital technologies and innovation to improve efficiency, service delivery, and quality of life. This includes implementing smart city solutions, leveraging data for evidence-based decisionmaking, and supporting innovation ecosystems to drive economic growth.
- 8. Preserve Cultural Heritage: Future cities should value and preserve their cultural heritage and history. Balancing modern development with the preservation of cultural landmarks, historical sites, and local traditions contributes to the unique identity and character of a city.

It is important to note that each city is unique and faces challenges and opportunities. Therefore, it's crucial to adapt these suggestions to each city's specific context and needs while considering the input and involvement of local communities and stakeholders" (OpenAI, 2023).

1.5. Examples of Future Cities

Q:5- Are there cities that have progressed today as an example of the city model of the future?

A:-*From the perspective of the ChatGPT:* "Yes, there are several existing city models that incorporate various elements of future city concepts. While no single city fully embodies the vision of a future city, some cities are recognized for their innovative approaches and notable features. Here are a few examples:

- Singapore: Singapore is often cited as a leading example of a smart city. It has implemented various technologies and digital systems to enhance urban life, such as smart transportation systems, extensive sensor networks, and digital government services. The city-state is also known for its sustainable urban planning, green initiatives, and efficient public transportation.
- 2. Copenhagen, Denmark: Copenhagen is renowned for its focus on sustainability, livability, and active transportation. The city promotes cycling as a primary mode of transportation, with extensive cycling infrastructure, pedestrian-friendly streets, and green spaces. Copenhagen also has a strong commitment to renewable energy and is working towards becoming carbon-neutral by 2025.
- 3. Masdar City, Abu Dhabi: Masdar City is an experimental project in the United Arab Emirates that aims to be a carbon-neutral and zero-waste city. It incorporates renewable energy sources, sustainable building practices, and smart grid technologies. Masdar City serves as a testbed for innovative sustainable solutions and is focused on research and development in clean energy and sustainable technologies.
- 4. Songdo, South Korea: Songdo is a planned smart city located near Seoul. It is designed as a sustainable and technologically advanced city, featuring smart buildings, efficient waste management systems, and a comprehensive network of sensors and data analytics. Songdo emphasizes walkability, green spaces, and smart transportation systems.

5. Barcelona, Spain: Barcelona is recognized for its use of technology and data to improve urban life. The city has implemented smart initiatives in areas like mobility, energy, and waste management. Barcelona also prioritizes citizen engagement through digital platforms and participatory initiatives, encouraging residents to contribute to decision-making processes.

It's important to note that while these cities demonstrate certain aspects of future city concepts, each city has its own unique context, challenges, and areas of focus. Moreover, the concept of the city of the future is continually evolving, and new models and approaches are emerging as cities worldwide strive to address their specific urban challenges and create more sustainable and livable environments" (OpenAI, 2023).

2. Material and Method

ChatGPT is the most famous AI on the market. ChatGPT3.5 open access version was used in this study. All quotes were obtained from a conversation with ChatGPT-3.5, an AI language model created by OpenAI. ChatGPT's information is limited as of the last information update in September 2021.

Using the interview technique, a qualitative research method (Polat, 2022), the answers to the questions were tested with the status reports of international organizations and articles in prominent journals in urban planning. Through in-depth interviews with AI, the author of this Chapter asks the interview questions. It is the ChatCPT that answers the questions. In this Chapter, the author's role is to frame the subject and design interview questions that will reveal the subject. The role of the writer can be called "prompt engineering." I asked ChatGPT's specific opinion about
a situation or phenomenon in interview questions. I have transferred what ChatGPT wrote transparently within double quotes.

3. Discussion on the New Context of Urban Planning Education

Q:6- What do you think about the new developments in urban planning in the world? Can it really offer a solution to the problems of cities?

A:-*From the perspective of the ChatGPT:* "Urban planning education is continually evolving to keep pace with the changing needs and challenges of cities. Here are some new developments and trends in urban planning education:

- Integration of Technology: There is a growing emphasis on incorporating technology in urban planning education. This includes training students in Geographic Information Systems (GIS), data analysis and visualization, remote sensing, and computer-aided design tools. Students are learning how to leverage technology for urban data collection, analysis, and simulation.
- 2. Sustainable and Resilient Planning: With the increasing focus on sustainability and resilience, urban planning education is incorporating principles of sustainable development, climate change adaptation, and disaster resilience. Courses and programs now emphasize sustainable design, renewable energy, green infrastructure, and strategies for mitigating and adapting to climate change.
- 3. Community Engagement and Social Justice: Urban planning programs are placing greater emphasis on community engagement, participatory planning processes, and addressing social justice issues. Students are taught to involve diverse communities in

decision-making processes and incorporate equity considerations into urban plans and policies.

- 4. Urban Design and Placemaking: Urban planning education is giving more attention to urban design and placemaking. Courses focus on creating attractive, functional, and inclusive public spaces that enhance the quality of life in cities. Students learn about principles of urban design, human-scale development, and the importance of creating vibrant and livable neighborhoods.
- 5. Data-driven Decision Making: The availability of big data and advancements in data analytics have influenced urban planning education. Students are trained in data-driven decision making, using quantitative and qualitative data to inform urban planning processes. They learn to use data analysis tools and techniques to understand urban trends, assess impacts, and make evidence-based decisions.
- 6. Interdisciplinary Approaches: Urban planning education is increasingly adopting interdisciplinary approaches. Students are encouraged to collaborate with professionals from fields such as architecture, landscape architecture, engineering, public health, and social sciences. This interdisciplinary approach helps students understand the interconnected nature of urban challenges and fosters holistic problem-solving.
- Global Perspectives: Urban planning education incorporates global perspectives to prepare students for the interconnected world. Students learn about planning approaches and challenges in different cultural, political, and economic contexts. They

understand international planning practices, cross-cultural communication, and the importance of considering local context in global planning processes.

These developments reflect the ongoing efforts in urban planning education to equip future planners with the knowledge, skills, and tools needed to tackle complex urban challenges and create more sustainable, resilient, and inclusive cities" (OpenAI, 2023).

4. Conclusion and Suggestions

ChatGPT gave answers within the scope of the Habitat III report, highlighting the content shaped by the sustainable development goals and the Paris Agreement on climate change and suggestions on how to plan and manage cities. These responses focus on "making cities inclusive, safe, resilient and sustainable" principles in line with the United Nations Sustainable Cities and Communities goal (Target no. 11).

In short, in the roadmap drawn by ChatGPT for future cities, it is understood that an infrastructure based on nature-based solutions is indispensable, in which smart technology is integrated. This urban infrastructure constitutes the first step toward realizing sustainable and climate-compatible cities. The second step is access to social facilities and infrastructure services, especially housing, and implementing inclusive, participatory, and transparent urban policies.

For the cities of the future, infrastructure solutions that are sensitive to disaster risk reduction and provide resilience, a planning approach that promotes the efficient use of energy, healthy neighborhoods that are designed with lively public spaces with public transportation, walkable and green area networks; and protected urban identity and cultural heritage

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are required. As a result, urban planning should embrace sustainability in every aspect of life. Although ChatGPT's answers were general, they still provided a well-thought-out framework. It is an excellent tool to make high-level introductions to topics in a more accessible format and flow than most information sources.

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Architectural Sciences and Recent Approaches and Trends in Urban and Regional Planning

CHAPTER-3

Exploring the Application of Big Data Analytics in Urban Planning and Design: A Comprehensive Review of Case Studies

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1. Introduction

Urban planning and design encompass among others the systematic and strategic processes of creating, improving, and managing cities, towns, and other urban areas (Al-Ghiyadh & Al-Khafaji, 2021; Madanipour, 2006; Rebernik et al., 2019). To design the built environment and improve inhabitants' quality of life, the discipline integrates many components such as land use, transportation, infrastructure, social equity, and environmental sustainability (Alipour & Dia, 2023; Kalfas et al., 2023; Mouratidis, 2021; Shafer et al., 2000).

With the introduction of big data analytics in recent years, the subject of urban planning and design has undergone a paradigm shift (Bibri, 2019; Bibri, 2021a; Bibri & Bibri, 2019b; Hashem et al., 2016; Sarker, 2022; Yu & Fang, 2023). The proliferation of digital technologies, the widespread use of sensors and IoT devices, and the increasing availability of data from a variety of sources have provided urban planners and designers with unprecedented opportunities to collect, analyze, and derive insights from massive amounts of data (Bibri & Bibri, 2019; Rathore et al., 2018). With increased data availability and technological improvements, urban professionals now have access to a variety of information that can inform their decision-making processes. This foundation lays the groundwork for investigating how big data analytics and is altering the profession of urban planning and design.

Big data analytics refers to the process of extracting valuable knowledge, patterns, and trends from large and complex datasets (Elgendy & Elragal, 2014; Jha et al., 2016; Vassakis et al., 2018).

The rise of big data has ushered in a data-driven revolution in urban planning and architecture. Hence, harnessing the power of advanced analytical techniques, such as machine learning, data mining, and predictive modeling, urban professionals can make informed decisions and develop evidence-based strategies. Big data analytics provides the ability to find undiscovered correlations, spot new trends, and obtain insightful knowledge about how cities operate and what their citizens need.

This Chapter delves into the application of big data analytics in the field of urban planning and design. The purpose of this study is to investigate how the application of big data analytics is reshaping established practices and influencing current trends in architectural sciences and urban and regional planning. A mixed-methods strategy is used to accomplish the goals of the article.

To obtain current information and new perspectives on big data analytics in urban planning and design, a literature study is first done. This include reading reports, scholarly papers, and pertinent books. Furthermore, case studies are looked at to demonstrate real-world big data analytics applications in various urban situations. The goal of the research is to offer a thorough knowledge of the advantages, difficulties, and possibilities connected with employing big data analytics in urban environments by looking at case studies, assessing trends, and researching current literature. This investigation highlighted the transformational potential of data-driven strategies in urban settings and offered a thorough assessment of the advantages, challenges, and prospects.

The scope of the Chapter encompasses various aspects of urban planning and design where big data analytics plays a significant role. It covered areas such as transportation planning and optimization, smart city development and management, land use planning and development, environmental planning and resilience, and urban resilience and disaster management.

The Chapter further highlights recent approaches and trends in big data analytics, including the integration of artificial intelligence, visualization and geospatial analysis, and ethical considerations in data governance.

Through an exploration of these topics, this Chapter provides researchers, practitioners, and students in the architectural sciences and urban and regional planning fields valuable insights into the transformative potential of big data analytics. It will also serve as a comprehensive resource, showcasing successful case studies, highlighting emerging trends, and addressing the challenges and future directions in leveraging big data analytics for creating sustainable, livable, and resilient urban environments.

2. The Concept of Big Data Analytics

Big data refers to extremely large and complex datasets that are beyond the capabilities of typical database software or traditional data processing methods (Casado & Younas, 2015; Yin & Kaynak, 2015; Zicari, 2014). Consensualy, and among researchers and practitioners, big data is characterized by three key dimensions of volume, velocity, and variety (Balusamy et al., 2021; Russom, 2011).



Figure 1. 3 Vs of big data (Balusamy et al., 2021)

According to Russom (2011), volume is the primary attribute of big data. Volume refers to the massive amount of data generated from various sources, including social media platforms, sensor networks, and digital transactions among others (Russom, 2011). Since data are continuously captured, data often has an exponential growth in volume of phenomenon under consideration (Balusamy et al., 2021). The exponential growth in data volume has resulted in a shift from traditional data processing methods to scalable and distributed computing frameworks, such as Hadoop and Spark, which can handle large datasets efficiently (Lenka et al., 2016; Zakir et al., 2015). Hence, the larger the amount of captured data, the more precise will be the result in view.

Velocity on the other hand relates to the speed at which data is generated and needs to be processed in real-time or near real-time. With the advent of the Internet of Things (IoT) and sensor technologies, data is continuously generated at high speeds. This requires organizations to adopt stream processing techniques that allow for real-time analytics and rapid decision-making.

Variety signifies the diverse nature of data sources and formats. In addition to structured data (e.g., databases), big data encompasses unstructured and semi-structured data, such as text, images, videos, and social media posts. Dealing with this variety of data requires advanced techniques for data integration, processing, and analysis.

Aside from the 3 Vs, researchers have also highlighted the concept of data veracity as an important aspect of big data analytics (Eembi et al., 2015; Kepner et al., 2014). Data veracity refers to the reliability, accuracy, and trustworthiness of data. Due to the vastness and heterogeneity of big data, ensuring data quality becomes a critical challenge, and measures such as data cleansing and validation techniques are employed to enhance data veracity.

Similarly, the definition and understanding of big data continues to evolve even as the field continues to progress. Scholars have emphasized that big data is not solely defined by the "three Vs" (volume, velocity, and variety), but also by additional dimensions such as value (the potential insights and business value that can be derived) and complexity (the interrelationships and interdependencies within the data) (Ferraris et al., 2019; Verhoef et al., 2016; Eembi et al., 2015; Kepner et al., 2014).

Big data analytics are often confronted with challenges which include data management and storage, data integration, data privacy and security, computational scalability, and extracting meaningful insights from the noise of large datasets. Hence, a wide range of tools and techniques have been developed to address these challenges. Researchers have explored various methodologies and technologies, including data mining, machine learning, natural language processing, predictive modeling, and visualization (Ghavami, 2019; Shakhovska, 2017).

While data mining techniques, association rule mining and clustering, are commonly employed to discover patterns, relationships, and anomalies within big datasets (Mennis & Guo, 2009). Machine learning algorithms on the other hand, enable the development of predictive models that can identify trends, make forecasts, and automate decision-making processes (Aldahiri et al., 2021; Ongsulee et al., 2018). Natural language processing techniques assist in analyzing and extracting insights from unstructured textual data.

Predictive modeling techniques, like regression analysis and time series forecasting, are widely utilized to anticipate future outcomes and trends based on historical data while Visualization tools and techniques play a crucial role in representing complex patterns and trends in a visually comprehensible manner, aiding analysts and decision-makers in understanding and interpreting big data.

In addition to these techniques, distributed computing frameworks like Hadoop and Spark have gained popularity for their ability to handle the volume, velocity, and variety of big data (García et al., 2016; Zakir et al., 2015). These frameworks enable the parallel processing of large datasets across clusters of computers, significantly improving computational scalability.

3. Big Data Analytics and Its Role in Urban Planning and Design

Urban planning and design are complex processes often involving shaping cities and urban areas to ensure optimal land use, efficient transportation networks, sustainable infrastructure, and a high quality of life for residents (Al-Ghiyadh & Al-Khafaji, 2021; Rebernik et al., 2019). The attributes of big data (the 3Vs) thus presents urban planners sufficient data and platform for better decision making and in achieving the goals of planning.

The importance of big data in urban planning and design are easily uncover by juxtaposting a traditional data—source approach to a data-driven approach in urban planning and design.

Traditional approaches of urban planning and design made judgements on the development of infrastructure, transit systems, and land use based on historical facts, expert opinions, and simplified models (Bracken, 2014). These approaches often lacked the specificity and real-time insights necessary to handle the complexity of rapidly evolving urban environments.

On the other side, data-driven approaches, made possible by big data analytics, leverage the potential of enormous and varied datasets to guide decision-making in urban planning and design (Miller & Goodchild, 2015). These approaches uses real-time data, advanced analytics techniques, and modeling tools to get indepth understanding of urban systems, patterns, and trends (Thakuriah et al., 2017). Data-driven approaches supports a more comprehensive understanding of the cities and enable evidence based decision making (Kitchin, 2015).

A comparative analysis between traditional approaches and data-driven approaches reveals the transformative potential of big data analytics in urban planning and design. Data-driven approaches offer advantages such as increased accuracy, improved understanding of complex urban systems, enhanced forecasting capabilities, optimized resource allocation, and more

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efficient decision-making processes. They make it possible for urban planners and designers to weigh different scenarios, analyse the effects of policies and interventions, and make data-driven decisions. In contrast, traditional approaches often rely on subjective judgment, limited datasets, and simplified models, which may lead to suboptimal outcomes and missed opportunities for sustainable and inclusive urban development.

Unlike the traditional approach, Big data analytics enables the collection and analysis of vast volumes of data from diverse sources, including sensors, social media, mobile devices, and administrative records. This abundance of data provides a more comprehensive and detailed understanding of urban dynamics, facilitating better decision-making in areas such as transportation planning, infrastructure development, and environmental management.

Big data analytics also improved our understanding of urban patterns and systems, enabling us to recognise intricate linkages and patterns in urban systems (Rathore et al., 2016). By analyzing data on transportation flows, energy consumption, land use, and socio-economic factors, urban planners can gain insights into the dynamics of cities, identify bottlenecks, and optimize urban systems for improved efficiency.

According to Sikder et al. (2022), data-driven approaches facilitates evidence-based decision-making by providing quantitative insights and empirical evidence. Urban planners can analyze data to assess the effectiveness of policies, evaluate the impact of interventions, and measure progress towards sustainability goals. This evidence-based approach increases transparency, accountability, and public trust in the decisionmaking process. Big data analytics, among other things, optimised resource distribution by detecting high-demand locations or places with insufficient services (Mehmood et al., 2017; Sodhro et al., 2019). Planners can allocate resources more effectively by analyzing data on population density, transportation patterns, and infrastructure utilization. This approach minimizes waste, improves service delivery, and supports sustainable urban development.

Regardless of the benefits accrue to big data analytics, they are not exempted from challenges and limitations (Bhadani & Jothimani, 2016; McNeely & Hahm, 2014). Among the major challenges and limitations of big data analytics in urban planning are

1. Data Privacy and Security Concerns

The use of big data analytics in urban planning raises concerns about privacy and the secure handling of personal data. To uphold public confidence and adhere to applicable legislation, it is essential to strike a balance between data accessibility and privacy protection.

2. Data Quality and Integration Issues

One of the biggest challenges in big data analytics is ensuring the accuracy and dependability of the data. Strong data management and quality control methods are needed to integrate numerous datasets from various sources and ensure their correctness, consistency, and completeness.

3. Computational and Analytical Challenges

Processing and analyzing large-scale datasets often require significant computational resources and expertise. The complexity of big data analytics techniques, such as machine learning algorithms and data mining, necessitates skilled.

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4. Data Sources for Urban Analytics

Data employed in urban analytics are sourced across boards. Some of the sources include:

1. Government Databases and Open Data Initiatives

Government databases and open data initiatives serve as valuable sources of data for urban analytics. Numerous data sets about demography, transportation, infrastructure, and public services are gathered and kept by governments. Through open data portals, this information is frequently made accessible to the public, allowing academics, decision-makers, and urban planners to access it and use it for various analyses.

Government databases provide comprehensive information on population demographics, including age, gender, income levels, and education. This data is crucial for understanding the needs and characteristics of different communities within a city and informing targeted urban planning strategies. Additionally, government databases often contain data on transportation infrastructure, such as road networks, public transportation systems, and traffic flow, which can be analyzed to optimize transportation planning and improve mobility in urban areas.

Open data initiatives further enhance the availability of government data by making it accessible in standardized formats. Researchers and urban professionals can access open datasets to gain insights into various urban aspects, such as land use, zoning regulations, crime rates, and environmental conditions. Open data fosters transparency, accountability, and collaboration among different stakeholders, promoting evidencebased decision-making in urban planning and design.

2. Sensor Networks and IoT Devices

Sensor networks and Internet of Things (IoT) devices are increasingly deployed in urban environments to collect real-time data on various parameters. These sensors are integrated into buildings, infrastructure, and even wearable technology, producing a constant stream of data that may be used for urban analytics.

Sensors can capture information on air quality, temperature, noise levels, traffic congestion, waste management, and energy consumption, among other factors. This real-time data enables urban planners to monitor and respond to changing urban conditions promptly. For instance, air quality data collected from sensor networks can help identify pollution hotspots and inform targeted interventions to improve air quality in specific areas. IoT devices, such as smart meters and smart sensors, provide granular data on energy usage, water consumption, and waste generation. This data can support resource optimization strategies and guide the development of sustainable infrastructure and services.

3. Social Media and Crowdsourced Data

Social media platforms have become valuable sources of data for urban analytics. On websites like Twitter, Facebook, and Instagram, people are increasingly sharing information about their activities, beliefs, and experiences. This user-generated information may be examined to learn about public opinion, spot new trends, and get knowledge about the social dynamics of metropolitan areas.

Social media data can provide real-time information on events, public gatherings, and patterns of movement within cities. By analyzing geotagged social media posts, researchers can gain insights into the use of public spaces, popular destinations, and social interactions. This

information can inform urban planning decisions related to the design of public spaces, the allocation of resources, and the improvement of social services.

Along with social media, crowdsourced data systems like OpenStreetMap and Waze let people upload information on travel routes, road conditions, and tourist attractions. Traditional data sources may be supplemented with crowdsourced data to provide current information and improve the precision of urban analytics.

4. Mobile Applications and GPS Tracking

Social media platforms have become valuable sources of data for urban analytics. People increasingly share information about their activities, opinions, and experiences on platforms like Twitter, Facebook, and Instagram. This user-generated content can be analyzed to understand public sentiment, identify emerging trends, and gather insights into the social dynamics of urban communities.

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Similar to social media, crowdsourced data platforms, such as OpenStreetMap and Waze, enable users to contribute data on transportation routes, road conditions, and points of interest.

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Crowdsourced data can complement traditional data sources, providing up-to-date information and enhancing the accuracy of urban analytics.

While the aforementioned data sources offer immense potential for urban analytics, it is crucial to address data privacy and security concerns. Personally identifiable information (PII) and sensitive data need to be protected to ensure the privacy and confidentiality of individuals.

Similarly, data anonymization techniques, such as aggregation, masking, and encryption, can be employed to remove or protect personally identifiable information from datasets. Also, data governance frameworks and protocols should be implemented to ensure compliance with privacy regulations and ethical guidelines.

Transparency and informed consent are essential in obtaining data from individuals. Clear communication regarding data collection, usage, and storage practices is also necessary to establish trust and encourage public participation.

In the same way, robust data security measures, including secure storage, access controls, and encryption, should be implemented to safeguard data from unauthorized access and breaches.

As diverse range of data sources, including government databases, sensor networks, social media, mobile applications, and crowdsourced data, contribute to the richness of data available for urban analytics. These data sources enable researchers and urban professionals to gain insights into various urban aspects, inform evidence-based decision-making, and foster sustainable and inclusive urban planning and design. However, it is essential to address data privacy and security concerns to ensure the responsible and ethical use of data in urban analytics.

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5. Case Studies of Big Data Analytics in Urban Planning and Design 5.1. Transportation Planning and Optimization

In order to provide effective, accessible, and sustainable transportation systems, transportation planning is a crucial component of urban development (Eren & Ajiboye, 2020; Mihyeon Jeon & Amekudzi, 2005; Thondoo et al., 2020). The rise of big data analytics thus opened an uprecendented chances for transportation planners to leverage vast amounts of data to gain insights and make data-driven decisions (Bibri, 2021b; Sanders, 2014). Applications of Big data analytics in transportation planning are often seen in:

5.1.1. Traffic flow analysis and congestion management

Traffic flow analysis and congestion management are critical aspects of urban transportation planning (Dixon, 1996; Hasan, 2010). Big data analytics significantly enhance these processes by providing real-time data on traffic patterns, road conditions, and travel behavior.

In order to monitor and analyze traffic flow in real time, it is necessary to collect and process data from a variety of sources, including traffic sensors, GPS devices, mobile applications, and social media platforms. This data is used to help urban planners understand traffic patterns, pinpoint congested areas, and forecast traffic conditions. Urban planners can use this data to create plans that optimize traffic flow, enhance signal timing, and put in place efficient congestion management systems (Anda et al., 2017; Borgi et al., 2017; Torre-Bastida et al., 2018).

With advanced analytics techniques, such as machine learning and data mining, traffic congestion can thus be detected and predicted (Mihaita et al., 2020; Zulfikar, 2019). Predictive models can locate prospective

congested locations and give early warnings to traffic management authorities by examining past traffic data, weather patterns, and unique events. These observations help to guide the allocation of resources, such as modifying the timing of traffic signals, rerouting traffic, or putting in place dynamic tolling systems.

By analyzing data on travel patterns and preferences, urban planners can optimize transportation networks, promote modal shift, and enhance overall transportation efficiency (Fan & Machemehl, 2011).

5.1.2. Public transportation planning and optimization

Big data analytics is essential for planning and optimizing public transportation, allowing urban planners to create and manage dependable and efficient transit networks. Public transportation companies can study user habits, travel behavior, and service performance to raise the caliber and accessibility of public transportation by utilizing data from smart cards, ticketing systems, and vehicle sensors (Eren & Ajiboye, 2020; Yim et al., 2011).

Through the analysis of passenger data, urban planners can identify highdemand routes, optimize service frequencies, and allocate resources effectively (Ajiboye, 2014; Fan & Machemehl, 2011). Big data analytics enables the identification of possible bottlenecks, overcrowding, and locations with insufficient service coverage and improves understanding of the dynamics of transportation systems. This information can direct the creation of plans for enhancing service dependability, lowering wait times, and improving transportation routes.

Real-time transit data can also be incorporated into traveler information systems, mobile applications, and digital signs thanks to big data analytics.

Commuters have access to up-to-date information about service disruptions, real-time vehicle positions, and transit schedules, which enhances their travel experience.

5.1.3. Intelligent Transportation Systems (ITS)

Intelligent Transportation Systems (ITS) use big data analytics to improve overall efficiency, increase safety, and optimize the operation of transportation networks (Dimitrakopoulos & Demestichas, 2010). It uses data analytics in conjunction with a variety of technologies, including sensors, cameras, and communication systems, to deliver real-time information and facilitate intelligent decision-making.

Big data analytics makes it possible to gather and analyze enormous volumes of data from ITS parts like traffic lights, security cameras, and vehicle detection systems. Urban planners can take a proactive approach to managing the transportation systems by evaluating this data to learn more about traffic patterns, incident detection, and road conditions.

ITS applications powered by big data analytics include adaptive traffic signal control, incident detection and management, and dynamic route guidance (Dimitrakopoulos & Demestichas, 2010). Real-time traffic data is used by adaptive traffic signal control systems to dynamically change signal timings, minimizing congestion and enhancing traffic flow. To quickly identify and respond to accidents, breakdowns, or other incidents, incident detection systems evaluate data from a variety of sources, including traffic cameras and sensors. Dynamic route guiding systems offer real-time data on the most effective routes, assisting drivers in avoiding traffic and making sensible travel choices.

5.1.4. Mobility as a Service (MaaS)

Mobility as a Service (MaaS) is an emerging concept that leverages big data analytics to provide integrated and personalized transportation services. MaaS platforms enable users to access various transportation modes, such as public transit, ride-sharing, bike-sharing, and car-sharing, through a single digital platform (Geurs et al., 2018).

By enabling the smooth integration of many data sources, such as real-time transportation data, user preferences, and payment information, big data analytics is essential to the success of MaaS. MaaS solutions can offer individualized travel advice, improve trip planning, and enable effective and sustainable travel options by evaluating user data and travel behavior. Big data analytics are also used by MaaS platforms to offer dynamic pricing and transportation that adapts to demand. MaaS providers can change rates and incentivise mode choices to help distribute travel demand more fairly across the transportation network by assessing supply and demand patterns, user behavior, and traffic conditions. This strategy may result in less traffic, better resource use, and a more sustainable transportation system.

Case Studies: Applications of Big Data in Transportation Planning

Several case studies highlight the successful applications of big data analytics in transportation planning. For instance, the city of Singapore has implemented the "Beeline" platform, which utilizes big data analytics to optimize bus routes based on user demand and travel patterns.

Big data analytics are used by the "Beeline" platform in Singapore to optimize bus routes based on user demand and travel habits (He et al., 2022). Users can suggest and vote for new bus routes, which are analyzed

using big data analytics to determine their feasibility and potential impact on the transportation system. This data-driven strategy has increased consumer satisfaction and improved the effectiveness of the bus service. The Beeline helps private bus companies run more direct routes with fewer stops, cutting down on end-user travel times. Additionally, private bus companies would be in a better position to adapt their bus services to shifting demand patterns by launching new routes and altering existing ones (Jeble et al., 2017).

This case studies demonstrate the transformative power of big data analytics in transportation planning, enabling more efficient, accessible, and sustainable transportation systems in cities. It makes it possible to analyze traffic flow, manage congestion, plan for public transit, and create intelligent transportation systems. Big data analytics also plays a significant part in defining the idea of Mobility as a Service (MaaS), which offers integrated and customized transportation solutions. It is clear from successful case studies that incorporating big data analytics into transportation planning increases effectiveness, improves user experience, and promotes more sustainable urban mobility.

5.2. Smart City Development and Management

Smart city development aims to leverage technology and data to create sustainable, efficient, and livable urban environments. With the quick advancements in information and communication technologies, the concept of smart cities has gained prominence as a solution to address urban challenges among which are:

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Integration of Information and Communication Technologies (ICT) Integration of information and communication technologies (ICT) is the cornerstone of smart cities. This includes the deployment of high-speed internet infrastructure, widespread connectivity, and the use of sensor networks to collect data. An example of this is the Dubai Blockchain Strateegy (DBS) where blockchain technology and Internent of things (IoT) are operational towards making Dubai city a smart and sustainale one (Alam, 2022). ICT integration makes it possible to gather, process, and analyze data for smart service delivery, resource optimization, and decision-making.

Data Management and Governance

Data management and governance are essential to the development of smart cities. Effective data management involves collecting, storing, and securing data while ensuring privacy and adhering to ethical guidelines. Proper governance frameworks and policies should be in place to address issues related to data ownership, access, and sharing between different stakeholders.

Citizen Engagement and Participation

The success of smart cities depends on involving citizens and getting their input during the decision-making process. Platforms for citizen engagement, participatory planning processes, and open data initiatives foster transparency, accountability, and collaborative problem-solving.

Energy Management and Resource Optimization

a. Smart Grid and Energy Infrastructure

Advanced energy management systems and smart grids are used in smart cities to maximize energy production, distribution, and consumption.

These systems use real-time data, renewable energy sources, and mechanisms for demand response to increase energy resilience, decrease carbon emissions, and improve energy efficiency.

b. Water Management and Conservation

A key component of creating smart cities is effective water management. To optimize water distribution, find leaks, and encourage water saving behaviors, smart water systems use sensors, real-time data monitoring, and advanced analytics. These techniques lessen water waste while ensuring sustainable management of water resources.

c. Resource Optimization and Circular Economy

Smart cities embrace the principles of a circular economy by optimizing resource usage and minimizing waste generation. This is done by implementing systems for resource monitoring, waste segregation, recycling, and reuse. Smart technologies make it possible to manage garbage effectively, encourage recycling efforts, and aid in the creation of a sustainable urban ecosystem.

Waste Management and Sustainability

a. Intelligent Waste Collection and Monitoring

Smart city projects use intelligent garbage collection systems that make use of sensors, real-time data, and predictive analytics to plan waste collection routes more efficiently, lower operating costs, and boost overall waste management effectiveness. Sensing-enabled smart bins can track fill levels and notify waste management workers for prompt collection, cutting down on pointless collection visits.

b. Waste Sorting and Recycling

Recycling and garbage sorting procedures are prioritized in smart cities. Robotic systems and machine learning algorithms are two examples of automated sorting technologies that efficiently separate recyclable materials. Smart waste management systems often involve public awareness campaigns, educational initiatives, and financial incentives to entice people to recycle.

c. Sustainable Materials and Construction Practices

Sustainable building methods and materials are given priority in smart cities to minimize their negative environmental effects. This includes using eco-friendly building materials, adopting energy-efficient designs, and implementing green building standards. Smart construction techniques leverage digital twin technologies, BIM (Building Information Modeling), and IoT devices to improve construction processes, minimize waste, and optimize energy usage.

Enhancing Urban Services and Quality of Life

a. Smart Transportation and Mobility Solutions

Smart cities employ intelligent transportation systems, including real-time traffic management, smart parking, and connected mobility solutions. These technologies improve the effectiveness of transportation, lessen traffic, and give locals and visitors smooth travel experiences. Sustainable mobility options like bike-sharing programs and facilities for electric vehicle charging are also promoted by smart transportation solutions.

b. Smart Healthcare and Well-being Services

Technology and data are combined in smart city initiatives to improve healthcare and the quality of life for citizens. Healthcare that is tailored and easily available is made possible by telemedicine services, wearable technology, and remote patient monitoring systems. In addition to supporting healthy lifestyles, smart city solutions also incorporate green areas into urban planning, smart fitness apps, and wellness initiatives.

c. Smart Safety and Security Systems

In order to improve public safety and emergency response capabilities, smart cities use cutting-edge security and safety measures. This incorporates sophisticated emergency management systems, video surveillance networks, and real-time crime analysis. Intelligent technologies facilitate quick and efficient emergency responses, lower crime rates, and enhance general safety in metropolitan environments.

Case Studies: Exemplary Smart City Initiatives: Barcelona, Spain -Superblocks

Urban blocks plays a crucial role in urban planning and design (Eren, 1995). In the case of Barcelona-Spain, the superblock became relevent. Superblock in Eggimann (2022) is a concept in urban design that consists of nine (3×3) urban city blocks or mesh, including interior and exterior streets. The idea behind the superblock project in Barcelona is to transform the city's mobility, public space, and environmental impact by constructing over 500 superblocks that cover all areas within its boundaries (Zografos et al., 2020). This concept aims to develop a self-sufficient area that lessens through traffic and fosters social contact, bicycle and pedestrian mobility, and green spaces.

The project combines climate mitigation and climate adaptation goals, seeking to reduce emissions by modifying the city model to address

challenges brought on by climate change, while also lowering vulnerability and boosting resilience (Zografos et al., 2020).

In essence, Superblocks strategy to combat the drawbacks of urban sprawl, including clogged roads, polluted air, and social isolation (Sollazzo, 2022). Big data analytics has been used for the automatic detection of superblock design opportunities.

With this method, vast datasets of urban street networks are analyzed to find prospective superblock or miniblock locations based on topology, geometry, and density standards.

A larger scale to this method was also shown in Eren (2019a), revealing how big data vizualization provides an easy interpretation to environmental phenomenon in the case of ancient Anatolian Grids.

Barcelona's Superblocks plan attempts to establish car-free areas and give priority to areas that are good for walking and bicycling. The effort has greatly boosted public space quality, reduced noise pollution, and dramatically improved air quality by restructuring the city's urban architecture and transportation infrastructure. This demonstrates that urban planners and designers may make better judgments on where to implement superblocks and how to optimize their design for maximum impact on traffic flow, air quality, and other sustainability indicators by using big data and sophisticated analytics.

The creation of sustainable, effective, and livable urban settings is greatly facilitated by the construction and management of smart cities. By leveraging information and communication technologies, big data analytics, and citizen engagement, smart cities can address urban challenges and enhance the quality of life for residents.

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It is evident that smart city development requires a holistic and multidisciplinary approach, involving various stakeholders, robust data governance frameworks, and continuous evaluation of technological advancements. The successful implementation of smart city initiatives can pave the way for future urban development, where technology, sustainability, and quality of life converge for the benefit of present and future generations.

5.3. Land Use Planning and Development

In order to build urban settings that are sustainable, practical, and inclusive, land use planning and development are essential elements of urban planning (Eren, 2007). The integration of big data analytics into these processes has the potential to enhance decision-making, optimize resource allocation, and foster equitable and efficient land use practices (Chen et al., 2021).

Big data analytics helps with the analysis of Land Use Patterns and Demographic Trends in land use planning (Ramachandra et al., 2012). This is made possible by big data analytics, which makes it possible to map and analyze patterns of land use using a variety of data sources, including satellite imagery, geospatial data, and social media feeds.

Urban planners can thus obtain insights into present land use distributions, spot trends and patterns, and evaluate the effectiveness and usefulness of land use practices by using machine learning algorithms and spatial analytic approaches (Ajiboye et al., 2022; Zhang & Li, 2022).

Demographic Trend Analysis is additionally made possible by big data analytics (Billari & Zagheni, 2017; Bruns, 2016; Miah et al., 2017). Since demographic data is a crucial component in land use planning and development, big data analytics allows for the integration and analysis of various data sources, such as census data, mobile phone usage patterns, and social media demographics, to understand population growth, migration trends, household characteristics, and socioeconomic dynamics. These insights help planners in anticipating future land use needs, identifying areas for infrastructure development, and tailoring land use strategies to meet the demands of specific populations (Ajiboye et al., 2022; Chen et al., 2021).

In the case of zoning regulations and urban development projects, big data analytics informs the development of zoning regulations by providing valuable insights into land use compatibility, environmental considerations, and infrastructure requirements (Liu & Liao, 2021; Mortaheb & Jankowski, 2023; Samarajiva et al., 2015). By analyzing data on transportation networks, environmental factors, and socioeconomic indicators, planners can establish zoning regulations that promote sustainable development, minimize conflicts between land uses, and enhance the overall livability of urban areas.

Similar to this, planners can find good places for mixed-use projects, choose the right combination of land uses, and make sure that the developments conform to the needs and desires of the community by examining data on market trends, transportation patterns, and demographic features. This data-driven strategy promotes thriving, sustainable communities with a range of services and benefits for the local economy. Big data analytics aid in optimizing the design and execution of mixed-income communities, according to Vale and Shamsuddin's (2017) research on big data analytics in land use planning (Vale & Shamsuddin, 2017).

By leveraging data on housing affordability, income distribution, and demographic trends, planners can pinpoint areas with housing discrepancies and develop plans to offer a range of housing options. Thus, these data-driven strategies enable the development of neighborhoods that can house inhabitants from different socioeconomic backgrounds and promote social fairness.

In same way, the inclusion of social justice issues into land use planning processes is also made easier by big data analytics. Planners can identify locations with unequal distribution and create policies to remedy these gaps by examining data on access to amenities, transportation options, and public services. All inhabitants benefit from having access to necessary resources and opportunities thanks to this data-driven strategy, which promotes more inclusive and equitable communities.

The application of big data analytics in land use planning and development offers significant potential for optimizing urban environments, fostering social equity, and promoting sustainable communities. By leveraging big data to analyze land use patterns, inform zoning regulations, optimize mixed-use developments, and address affordable housing challenges, urban planners can make data-driven decisions that enhance the functionality and livability of cities. The case studies presented in this paper demonstrate the successful implementation of data-driven approaches to land use planning, highlighting the transformative impact of big data analytics. As cities continue to evolve, the integration of big data analytics will play a crucial role in shaping future land use strategies and ensuring the creation of vibrant, inclusive, and sustainable urban environments.

5.4. Big Data Analytics in Environmental Planning and Resilience

Environmental planning and resilience are of crucial considerations in urban planning and design, aiming to minimize the environmental footprint, enhance natural resource management, and promote adaptation to climate change. The integration of big data analytics into these processes offers opportunities for monitoring, analyzing, and mitigating environmental impacts.

In monitoring and mitigating environmental impacts, big data analytics permits the collection and analysis of enormous volumes of environmental data from various sources, including satellite imagery, sensor networks, and citizen science initiatives. This data-driven approach facilitates the monitoring of key environmental indicators such as water quality, air pollution levels, noise levels, and land use changes. By analyzing this data, urban planners can identify environmental hotspots, assess the effectiveness of mitigation measures, and make informed decisions to minimize negative impacts on the environment.

From the data collected, big data analytics can support predictive modeling to assess the potential environmental impacts of urban development projects. By integrating data on land use, demographic trends, and environmental factors, planners can evaluate the potential impacts of new developments on ecosystems, water resources, and air quality. This datadriven approach helps identify potential risks, inform mitigation strategies, and promote sustainable development practices.

Among the sustainable development practices is the sustainable water management (Water Resource Monitoring and Optimization). Big data analytics can enhance water resource management by monitoring water quantity and quality in real-time. By utilizing data from smart sensors, weather forecasts, and hydrological models, urban planners can optimize water allocation, detect leaks in water distribution systems, and improve water efficiency. Similarly, big data analytics can aid in flood prediction and resilience planning. By analyzing data from weather stations, river gauges, and historical flood events, planners can develop predictive models to anticipate flood risks and inform early warning systems. This data-driven approach enables the implementation of flood control measures, such as green infrastructure and improved drainage systems, to enhance urban resilience and reduce flood-related damages.

Air Quality Improvement is another aspect big data analytic are highly applicable. Big data analytics enables real-time monitoring of air quality by collecting data from sensor networks, satellite observations, and mobile applications. This data-driven approach provides up-to-date information on air pollutant levels, identifies pollution sources, and supports the implementation of targeted air quality improvement strategies. Real-time monitoring enhances public health outcomes and allows for prompt interventions to reduce air pollution.

In reducing air pollution, big data analytics can optimize traffic management to reduce air pollution emissions. By analyzing data from traffic sensors, GPS devices, and mobile applications, planners can identify congestion hotspots, optimize traffic signal timings, and promote alternative transportation modes. This data-driven approach helps reduce vehicle emissions, improve air quality, and enhance urban livability.

In the case of Green Infrastructure and Urban Biodiversity, big data analytics can inform the planning and design of green infrastructure by analyzing data on land use, climate, and biodiversity. By utilizing remote sensing data, ecological modeling, and citizen science data, planners can identify suitable locations for green spaces, assess the ecological value of different areas, and ensure the equitable distribution of green infrastructure. This data-driven approach enhances urban biodiversity, improves ecosystem services, and promotes residents' well-being.

Case Studies: Promoting Urban Resilience through Data Analytics: Copenhagen, Denmark - Climate Adaptation and Green Infrastructure

Giest (2017) described the use of big data analytics by Copenhagen to advance urban resilience via climate adaption and green infrastructure. Copenhagen adopted the CPH 2025 Climate Plan with the aim of becoming carbon-neutral by 2025. To achieve this, the city partnered with IBM to gather energy data for cutting CO2 emissions. IBM collects and channels relevant data into an open data hub, which connects data providers and consumers, as well as entrepreneurs and programmers, so they can use the data to find ways to help the city reduce its energy use.

By analyzing climate data, flood risk maps, and urban heat island patterns, the city has implemented strategies such as green roofs, permeable surfaces, and rainwater harvesting systems to manage stormwater, reduce flooding risks, and enhance the city's overall resilience to climate change. Other cities include Malmo in Sweden (goal to have 40% less GHG emission by 2020), Vienna, Austria (the smart city Wien), and across all cities in the United Kingdom (reduce emission by minimum 80% from 1990 to 2050).

The application of big data analytics in environmental planning and resilience presents significant opportunities for addressing environmental challenges and enhancing the sustainability of urban areas. By utilizing data-driven approaches to monitor and mitigate environmental impacts, optimize water management, improve air quality, and promote green infrastructure and urban biodiversity, urban planners can foster resilient and sustainable cities. The case studies presented in this research article highlight the successful implementation of data-driven approaches, emphasizing the transformative potential of big data analytics in promoting urban resilience and addressing environmental issues. As cities continue to face complex environmental challenges, the integration of big data analytics will play a vital role in guiding evidence-based decisionmaking, enhancing environmental planning, and fostering resilient urban environments.

5.5. Big Data in Urban Resilience and Disaster Management

For cities to survive and recover from natural or man-made disasters, urban resilience and efficient disaster management are essential (Eren, 2019b; Fleischhauer, 2008; Gülhan, 2021). Big data analytics thus presents chances to improve disaster preparedness, response, recovery, and reconstruction activities.

In Disaster preparedness and response, big data analytics enables the collection and analysis of real-time data from various sources, including field data, sensors, and remote sensing technologies (Li et al., 2019; Rathore et al., 2016; Rathore et al., 2015). To improve disaster preparedness, this data can be used to track natural phenomena such environmental occurrences, weather patterns, earthquake activity, and
hydrological conditions. Emergency responders receive fast information from the analysis of these real-time data, which helps in decision-making and resource allocation during disaster response operations.

Aside Disaster preparedness and response, Big data analytics also support risk assessment and vulnerability mapping by integrating and analyzing geospatial data, socio-economic data, and infrastructure data (Armenakis et al., 2017; Arrogante-Funes et al., 2021; Rumson et al., 2017). Urban planners can identify locations vulnerable to different hazards using this data-driven method, as well as evaluate the risk of local communities, vital infrastructure, and key services. Risk analysis and vulnerability mapping help to generate targeted treatments to improve resilience and inform catastrophe mitigation plans (Van Niekerk et al., 2018).

In order to create early warning systems and predictive analyses, big data analytics is also essential (Howard et al., 2016). Early warning systems give populations at risk prompt alerts and notifications (Ragini et al., 2018). Early warning systems can identify and predict natural disasters like hurricanes, floods, and earthquakes by analyzing data from meteorological stations, seismic sensors, and social media platforms. These systems allow for the prompt issuance of warnings, the evacuation of populations, and the activation of emergency response procedures, all of which help to lessen the effect of disasters.

In the case of big data for predictive analytics for disaster risk assessment, predictive analytics leverages historical data and statistical models to assess and forecast disaster risks. By analyzing data on past events, climate patterns, and socio-economic factors, predictive analytics can estimate the likelihood and severity of future disasters. In order to improve urban

resilience and lessen the effects of future catastrophes, this information helps in the development of proactive measures for disaster risk reduction, land use planning, and infrastructure design.

As big data analytics is of great importance in disaster preparedness and response, early warning and predictive analysis, it is also applicable in Post-Disaster Recovery and Reconstruction. During the recovery and reconstruction phase following a disaster, big data analytics can assist data-driven decision-making. By analyzing data on damages. infrastructure performance, and socio-economic indicators, planners can prioritize recovery efforts, allocate resources efficiently, and design resilient infrastructure systems. In essence, data analytics facilitate evidence-based decision-making and ensure that recovery efforts are targeted, equitable, and sustainable.

Similarly, simulation and modeling techniques enabled by big data analytics can aid in post-disaster reconstruction planning. By utilizing data on damages, topography, and population distribution, planners can simulate different scenarios, test the effectiveness of reconstruction strategies, and optimize resource allocation. Simulation and modeling enhance the resilience of reconstructed areas and support long-term planning for future disasters.

Case Studies: Enhancing Urban Resilience through Big Data

Big data was used in emergency management in Song et al.'s (2020) study to demonstrate how the expansion of extremely large and complex datasets, along with various advancements in information and communications technology and computing, now support more efficient approaches to disaster relief, logistical coordination, overall disaster management, and long-term recovery in connection with natural disasters and emergent situations.

A specific example of big data application in emergency management is during the 2011 earthquake in Japan, where the probe information service was deployed to aggregate daily traffic data from multiple private companies, including Honda, Pioneer, Toyota, and Nissan. This made it possible to create high-fidelity road passage maps, which were extremely helpful for recovery efforts after a disaster. Additionally, real-time mapping of road conditions during an emergency, from congestion to blockages, allows intelligent support for emergency vehicle navigation, transportation of rescue teams, distribution of supplies, and more

Through the analysis of historical data and the discovery of patterns that can aid early warning systems, Song et al. (2020) demonstrate how big data can be utilized to forecast and prevent disasters. For instance, analyzing weather data can help predict natural disasters such as hurricanes, floods, and wildfires, and enable authorities to take preventive measures to minimize the impact of such disasters.

The study by Song et al. (2020) also demonstrated that big data can be utilized to manage emergencies other than natural disasters, such as disease outbreaks and terrorist attacks. For instance, studying social media data can help authorities spot the spread of diseases and take proactive steps to stop the outbreak. Analyzing social media data similarly enables authorities to spot potential terrorist threats and take action to stop assaults. In similar ways, Yu et al. (2018) revealed how using satellite imagery, crowdsourcing, and social media data aids in monitoring and detecting natural hazards. Other examples include: 1. Using Machine Learning and historical and Big Data analytics to improve damage forecasting modeling.

2. Using a private cloud approach to allow data to be restored to multiple sites with multiple methods in facilitating the organization to recover close to 100 percent of the data.

3. Determining risky locations for natural disasters and creating evacuation strategies using Big Data analytics.

4. Coordinating relief operations before, during, and after natural catastrophes using Big Data analytics.

5. Applying big data analytics to evaluate the damage caused by natural catastrophes and create recovery and reconstruction plans.

Among others, Taale and Ventura (2020) described how Sendai has implemented an earthquake early warning system that makes use of big data analytics to find seismic activity and send out signals in a timely manner. By analyzing data from seismic sensors, the system provides warnings to residents, businesses, and emergency services, allowing them to take immediate protective actions. The system alerts locals, companies, and emergency services by analyzing seismic sensor data, enabling them to take quick precautionary measures. The city's overall resilience has improved as a result of this data-driven strategy's dramatic reduction in earthquake mortality and damage.

Urban resilience can be significantly improved by using big data analytics in urban planning and design for disaster management. Cities can better manage risks, enhance response capabilities, and create more resilient communities by utilizing data analytics for disaster preparedness and response, putting early warning systems and predictive analytics into place, and relying on data-driven decision-making for post-disaster recovery and reconstruction. The case studies discussed in this research paper show how big data analytics has been effectively used to improve urban resilience. The incorporation of big data analytics will be essential in developing efficient disaster management strategies and building resilient urban settings as cities face growing risks and uncertainties.

6. Finding, Discussion and Recommendations

As urban environments become increasingly complex and interconnected, the application of big data analytics in urban planning and design holds great potential for improving decision-making, enhancing efficiency, and fostering sustainable development.

The study has examined how big data analytics are used in many aspects of urban planning and design. As demostrated by Singapore in its beeline platform, big data analytics has shown its applicability in optimizing bus routes based on user demand and travel patterns, thus a revolutionary potential of data-driven insights in transportation planning.

In the case of big data analytic in smart cities, the Barcelona superblock effort serves as an example of how big data analytics may assist smart cities. It clearly demonstrates how using a huge dataset to optimise superblock sites aids in lowering traffic congestion, enhancing air quality, and fostering mobility for pedestrians and bicyclists.

Findings further shows big data analytics being pivotal for fostering urban resilience through climate adaptation and green infrastructure as exemplified in the Copenhagen's initiatives. By analysing meteorological data and urban trends, the city has put plans in place to manage storm water, reduce the risk of flooding, and enhance overall resilience to climate change.

In disaster management, the research demonstrates the critical importance of big data analytics in emergency situations. It demonstrates how datadriven insights make it possible to map out the state of the roads in real time during emergencies, improving emergency response efforts, supporting early warning systems, disaster forecasting, illness epidemic detection, and the reduction of terrorist threats.

The overall findings of the study demonstrate how the application of big data analytics is revolutionising urban planning and design and promoting resilience, effectiveness, and sustainability across many sectors. The revolutionary potential of using data-driven insights to create smarter, more livable cities for the present and the future is highlighted by these remarkable case studies.

Despite the advantages of big data analytics, its effectiveness still depends on the availability and quality of the data as employing incorrect data for analysis might result in distorted conclusions and flawed decision-making. In the case of accurate data, implementation can also pose a challenge. This is because integrating big data analytics into urban planning requires important investments in infrastructures or hardware, software, and expertise. Other noticeable limitations presented in the study centered on scale and generation of the case study as generalizing their findings on other urban areas may not yield same level of success.

Complexity of big data analytics which can lead to misinterpretations or biases in the results and decision making, tendencies of traditional urban planning approaches to resist the integration of data-driven methods, leading to slow adoption and limited impact; cost and resources intensiveness in implementing and maintaining big data analytics, regulator barriers, among others are limitation surroundings big data analytics.

The proliferation of IoT devices and sensor networks offers a plethora of data that can be tapped into for urban planning and design thanks to rising technologies and trends. Real-time data on numerous urban features, including transportation, energy use, and environmental factors, is provided by these systems. Urban planners may obtain complete insights for well-informed decision-making and predictive modelling by merging IoT data with big data analytics.

Advancements in spatial data analysis and geospatial technologies also enable urban planners to analyze large-scale geospatial data, including satellite imagery, LiDAR data, and geolocation information. These tools make it easier to spot spatial patterns, modify the way land is used, and develop infrastructure. Integrating spatial data analysis with big data analytics empowers planners to make data-driven decisions and optimize urban planning processes.

Using the data for spatial analysis, and other available big data, Artificial Intelligence and Machine Learning can be integrated for decision making. Artificial intelligence (AI) and machine learning algorithms can be utilized to develop decision support systems that assist urban planners in data analysis, modeling, and scenario planning. These systems have the capacity to analyse enormous volumes of data, spot trends, and produce insights for smarter decision-making. AI-driven decision support systems enhance the efficiency and accuracy of urban planning processes.

With machine learning algorithms, the creation of predictive models that can forecast various urban phenomena, such as population growth, traffic patterns, and energy consumption can be develop. These simulations help defining long-term urban planning plans, assessing the possible effects of planning decisions, and modelling various scenarios. Predictive modeling and simulation empower planners to proactively address future challenges and optimize resource allocation.

Although the big data age and its advances may be upon us, ethical questions about data security and privacy protection may still be of concern. Big data analytics' use in urban planning raises questions about data security and privacy protection. It is crucial to ensure that personal data collected is anonymized, stored securely, and used in compliance with privacy regulations. Robust data governance frameworks and transparent data management practices are essential to build public trust and safeguard sensitive information.

Scaling up the application of big data analytics in urban planning and design requires addressing the challenge of data integration and interoperability. Urban planners need to establish mechanisms for integrating diverse datasets from multiple sources and ensuring compatibility between different data formats and platforms. This interoperability makes it possible to do thorough analysis and makes it easier to comprehend urban systems holistically.

Similarly, to effectively implement big data analytics in urban planning and design, there is a need for capacity building initiatives and collaborative efforts. Urban planning experts should acquire the abilities and expertise needed to make successful use of big data analytics. To effectively address complex urban concerns, cooperation amongst many stakeholders is essential. This includes urban planners, policymakers, technologists, and communities.

7. Conclusion

Big data analytics in urban planning and design has the potential to significantly improve decision-making, increase effectiveness, and promote sustainable development. To fully realise the potential of big data analytics, however, issues including ethical considerations, data governance, scaling up, and interoperability must be resolved. By embracing emerging technologies, integrating artificial intelligence, ensuring ethical practices, and promoting collaboration, urban planners can navigate these challenges and shape the future of urban planning and design in an increasingly data-driven era.

Harnessing the potential of big data analytics while solving the problems it raises is key to the future of urban planning and design. With the right strategies, tools, and collaborative efforts, big data analytics can revolutionize urban planning, enabling cities to become more resilient, sustainable, and livable. Embracing the future of big data analytics in urban planning and design requires a proactive approach that balances technological advancements, ethical considerations, and the needs of the communities.

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Architectural Sciences and Recent Approaches and Trends in Urban and Regional Planning

CHAPTER-4

Digitalization in Smart City Solutions, The Traffic Flow Prediction in New York City, U.S.A.

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1. Introduction

Integration of the global world market has been a crucial precondition of the continues economic growth. Integration into the rising global economy has become crucial in the last part of the twentieth century. During the 20. century, there have been many radical changes in economic, social and cultural context. This change can also be represented as a transition from industrial economy to knowledge economy and/or as a restructuring of capitalist economy. Knowledge-based and knowledge-intensive industrial production is at the heart of these changes. Therefore, the measurement of the effects of the new information economy on cities has been emerged as a new urban research area.

In this regard, since the production and dissemination of information and its reflections in the post-industrial process are realized in the technology dimension, the social structures and cities have to keep up with this change and transformation.

The expectation and the habits of people has been influenced from the changes and development in the communication technology. The digital/information revolution has been considered as important as agricultural and industrial revolution. The contemporary societies has been evolving towards the information society due to advanced technologies (Uçar, Şemşit, & Negiz, 2017). The importance of the production and the evaluation of knowledge has been increased with in the information society. For this reason, societies and urban spatial systems in the world have been in an effort to integrate this structure into the system within the continuity of globalization - localization. Therefore, the subject of research has been the smart city and smart city applications in Turkey. This study

will present international and national samples from Turkey by reviewing the literature. Moreover, the information is presented about a sample application.

The aim of this study is to examine the status of the smart city in the world and Turkey and to set flow prediction in New York City.

2. Development of Smart Cities in the World

Smart city is a concept that emerged with the use of developments in information and information technology in urban structures. This concept has been used in all areas of life.

2.1. Cities in Global Information Economics

The phenomenon of globalization has led to the rapid flow of capital; therefore, together with this fluidity, it has intensified on capital accumulation in few centers. In particular, the technology infrastructure for the use of information and knowledge other than labor has been the basis for the formation of an important economy in this field.

Information Economics:

In terms of production, 4 types of information production are given as follows:

- Information production industries vary from real estate, law, health and engineering to accounting services,
- Information dissemination and telecommunication industries (Education and communication industries),
- Information processing industries, advertising, marketing, insurance, finance, etc.
- All machines used for information infrastructure,

• Rapid and dizzying developments in information and communication technologies in the world.

Daniel Bell claims that developments in science and technology cause radical changes in the field of production and as a result social relations change (Bell, 2001). Masuda states that information civilization invests in computer and communication technologies and it is a society that distinguishes itself from industrial society with its various features. Instead of consuming the resources of the information society abundantly, Masuda follows the ideal of creating a social situation that will bring the human creativity to the forefront instead of huge consumption of the sources. From this point, Masuda points out that "The age of information, which is the result of computer-aided technology, will cause a greater social transformation than the industrial revolution" (Masuda, 2004). Hence, it is observed that in developed societies technology is used very effectively in all areas of life, so that capital accumulation becomes more intense by saving time and labor. Therefore, lifelong education is ensured as an important way.

However, Castells (2009) does not accept the distinction between industrial and post-industrial societies, which is regarded as an advance by post-industrial and information society thinkers. According to Castells, technological transformations can be dealt with in the context of social relations before capitalism. Another dimension of new communication technologies is the penetration of organizational processes. Therefore, he does not regard the information society as a new era of social change. Castells (2009) claims that a society in the information age is a network of interconnected points. The points on this network are equal to each other or space less. Networks have open and dynamic structures. Castells states that "the new space of the world capitalist system is comprised of a hierarchically aligned position within the constantly changing and flow networks, and has variable geometry" (Castells, 2009). Hereby, it is determined that settlements are collected in certain centers and these centers perform certain functions.

Accordingly, the majority of investments through information technologies and networks are intensified in urban areas. The major changes in transportation and communication technologies, in parallel with globalization, has been effected globally. However, the penetration of these changes to different countries varies based on economic development level of countries. However, according to the level of economic development of countries, the level and degree of utilization of these opportunities may vary. With this aspect, competition markets between living cities and regions has been increasing today.

Castells (2014) assert that cities and regions will compete against each other in the process of creating a new developmental dynamic; the source of the economy based on the invention will contribute to the collective effort to create qualified spaces for the medium of activity and better living and working (Castells, 2014). According to Castells (2014), the development of electronic communication and information systems allow to increase the disparity between spatial proximity and performance in daily life. The information age led to the formation of a new kind of city in a new urban form in a new era. Accordingly, figure 1 shows the shape of the today's Modern city.



Figure 1. Today's Modern Cities (Megatrends, 2011)

In this case, it is necessary to make a distinction between the ones who produce and market the technology in the world, the technology users and the ones remaining between them. In this respect, Universities and research centers, which are the centers where technology is produced and distributed, are becoming the most important elements of the spatial structure. In this context, information systems called information corridors are integrated with transportation and land use patterns and these technologies are concentrated on the new media. They are implemented in order to promote local economic activities by strengthening local community ties in electronic environment. Accordingly, emerging urban information regions are preferred by specialized intensive information service industries.

2.2. Smart Cities Concept and Different Definitions

After determining this theoretical background, it is recognized that smart cities are defined under different names in historical development in the 21st century. Smart cities have emerged with the use of developments in information technology in urban structures. With the establishment of smart cities, it is tried to solve the problems of cities such as energy, environmental pollution, transportation / traffic with technology and thus, people can use time and space more effectively.

It is the city which has a better planning of the city's resources and preventive maintenance activities with the infrastructure elements of the city (roads, railways, bridges, airports, communication systems, water and energy systems and important buildings) by continuously and integrally monitoring the security elements and as a result it provides the city residents with this high level service (Ben Letaifa, 2015).

On the other hand, Velibeyoğlu (2019) evaluates the issue from another perspective and points out on the importance of urban technologies. Urban technologies constitute the main substructures in the formation of smart cities. Velibeyoğlu (2019) further suggests that geographic information systems, virtual reality and simulation technologies have a significant share in the real-time analysis and evaluation of the city. Figure 2 shows which components smart cities consist of and serve.

SMARTER SMART CITIES The "smart cities" agenda is mainly focused on top down technological initiatives (embedded sensors, data integration and analytics). The real smart cities of the future will mobilise human intelligence as well as artificial intelligence, bottom up creativity as well as top down control. Barcelona IBM Has embedded Has designed a sensors in the city's centralised Intelligent infrastructure to Operations Centre to infrastructure to onitor and manage coordinate and manage optimise the flows of water use all of a citv's services people and goods and deliver public services



PlanIT's Urban

Operating System

Is marketed as a

way to manage

the entire urban

landscape

Figure 2. Smarter Smart Cities (X-ThemeApollo, 2023)

Anthpoulos (2017) states that the smart city is the use of innovations and information and communication technologies (ICT) for the sustainability of cities in the economic, social and environmental areas by contributing to overcome some of the difficulties encountered. According to Dameri (Dameri, 2013), the smart city is the place where digital data, services and communication take place via internet connections in order to improve the quality of life and reduce the environmental footprint. According to study, a smart city has described that it has taking advantage of the existing technologies in order to improve the living conditions of the city by using the parameters raised in urban life (Memis, 2017).

The European Commission describes the smart city as a concept that is defined and shaped according to the factors of sustainability, economic development and quality of life (Deloitte Turkey, 2023). As can be seen in Figure 3, the features of the smart city are related to each other as much as they are different from each other.



Figure 3. Characteristics of the smart city (Witte et al., 2017)

According to the final report concerned with the Smart Cities ranking of medium sized in European cities:

The following factors are also effective in the definition of the smart city.

- Changes and innovations arising from information and communication technologies are city-based or spatially clustered in the city,
- 2) Techno cities, technology development areas, even cities and urban areas where sectors and jobs are based on internet and similar information and communication technologies are defined as the smart city. In this context, the six main characteristics have been set by the European Parliament. These characteristics are smart

economy, smart mobility, smart governance, smart environment, smart living and smart people (European Parleiment 2023).

- Smart Economy: Innovative and entrepreneurial spirit, flexibility in the labor market, integration and transformation in international markets
- Intelligent Mobility: Local and transnational accessibility, the existence of sustainable transport systems by municipal economic enterprises (ICT).
- Smart Governance: Participation for decision making processes within the transparency in governance systems leading to availability and accessibility of public services.
- Smart Environment: Attractiveness of natural environmental conditions, prevention of environmental pollution and conservation and management of resources.
- 5) Smart living: The life standard desired and measured for the existence of presence and accessibility of digital services, touristic places, social cohesion, healthy environment, security of people and their houses
- Smart People: The level of competence and quality of social capital (Vanolo, 2014).

Among the factors that are explained the above, technological, institutional and human factors can be listed. The smart city is in the intersection of these three factors. The components of the smart city are summarized in above Figure 4.



Figure 4. Component of a Smart City (Nam & Pardo, 2011)

The concept of the smart city in the EU goes beyond the use of information communication technologies for more efficient resource utilization and less emissions. This concept means more efficient methods for smarter urban transport networks, renewed water supply networks and waste disposal facilities and illuminating and heating buildings. In addition, this concept includes more interactive and sensitive urban management, safer public areas and meeting the needs of the older population (Uçar et al., 2017).

The city should be analyzed in various aspects of the city in order to provide effective service and access to services in every field by collecting data, making observations and producing urban theories together with urban outputs. In this digitalization age, this can be realized by gathering real-time data through making abstracts about the city with the help of computer technologies. The city has begun to be transformed into flexible and dynamic structures that can be actively monitored by a computer and the sensors in place and able to adapt to any external event and offer alternatives. In this regard, local governments have important duties and responsibilities in order to solve problems that directly affect cities and people, and to establish monitoring networks by establishing communication networks between them. It can be seen in Figure 5.



Figure 5. Understanding, Managing, Planning the Smart City (Batty, 2017)

On the other hand, as can be seen in Figure 6, the themes of smart cities and the proportions of initiatives and related platforms according to cities are indicated. For example, Masdar City Abu Dhabi in the United Arab Emirates, Amsterdam Smart City Project, Amsterdam in Netherlands etc. Various network connections have been established for this purpose. In fact, this structure, together with globalization, has lost the importance of the nation-state, instead it is a mixed structure in which NGO's, local governments and other international organizations are active. Especially, advances in information communication technologies lead to the completion of transactions in every area in a very short time, thus economic efficiency has been increasing. Therefore, cities should be integrated into this system by creating their managerial, organizational, economic and social infrastructures in every aspect.



Figure 6. Percentage of Sub topics and trends in Smart city initiatives all over the world (Neirotti et al., 2014)

In this context, the indices that will evaluate and classify the smart cities according to different criteria will be utilized and analyzes will be made about the levels of other studies related to the subject. It is necessary to determine the functions, structures and problems in the cities for smart city projects that can be developed. It is observed that the problems in the following areas have become prominent in the cities which have undergone significant quantity and quality changes in their structure and functions in the historical process. Those are;

- 1) Energy (Production and consumption),
- 2) Safety,
- 3) Transportation /Traffic (parking problem),
- Air and Environmental pollution (solid, liquid, gas, electronic and chemical wastes + radiation and noise),
- 5) Disabilities (Disabled),
- 6) Infrastructure (energy, information, communication, water, sewage, etc.),
- 7) City management,
- 8) Management of emergency (war, earthquake, flood, fire etc.),
- 9) The problem of migrants (Migration problems),
- 10) Use of clean water resources,
- 11) Health services,
- 12) Waste management (Recycling).

2.2. Highlights from Smart City Applications in the World

It is understood that the above 12 main headings, which constitute the weights and priorities of smart city projects, are carried out in all cities. However, particularly with local authorities and municipalities in which they are confined to a few of the applications and the performance unlike countries like European and U.S. China, Japan, it should not be forgotten that the cities of Turkey are relatively low. In this case, how and how projects are handled and implemented (financing and organizational model) become important. There will be able to make comparisons between successful examples in the world and discuss the situation of smart city applications (Göver, 2023).

Energy:

The use of energy is inevitable in order to sustain the survival of cities. Energy consumption also raises the question of efficient use of energy and the introduction of alternative energy sources. The energy is no longer consumed in the city as it was in the past, and the energy production and consumption are realized in the city. Technological solutions to be proposed in this context.

As shown in the Figures 7, 8, and 9, the bus stops and parts of the roads can be covered with solar panels.

- With smart meters, energy can be used in households with different time zones (after 18 o'clock).
- 2) Solar energy is a renewable energy source that can be used in cities more and more efficiently.
- A central light source (light ball/sunlight) can be placed in the city centers until 12 o'clock at night and the light power is reduced after 24.00. With such a strong central illumination, the city center can be removed from the streets while lighting is much more efficient.



Figure 7. Solar panel equipped roadway (Dutch open world's first solar powered bike path, 2014)


Figure 8. Solar Street Lighting (SRA International, 2023)



Figure 9. Solar Powered Smart Stops (Solaripedia, 2023)

Transportation-Traffic:

In crowded cities, it is vital for people to travel fast and safely from one point to another. However, a large number of vehicles at the same time in traffic, parking problem, air pollution, noise and traffic density, such as some problems brings with it. In this context,

- Improvements can be made in the signaling system (for example, the number of vehicles in the intersections by setting sensors on traffic lights is calculated by instant algorithms, so that the green light can be illuminated for a longer period of time for traffic in the direction of many vehicles.)
- 2) Traffic control system can be made more efficient (high lines can be written to vehicles polluting the environment and making noise, and in 10 days if the vehicle in the traffic control if the written penalty can be deleted, bicycle usage can be encouraged to drive less motor vehicles to traffic,
- 3) Public transport system can be made more efficient (bus stops are covered with solar panels and the number of passengers waiting at the stop can be calculated with the information of the time at which the bus will arrive at the station (intelligent transport system).
- Electric golf vehicles and tourist trains in city traffic can be used in the summer outlines of the city to encourage public transport, making it fun and attractive. It has seen as Figure 10.
- 5) As in the USA, vehicles and electric vehicles with at least 3 passengers in the environment and main arteries, allowing them to use the left-most lane of the road.

In addition, smart applications are used to regularly control and manage the traffic system. It has been indicated on Figure 11.



Figure 10. An alternative for short distance public transport: electric golf tools (Alibaba, 2022)



Figure 11. Smart Traffic Lights (Smart Traffic Lights, 2017)

Air and Environmental Pollution:

One of the most important problems of today's cities are given below. In this context;

- 1) Air pollution measurement can be done at regular intervals at certain points,
- 2) Heavy penalties and sanctions can be applied to industrial enterprises polluting the environment,
- Heavy penalties can be issued for vehicle drivers who do not pay attention to exhaust emissions,
- 4) Legal measures can be taken for heating houses only with electricity and natural gas,
- 5) Precautions can be taken to collect electronic waste at more points,
- Disposable (plastic) cups, plates, forks, spoons instead of glass cups, porcelain plates and metal spoons, fork use can be encouraged,
- It can be encouraged to use paper bags and net instead of plastic bags in shopping,
- 8) The amount of solid waste collected in the city can be published daily, weekly, monthly and yearly by putting billboard thus, public awareness can be provided on this issue.

After evaluating the smart city applications and examples that have become widespread today, this time the statistical findings made in New York City to predict the flow of traffic are evaluated in detail in the next section.

3. Application to Traffic Flow Prediction

3.1. Introduction and Literature Review

Traffic has become one of the biggest problems in urban areas with the increase in the number of vehicles. The number of vehicles in the world is expected to increase gradually. Therefore, Intelligent Transportation Systems (ITS) has become a popular research topic nowadays. Traffic flow prediction (TFP) is one of main problem in ITS. TFP has many benefits for individual travelers, government agencies and business sectors. With the help of TFP road users can make better travel decisions, choose less crowded routes, which may eventually alleviate traffic congestion, reduce accidents, traffic pollution and carbon emissions. To date many machine learning algorithms have been developed to estimate TFP. In these studies, firstly, a time interval t is determined and in each interval, number of vehicles is counted. Finally, as shown in the equation below, number of vehicles are estimated by based on the number of vehicles at neighboring w intervals that come before t.

$$n_t = f(n_{t-1}, n_{t-2}, \dots, n_{t-w})$$

In this equation, f represents the statistical function or machine learning model that estimates the number of vehicles expected to pass from a road or intersection using historical data.

There are various publications that estimate the traffic flow using a real dataset. Kumar et al. predicted short-term traffic flow for non-urban highway using artificial neural networks. They collected the dataset from Muzaffarnagar bye-pass on the road from Roorkee to Delhi. Number of vehicles is estimated in two different time intervals of 5 minutes and 15 minutes. They obtained a 0.6281 mean absolute error (MAE) for intervals

of 5 minutes and 1.2786 MAE for intervals of 15 minutes (Kumar, Parida, & Katiyar, 2013).

Lv et al. collected the California traffic data from the Caltrans Performance Measurement System (PeMS) database as a numerical example and generates four different datasets in intervals of 15 minutes, 30 minutes, 45 minutes and 60 minutes. Their auto encoder models obtained the best MAE scores of 34.1 for 15 minutes, 64.1 for 30 minutes, 92.0 for 45 minutes and 122.8 for 60 minutes (Lv et al., 2015). Koesdwiady, Soua and Karray (2016) collected traffic flow and weather data from 47 roads in California and divided the dataset in 3 parts based on the roads with low traffic, med traffic and high traffic. They estimated the number of vehicles for intervals of 5 minutes and obtained a 0.041 MAE for low traffic, a 0.034 MAE for med traffic and a 0.085 MAE for high traffic (Koesdwiady et al., 2016).

Fu, Zhang, & Li (2016) formed a dataset starting from the PeMS database, which contains traffic flow data of California and obtained a 19.17 MAE by an ARIMA model, an 18.12 MAE by a Long Short Term Memory (LSTM) model and a 17.21 MAE by a neural network with gated recurrent unit mode in intervals of 5 minutes (Fu et al., 2016). Rahman collected data from the road of Dublin Airport and applied Monte Carlo simulation several times by sampling from normal distribution and obtained a 17.07% mean absolute percentage error (MAPE) in intervals of 10 minutes (Rahman, 2018). Zhao et al. (2018) collected data from PeMS database in intervals of 5 minutes and obtained a 17.23 MAE by an LSTM model. According to the results obtained in the literature, MAE score of TFP is affected by many factors, such as time interval, number of samples, traffic

density, etc. Kumar et al. (2013) used the MAE score because they

collected data from a highway that has low traffic congestion, which can be easier for estimating the traffic flow.

Decreasing the time interval reduces, the MAE score. There are two reasons for this behavior: the increase in the number of samples and characteristics of the MAE metric. As expected, decreasing the time interval increases the number of samples. Second, decreasing the time interval decreases the number of vehicles for one interval and it has positive effect on the MAE score. For example, suppose the actual number of vehicles are 12 for the first 5 minutes, 11 for the second 5 minutes and 7 for the last 5 minutes (with a total of 30 vehicles for the interval of 15 minutes), and the model estimates these as 14 for the first 5 minutes, 10 for the second 5 minutes and 12 for the last five minutes (with the total number of vehicles estimated. as 36).

The MAE score computed for the interval of 15 minutes is |30-36|=6, while for the intervals of 5 minutes it becomes ((|12-14|+|11-10|+|7-12|))/3=4.66, which is lower than the MAE score for 15-minute interval. In both cases, the total number of errors is the same, but MAE scores are different from each other due to normalization with the number of intervals. This situation is also similar for the minimum square error metric. Therefore, low MAE scores can be obtained for short time intervals.

In this study, the New York dataset is selected as a case study, which is a large metropolitan city with high population density and different types of land use planning. New York is ranked among the most congested metro areas in the USA and contains various challenges for estimating the traffic flow accurately. Three regression models are implemented for predicting traffic flow in various roadways in New York including linear regression, random forest and recurrent neural networks with LSTM model.

3.2. Experiments

The dataset used in this study is downloaded from Kaggle (2020). It contains car count for 5956 days in 2012 and 2013 that were collected from 377 different roadways within time intervals of 60 minutes. Two types of modeling approaches are implemented on this dataset. In the first one, a separate regressor is trained for each roadway to estimate the number of cars that will pass through that roadway. In the second approach, a single regressor is trained on combined data that includes all the roadways available.

For the first approach, linear regression and random forest are implemented as regressors and for the second approach linear regression, random forest and recurrent neural network with LSTM model are developed. Linear regression and random forest methods are implemented using the scikit-learn library of Python (https://scikit-learn.org/stable/) and recurrent neural network using the Keras library of Python (https://keras.io). All the other scripts are implemented in Python language.

Linear re-gression model is implemented using the default settings. The number of trees parameter of random forest is optimized by performing a 10-fold cross-validation experiment on each train set separately. A deep unidirectional recurrent network with two consecutive LSTM layers followed by a fully connected hidden layer and a fully connected output (i.e. regression) layer. The activation function for LSTM and hidden layer is selected as ReL U and the activation at the output layer is chosen as linear. Adam optimizer is employed with a beta1 coefficient of 0.95, beta2 coefficient of 0.99; the learning rate is set to 0.01, number of epochs to 25, batch size to 512, and clip value is 0.5 (for gradient clipping). The cost metric is chosen as MAE for learning the weight parameters of the network. The train and test sets are formed by splitting data samples in each roadway into two.

For this purpose, first, the most recent 25% of the data samples for a particular roadway are assigned to test set. If 25% of the samples occupy less than a day, then the last day is assigned to test set. The remaining samples are assigned to train set.

Table 1 shows the MAE scores for the first approach and Table 2 includes the MAE scores for the second category of models. The best MAE score is obtained as 42.56 using a random forest model for the time interval of 60 minutes. The closest work to the present analysis belongs to Lv et al. (2015) who analyzed a similar dataset that contains road traffic flow information for California. and obtained a MAE score of 122.8 for a time interval of 60 minutes. Though the two MAE scores may not be directly comparable the MAE scores obtained for New York are promising.

Based on these results shows the second type of models obtained lower MAE scores. In both scenarios and the random forest model obtained better MAE values than other regressor. In the next step five roadways are selected randomly on various districts of New York. Figure 12 contains maps of these roadways as well as the map that shows the five roads selected. According to this figure, the roads selected contain different types of land use planning and building types.

Method	MAE
LR	57.75
RF	54.94

Table 1. Mean absolute error (MAE) scores for the first category of models. A separate model is trained for each roadway

Table 2. Mean absolute error (MAE) scores for the second category of models. A single model is trained using the combined data from all roadways

Method	MAE
LR	46.73
RF	42.56
LSTM	45.78



Figure 12. Maps of the five roadways selected from the city of New York

Table 3 provides the MAE scores for the selected roadways. Table 4 includes distance between each roadway. As observed from this table, the roadways are well separated from each other. Based on this table, road D had the highest MAE score both by linear regression and random forest. This is not surprising since the district around road D contains different types of buildings including a shopping mall, shopping stores, restaurants, residential buildings, a metro station, and bus stops causing the traffic flow to be highly variable and dynamic.

Roadway	RF	LR
Road A	59.16	52.3
Road B	29.54	34.48
Road C	51.54	61.0
Road D	55.61	61.17
Road E	36.27	47.29

Table 3. MAE scores for five selected roadways

Table 4. Distance between selected roadways (km)

	Road A	Road B	Road C	Road D	Road E
Road A	0	13.5	21.1	9.1	5
Road B	13.5	0	32	11.8	18.3
Road C	21.1	32	0	20.2	34.5
Road D	9.1	11.8	20.2	0	11.8
Road E	5	18.3	34.5	11.8	0

4. Conclusion and Suggestions

Cities are changing and transforming very rapidly in every field and it is inevitable that institutions and social structure should adapt to this change. In particular, the production of technology and knowledge along with the dynamics of industry has led the cities to transform into smart cities. As a result of the rising network type of society, urban and spatial structures have lost their meaning and the means for re-representation have been developed. By eliminating the distance between space-location and time, the necessity of redefining these concepts has emerged. As a result, we are witnessing the importance of consumption and capital in this period of time where location and space concepts are effective.

Similar places emerge as a form of reflection of the culture and image, which are becoming standardized throughout the world, where local cultures and identities begin to disappear. It is now possible to identify problems that are similar to each other by means of simulations, and apply them by finding rational, technological, environmental, sustainable and innovative solutions.

In this context, energy, smart grids, transportation and traffic, environmental pollution, waste management and various social problems are among the subjects that are tried to be solved in a holistic perspective. In particular, it is clear that the smart city studies of smart urbanism, such as Seoul 2020, Amsterdam, which we see only in the world, are based on participation and transparency. At the same time, projects with high added value are made in this field together with the great economic and financial forces provided by the political and economic supreme organizations (such as the European Union and the Shanghai Five), where the strong regional identity with globalization is important. In this respect, it can be stated that the gap between developed and backward countries has increased.

As a case study, in this work, traffic flow is predicted for 377 roadways of New York using various regression techniques. The roadways contained a large variety of land use planning and building types including residential buildings, shopping malls, stores, restaurants, metro stations, bus stations, hospitals, schools, churches, fire stations, which cause the traffic to be a highly dynamic process. If traffic flow can be estimated using forecasting methods ahead of time for a large number of roadways with reasonable accuracy, then the drivers will have the opportunity to do better road and time planning by reaching this information from online resources, which will eventually improve the quality of people's lives and may reduce traffic congestions considerably.

As a future work, we are planning to collect the traffic flow data of selected roadways in Kayseri, which is a city in central part of Turkey, with more frequent time intervals than New York dataset. This will help estimating the traffic flow more accurately and more frequently, which will enable the drivers to have information about alternative route options quickly through their mobile phones, make better driving and parking decisions, and schedule their work and leisure time activities more effectively. This work may also serve as a prototype model for smart city applications for other cities of Turkey.

Author Contribution and Conflict of Interest Disclosure Information

1st Author % 40, 2nd Author %30 and 3rd Author %30 contributed. There is no conflict of interest.

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Architectural Sciences and Recent Approaches and Trends in Urban and Regional Planning

CHAPTER-5

Sustainable Land Use and Planning in Coastal Zones Through the Perspective of Green and Blue Economy



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1. Introduction

Along with the developing economies throughout history, human-oriented activities have had negative effects on the environment. However, the production that gained speed with the Industrial Revolution and the understanding based only on economic development led to the accumulation of many problems in cities over time. It is not possible to talk about the importance of environmental values in this period. The production of these resources by constantly consuming and ignoring environmental values continued until the end of the twentieth century.

Environmental awareness in the world began to emerge in the 1970s. The 1972 United Nations (UN) Conference on the Human Environment in Stockholm, was the first development in which environmental problems were addressed globally. The report titled "Limits to Growth", prepared by the Club of Rome in 1972, emphasized that the economy and the natural environment should be considered together in development policies, and it was stated that if the increase in world population, industrialization, environmental pollution and consumption of natural resources continued, the limits of global economic growth would be reached within a century. In the report "Our Common Future" published by the UN Commission on Environment and Development in 1987, meeting the needs of the present without ignoring the needs of future generations was defined as sustainable development. With this approach, a different perspective was brought to economic development and its importance was emphasized (Al, 2019). The concept of sustainable development has gained great importance since

the 1990s and was adopted by the whole world at the UN Conference on Environment and Development held in Rio in 1992. The dominant development paradigms that have been going on since the past have changed and left their place to the emergence of concepts including an ecological perspective. Concepts such as *green economy, green growth* or *green development* have emerged. Regulations such as the UN Framework Convention on Climate Change (UNFCCC), the Kyoto Protocol, and the Paris Agreement were effective in turning this idea into an international effort. Green concepts created on the axis of economy, environment and society basically explain economic production approaches in which environmental damage is minimized.

Today, the transformation of existing economic and development models with climate change, which is increasingly showing its effect, is discussed. The green economy offers a framework to facilitate this transformation. It is stated that the cities where 54 % of the world's population live today are responsible for 70% of global greenhouse gas emissions (İstanbul Policy Center [İPM], 2017). There is resistance to approaches that aim policies based on reducing greenhouse gas emissions, which will negatively affect economic growth. However, if sustainable growth does not occur in the long term, irreversible economic losses are also expected.

1.1. Climate Change

Coastal cities are areas that will be affected more by climate change than other cities. It is predicted that coastal areas will face effects such as deterioration of marine ecosystems, rise in sea level, formation of floods and overflows, formation of strong storms, increase in temperatures, increase in drought, and forest fires. On the other hand, coastal erosion caused by storm surge also poses a significant danger to coastal cities. Densely populated deltas and low-lying coastal cities are considered important points of coastal vulnerability (Balica, Wright & Meulen, 2012). According to climate change scenarios, the most important factor that may occur in coastal areas is the increase in sea levels. Many of the world's largest cities are located in low-lying coastal areas. Although low-elevation coastal areas account for only 2% of the world's total land area, they contain about 13% of the world's urban population (UN, 2011). Emphasizing that approximately one third of the population of the European Union (EU) lives at a distance of 50 km from the coast, it is stated that if greenhouse gas emissions continue in their current trend, with the increase in sea levels, sea and ocean-based economic assets, living population and infrastructure will be seriously damaged.

1.2. Green Economy

The term green economy was first mentioned in the title of the report "Green Economy Draft" published in England in 1989. The foundations of the green economy and green growth concepts were laid at the Environment and Development Ministerial Conference held in Seoul in 2005, and it was agreed to go beyond the sustainable development discourse and follow the green growth path. The concept of green economy started to become widespread with the 2008 crisis, when economic, social and ecological crises were experienced together (IPM, 2017). At the UN Conference on Sustainable Development Rio+20 held in 2012, it was stated that green growth is a strategy for achieving sustainable development (Al, 2019).

Green economy, also called green growth or green development, is a concept that envisages economic development by protecting the environment. With the green economy, it is basically aimed to reduce carbon emissions and develop new technologies in production. According to the Organization for Economic Co-operation and Development (OECD), green growth is "the promotion of economic growth and development, while protecting natural assets that will enable the continuation of resources and environmental services that enhance people's well-being." The World Bank, on the other hand, defined green growth as "the efficiency in the use of natural resources". According to another definition, green economy is defined as "sustainable innovation process that ensures sustainable socioeconomic development" (Al, 2019). It is possible to come across many different definitions of green economy. However, on the basis of the definitions, it is seen that the concept of sustainable design of economic growth is emphasized.

The "A European Green Deal", which commits to take more specific steps in environmental and sustainability issues, aims to make the European continent climate neutral by 2050. On the other hand, "EU Strategy on Green Infrastructure" was adopted by the European Commission in 2013, which encourages green infrastructure investments. In this strategy, it was stated that green infrastructure would contribute greatly to areas such as regional development, climate change, and disaster risk management, and it was emphasized that green infrastructure applications should be integrated into spatial planning and regional development (Türkiye'de İklim Değişikliğine Uyum Çalışmaları, 2021).

1.3. Blue Economy

The blue economy, which was first introduced by Gunter Pauli (2010) in his book "The Blue Economy"; it seeks to ensure the environmental sustainability of the oceans and coastal areas, while supporting the development and protection of the livelihoods of those who make their living by sea (Toplu-Yılmaz, 2021). The concept of blue economy was later used at the Rio+20 Conference held in 2012, and it was stated that the blue economy concept should be used and protected to the fullest extent of the current economic potential of the oceans and seas (Öktem, Kutluay Tutar, Tutar & Tutar Güçlüçen, 2021).

The roots of the concept of blue economy go back to the conceptualization of sustainable development. At the Rio+20 Conference held in 2012, a new concept called "green growth" emerged in the environment of international financial crisis. A group of small island states, recognizing the attractiveness of this new concept and its close relationship with growth from terrestrial ecosystems, emphasized the importance of the blue economy and referred to the multifaceted economic and social importance of the ocean (Eikeset, Mazzarella, Davíðsdóttir, Klinger, Levin, Rovenskaya & Stenseth, 2018). After the Rio+20 Conference, the concept of blue growth began to be widely used and became important in development in many countries.

The UN has defined the oceans as areas of development in which sustainable use, conservation, bio-exploration, oil and mineral extraction, maritime transport and sustainable energy production are integrated. The UN states that the blue economy should promote the protection and improvement of livelihoods in relation to economic growth, while ensuring the environmental sustainability of the oceans and coastal areas. The World Bank, on the other hand, emphasized that trying to balance the economic, social and environmental dimensions of sustainable development with regard to the oceans is the main component of the blue economy (United Nation Environment Programme [UNEP], 2022).

In the EU, the concept of "Blue Growth" has emerged as an economic growth strategy in the seas due to reasons such as climate change, depletion of natural resources, increasing urbanization and population density in coastal areas. The "Blue Growth Strategy" was published by the European Commission in 2012, which includes policies and actions in a number of areas such as biodiversity conservation, fisheries, tourism and energy to regulate the sustainability of the seas. This Strategy, which supports sustainable growth of marine areas, emphasizes marine spatial planning and coastal protection. In addition, the importance of marine areas for innovation and growth is emphasized in the blue energy, aquaculture, coastal and marine tourism, marina, blue biotechnology and marine mineral resources (seabed mining) sectors (Akay, 2020).

2. Material and Method

The aim of the study is how to create a new model in legal, administrative, institutional and especially practical areas related to spatial planning in coastal areas, which will ensure the sustainability of coastal areas that are sensitive to climate change in Turkey.

Intense usage demand of different sectors in coastal areas, construction pressure and population growth are the main problems. In addition, the fact that climate change will have a greater impact on these areas makes it difficult to ensure the sustainability of these areas in the future. The pressures that have emerged in the coastal areas, especially in the last half century and whose effect is increasing, have led to the emergence of new approaches for the unique planning and management of these areas over time. There are many regulations, agreements, directives, plans, programs, projects, laws, regulations and so on, related to the planning and management of coastal areas on an international, national, regional and local scale. On the other hand, there are index studies produced for different purposes for coastal area management and sustainable land use. There have been many regulations concerning coastal areas in Turkey since the past. It is seen that the sustainable use of coastal areas cannot be achieved sufficiently with these approaches, which basically aim to eliminate the conflict between ecological values and economic activities. The main reasons for this are the inability to deal with the issue in a holistic and multifaceted manner and the inadequacy of concrete and measurable approaches to ensure the sustainability of coastal areas. For this reason, there is a need for a model that will reveal the spatial transformation of the coastal areas of Turkey, which is sensitive to climate change, in a sustainable manner within the framework of the green and blue economy approach. In this context, the model aimed to be developed;

- Guiding all sectors in the coastal areas and determining the thresholds,
- Guiding all plans, programs and projects in coastal areas,
- Limiting and controlling land uses in coastal areas,
- Strategic, flexible, dynamic, proactive, innovative, which foresees the semi-open system approach,
- Helping multi-faceted decision making,
- Nature-based and suitable for adaptation to climate change targets,
- Establishing the balance between ecological values and economic activities,

• It is envisaged to be a decision-making tool that aims to make an objective decision between coastal uses.

In studies on coastal areas; it is seen that the focus is on issues such as identity in coastal areas, sustainable tourism, integrated coastal areas management and planning, the vulnerability of coastal areas to climate change, the effects of sea level changes on coastal areas, and the effects of development in coastal cities on spatial growth. In the current studies, it is seen that comprehensive and concrete criteria regarding how the coastal areas will develop in the future within the framework of the current situation and how this development will be evaluated within the conflict of environmental and economic values of the coastal cities have not been put forward. However, in this study, it is aimed to develop a comprehensive model for the creation of indicators that will guide the spatial development of coastal cities, such as population growth, the effects of climate change, and the evaluation of coastal uses within the framework of land use they should have.

Coastal areas are complex and sensitive areas consisting of many natural and artificial systems that are in contact with each other. More complex problems and management issues arise when city and coast come together. These are areas that change easily due to the continuity of natural and manmade influences. Man-made change takes place much faster than natural means and results in the loss of the coastal area's resistance to sudden events. Therefore, the change in coastal areas needs to be controlled by planning. In coastal development, mainly urban coastal settlements show themselves. Coastal areas require evaluation with a special planning approach. Each coastal area has different and unique characteristics such as morphology, landforms, land use and sociospatial characteristics. For this reason, in the evaluation of coastal areas, coastal areas should be classified according to some basic and common characteristics (Çakır, 2010).

Coastal areas; structured-nonstructured, permeable-nonpermeable, densenondense, natural-artificial etc. can be explained by many forms of land use. The intensity of the pressure on land use is determined by the ratios between these opposite uses. Likewise, revealing the uses on the areas defined as coastal areas at a measurable and calculable level depending on different variables will enable optimal decisions for sustainable land use. Thus, a quantitative mechanism will come into question in all types and scales of decisions on land use in coastal areas. For this reason, there is a need for a flexible and dynamic system that will reveal the current situation in the coastal areas, limit the pressure of the country/basin/region/city on the coastal areas, ensure that the usage thresholds for the sectors can be determined and measured, and that will guide the future land use accordingly.

It is necessary to monitor land use changes in order to make a study and assessment of the future of coastal areas. On the other hand, land use is non-linear. Especially coastal areas are complex areas where natural and human influences coexist. For this reason, there is a need for a system with certain limitations to ensure sustainable land use. In order to determine these limitations, it is necessary to establish the criteria and measurable indicators that will ensure the realization of these criteria. It is envisaged to divide the coast into zones according to their areas of influence and to calculate the impact of each land use type on sustainability through indicators to be determined by weighting according to these regions. With this method; the relationships between climate change - land use change, economic transformation - land use transformation, incompatible uses optimal location selections are examined.

In any study to be carried out on coastal areas, first of all, coastal areas should be defined and classified. It is stated that one of the most important factors for good management and planning of coastal areas should be adequate boundaries of the area to be managed (de Andrés, Barragán & Scherer, 2018). There are different approaches to defining and classifying coastal areas, depending on the purpose. Geographical and morphological features constitute the threshold in determining the physical boundaries of coastal areas. In general, it consists of two regions, the landward and seaward. These two regions are connected by water flow. Defining the boundaries of these areas is important in terms of determining the usage principles, interactions and effects (Çakır, 2010).

Determining the unique coastal area formed by the shoreline, defined as the line where land and water intersect, on the land and sea sides, the rear areas that are the continuation of the coastal area and having the characteristics of a transition zone, and the impact areas, especially on the land side, constitute the most important limitations when making decisions regarding these areas. Defining coastal areas and imposing restrictions accordingly have critical importance in terms of their sustainable management. In order to manage coastal areas in a measurable way, its borders should be determined rationally and defined as a system due to its ecological and socioeconomic character. Regarding the classification of coastal areas, physical, biological, geographical, geological etc. many classifications have been made. It is difficult to make a general classification as the classifications made in coastal areas differ according to the purpose. However, it is seen that there are two types of classification in general. The first is morphological classifications made due to their natural characteristics. The second is the classifications describing the coastal area. In studies on climate change, the natural structure of coastal areas and the physical characteristics of the built environment that will be affected are taken into account. All kinds of studies on the classification of coastal areas.

There are many regulations for the protection and use of coastal areas, from the international level to the local level. The extent to which these regulations ensure sustainability has been a matter of debate. In an area like the coast, which has a complex and dynamic structure, there is an increase in inconsistencies with the increase in regulations of different sizes that affect land use. The biggest obstacles in ensuring the sustainability of land use are the problems related to the incompatibility of uses. When these existing regulations regarding coastal areas are examined, it is seen that the themes of holisticity and sustainability are mostly at the forefront. However, it is also seen that this area contains uncertainties, especially when it comes to the conditions for holistic and sustainable land use. It is seen that a rational sustainability cannot be achieved in terms of land use in coastal areas with the existing regulations and the practices realized in line with these regulations. A complex and multiple structure emerges when conceptual and practical international initiatives, national-scale regulations and local-specific situation regarding coastal areas are taken into consideration. All this structure should be taken into account in the creation of a model for sustainable land use in coastal areas (Table 1).

Problems	Concepts
Build pressure	Sustainability
Population growth and immigration	Integrity
Climate change	Capacity
Economic activities	Protection and usage balance
Conflict and incompatible uses	Vulnerability
Ecological destruction	
Natural vulnerabilities	
Approaches	International Regulations
Sustainable development	Deals
Green economy	Directives
Blue economy	Policies
Integrated Coastal Zone Management (ICZM)	Strategies
Marine spatial planning	Plans
Disaster risk management	Programs
Ecological footprint	

Table 1. Topics Forming the Framework of the Model

When viewed on the scale of Turkey, in addition to the current global situation, the current situation specific to coastal areas and the studies carried out constitute the other basic foundations for the creation of the model. Legal regulations, spatial plans, ICZM and its planning and projects are the leading ones. In the creation of a model for sustainable

land use in coastal areas in Turkey and indicators related to this model, it is necessary to take or adapt indicators especially related to land use by making use of all these approaches. Thus, a system specific to Turkey will be designed. The general outlines of the stages of the model to be put forward as a result of the evaluation of the above-mentioned issues regarding the coastal areas are listed below (Figure 1).



Figure 1. Stages of the Model

3. Situation in Turkey

In Turkey, one of the important countries of the Mediterranean Basin, coastal areas differ from region to region. There are regional differences in terms of physical characteristics, land use and population density. Coastal areas were the areas most affected by environmental problems due to the rapid and unplanned urbanization and illegal construction seen as a result of migration movements from rural to urban in the 1960s. After the

1970s, the pressure to use in coastal areas has increased. With the laws enacted in the 1980s, it is seen that both the legal boundaries of the coastal areas have started to be determined and detailed regulations have been made regarding the construction. However, there is no direct regulation specific to coastal areas regarding climate change, green and blue economy.

Low altitude (below 10 m) coastal regions constitute 3% of Turkey's surface area (Kahraman & Aydın, 2016). Although 28 out of 81 provinces have coastlines, it is seen that the effects of current activities in coastal areas are also observed in the inner regions according to regional characteristics and interactions (Gülbitti & Özüduru, 2020). In addition, pressure is increasing on coastal cities due to massive migration. It is predicted that climate change will affect the coastal areas, which have more sensitive features and structures compared to the inner regions.

3.1. Climate Change in Coastal Areas

Since Turkey has a different climate and geographical structure from region to region, it is also affected by climate change in different ways and degrees. On the other hand, coastal cities stand out as more vulnerable areas against the risk of sea level rise, storms and floods. Turkey's coastal areas are most threatened by sea level rise from the effects of climate change. The places that will be most affected by the sea level rise in the coastal regions of Turkey are the coastal deltas, wetlands, low altitude tourism regions and where agricultural production is highest. It is stated that the Turkish coasts have high regional sensitivity due to topography and subsidence, and the Mediterranean coast of Turkey is the area that will

experience the most soil loss due to rising sea water levels (Çevre ve Şehircilik Bakanlığı [ÇŞB], 2018).

In the 11th Development Plan (2019-2023), it is stated that Turkey is among the countries that will be most affected by climate change due to its geographical location, and a policy is being followed to limit the green growth and emission increase trend in parallel with its position as a developing country. And also; it was emphasized that practices such as supporting green port applications, increasing the quality of life in line with the green city vision, building the National Gardens and increasing the amount of green areas, creating a green corridor, planning and infrastructure works will be carried out in order to increase the amount of protected areas in the land and sea and to ensure the effective management of these areas (Cumhurbaşkanlığı Strateji ve Bütçe Başkanlığı [CSBB], 2019).

Turkey became a party to the UNFCCC in 2004 and started national studies on climate change. In 2012, Turkey's Climate Change Adaptation Strategy and Action Plan covering the years 2011-2023 were prepared. Turkey ratified the Paris Climate Agreement and entered into force on 7 October 2021. In Turkey's Climate Change Adaptation Strategy and Action Plan, targets related to coastal areas are included. In line with the primary objective of "Developing and Disseminating R&D and Scientific Studies for Adaptation to the Impacts of Climate Change in the Management of Water Resources", "Determining the vulnerability of water resources and coastal management to climate change, developing adaptation options, making periodic revisions according to the monitoring results" has been determined as the target. In this context, it is stated that

risk assessment studies will be carried out first in order to determine the vulnerability of coasts (including rivers, natural and artificial lake shores) to climate change and to develop adaptation options in these regions. Another target has been determined as *determining and monitoring the* effects of climate change on mountain, steppe, inland water and sea coastal ecosystems and the ecosystem services they provide, and developing measures for adaptation to climate change. In addition, it was emphasized that a new management model should be established in the fight against climate change in terms of coastal areas, and that integrated coastal area studies are an important tool in climate change (CSB, 2012). National Communication, Turkey's Seventh reduction In and precautionary activities are included in order to implement green port and green airport projects that will ensure energy efficiency until 2030. The "Green Port" Project was developed by the Ministry of Transport and Infrastructure in 2013 in order to prevent and eliminate environmental impacts to a certain extent (CSB, 2018). On the other hand, the Climate Council was held in February 2022 by the Ministry of Environment,

Urbanization and Climate Change with the aim of "dealing Turkey's new climate change vision within the framework of developing and changing conditions and presenting the green transformation understanding in a participatory manner" (CSB, 2022).

3.2. Green and Blue Economy in Turkey

Studies on green economy in Turkey generally develop within the framework of international agreements and efforts to harmonize with the EU. Turkey is still in the early stages of developing low carbon or green growth policies. In the study titled "Green Economy Policies for Climate" in Turkey, carried out in 2017 with the cooperation of the Green Thought Association, Sabancı University Istanbul Policy Center and the Green European Foundation; good examples of reduction and harmonization in the fields of urbanization, land use and energy in EU countries were discussed within the framework of Turkish conditions, and green economy policy practices that could be implemented by decision makers were pointed out based on these examples (Çevre, Şehircilik ve İklim Değişikliği Bakanlığı [ÇŞİDB], 2022). In this direction, three economic subsystems, namely urban policies, land use and energy, have been discussed as urgent areas for Turkey (İPM, 2017).

Considering Turkey's performance in the international arena regarding the green economy, it is seen that it is not in a good position. According to the "Global Green Economy Index (GGEI); as of 2022, Turkey ranks 140th among 160 countries. It is ranked 38th among OECD countries. It is seen that developed countries take place in the top 10 rankings in the world ranking (Table 2).

When we look at the plans and policies regarding the green and blue economy in Turkey, it is seen that although the green economy is directly or indirectly included in many plans and reports, there is no initiative regarding the blue economy. 10th Development Plan (2014-2018) is important in that the concept of green growth is included in government policies for the first time. Under the title of "Climate Change and Environment", the global importance of green growth is mentioned in order to achieve sustainable development goals (Kalkınma Bakanlığı [KB], 2013). Another important document on green growth at the national level is the *Turkey's Sustainable Development Report: Claiming the Future,*
which was produced with the participation of 55 institutions and organizations within the scope of the national preparatory work initiated under the coordination of the Ministry of Development.

2022 Results	(%)	Arrangement
Sweden	0.799	1
Switzerland	0.781	2
Norway	0.747	3
France	0.744	4
Denmark	0.742	5
Iceland	0.713	6
Austria	0.711	7
United Kingdom	0.704	8
Ireland	0.704	0
Portugal	0.703	9
Turkev	0.701	10
	0.399	140
Pakistan	0.342	156
Trinidad-Tobago	0.334	157
Turkmenistan	0.318	158
Saudi Arabia	0.314	159
Oman	0.262	160

Table 2. Green Economy Performance of Countries by Change Between2005-2020 (Global Green Economy Index, 2022)

One of the aims of the report is to "identify opportunities and barriers to green growth as a tool of sustainable development and to address the areas where green growth can contribute to the formulation of holistic policies for the economy, social and environment." It has been stated that Turkey will strengthen green growth in the path of sustainable development and current practices in the short term to the extent of its relative feasibility, and in the medium and long term; it is stated that opportunities and risks in all sectors will be evaluated, tools suitable for the conditions of the country will be developed, and priority will be given to increasing the returns of this approach, especially at the local level (KB, 2012).

3.3. Legal Status and Planning in Coastal Areas

With Turkey's acceptance of the Paris Agreement, it is seen that the concepts related to climate change and green economy have been included in the legal regulations and institutional structures have been started. The name of the Ministry of Environment and Urbanization was changed to the Ministry of Environment, Urbanization and Climate Change and the Climate Change Department was established *to carry out national and international studies regarding the determination of plans, policies and strategies for green development, to carry out necessary negotiations and to ensure coordination with other institutions and organizations.* In addition to concepts such as climate change, mitigation and adaptation the definition of "green development", which is expressed as "development that aims at low carbon emissions with the efficient use of natural resources together with the principle of sustainable development, and focuses on environmental sustainability and climate sustainability" is included.

Among the duties and powers of the Presidency are "to carry out modeling and risk assessment studies to determine the effects of climate change, to prepare or have risk maps prepared" (Bazı Cumhurbaşkanlığı Kararnamelerinde Değişiklik Yapılması Hakkında Cumhurbaşkanlığı Kararnamesi, 2021). In the Coastal Law No. 3621, which directs the development planning in coastal areas in Turkey, the coastal areas and the structures and facilities that can be built with the decision of a development plan are listed. There is no direct rule in the Coastal Law regarding climate change and the green and blue economy. On the other hand, the structures and facilities envisaged to be built according to the coastal legislation should be for the public interest and to protect the coast, or they should be structures that must be built on the coast. For this reason, structures and facilities built for purposes other than these or not suitable for their purpose will cause damage and destruction of coastal areas, which are a scarce resource. Along with the effects of climate change, especially due to the rise in sea levels, coastal areas should be redefined and economic activities subject to planning should be evaluated within the scope of sustainable blue economy.

Regulation for the Preparation of Spatial Plans, which entered into force in 2014, statements about climate change are included. First of all, in the 17th article, which includes the data to be obtained and the analyzes to be made during the preparation of spatial strategy plans; climate change has been mentioned as a danger as "...*areas where there is a certain danger such as earthquake, landslide, flood, climate change...*" Secondly, in article 23, which includes the data to be obtained and the studies to be done during the preparation of master development plans; "*climate characteristics*" are listed as one of the data to be obtained. Finally, under the heading of planning principles for integrated coastal zone plans, in article 29, which includes the data to be obtained during the preparation of integrated coastal zone plans and the studies to be done; "Wave and wind climate, water cycle characteristics, sea currents, storm surge, sea level rise" are listed as one of the data to be obtained.

In Turkey, many planning studies with different characteristics and scales are carried out in coastal areas. These studies are divided into two as spatial and strategic planning studies that direct land use and construction. Regarding coastal areas, spatial strategy plans, territorial plans and development plans constitute spatial planning studies, and integrated coastal zone plans constitute strategic planning studies. In Turkey, there is no regulation included in the spatial planning for the implementation of climate change and green and blue economy.

4. Approaches to the Creation of Indicators

Determining the extent to which the management and planning of an area is sustainable is a difficult situation. However, this can be achieved if measurable values are put forward to detect this situation. These measurable values are the indicators. Indicators are used to assess the sustainability of urban developments and planning practices, and tools are designed to facilitate strategic urban planning processes for the assessment of urban areas. In this context, urban sustainability assessment tools have been developed for studies on the development of cities.

Different approaches have emerged to evaluate cities and natural areas under pressure, and various indices and models have been produced within the framework of these approaches. When these approaches are examined, it is seen that different indicators are created according to the purpose. Sometimes indicators focused on economic growth and sometimes on the protection of environmental values have been created. It is possible to diversify these indicators according to the purpose of the study and the data obtained.

4.1. Green Economy Index

Green economy performances of countries are calculated according to indices calculated by some organizations. Dual Citizen, it has been calculating the green economy performances of countries since 2010. *The* GGEI measures the green economy performance of 160 countries using 18 indicators in 4 dimensions: *Environmental Health, Climate Change and Social Equality, Market & Investments and Sector Decarbonization.* These indicators, which measure the change in performance between 2005 and a selected reference year, are given below (Figure 2).



Figure 2. Global Green Economy Index Indicators (Global Green Economy Index, 2022)

4.2. Ecological Footprint

The ecological footprint is a tool created to show the planetary boundaries and to what extent people have crossed these boundaries. The Ecological Footprint calculation is based on the demands of a society and the resources that the ecosystem can meet. "*Demand calculation*" measures the plant or animal food consumed by the individual or society, the timber and forest products, the carbon dioxide emissions as a result of urban infrastructure and fuel consumption. "*Resource calculation*" represents the biocapacity of a city or nation, production lands, forest lands, livestock lands, farmland, settled lands, and marine areas. "*Ecological footprint*"; it is calculated for individual, city, region and planet (Boğaziçi University, 2022).

Ecological footprint has six components according to different land use types; carbon capture footprint, forest footprint, farmland footprint, builtup area footprint, grassland footprint, and fishery field footprint. Among them, "built-up area footprint"; it is obtained by calculating the area covered by the relevant infrastructure and superstructure for human needs, including housing, transportation, industrial structures and power plants.

4.3. Sustainable Land Use Models

There are different studies at the regional or country level for sustainable land use in coastal areas. These vary according to the location and purpose of construction. However, it constitutes important case studies in terms of revealing the approaches in determining the indicators for land use, especially in coastal areas.

For example, land use simulation has been made by the European Commission for the "Uncontrolled" and "Sustainable" options in line with two policy alternatives regarding ICZM in Europe. The difference between the two policy alternatives appeared to be observable for both all of Europe and coastal areas only, but the difference was more pronounced for coastal areas. For the entire EU (27) between 2000 and 2050, the increase in residential areas for the "Uncontrolled" policy alternative was 7.49 percent higher than the increase under the "Sustainable" policy alternative. When only coastal areas are taken into account, the increase in construction is 7.85 percent higher under the "Uncontrolled" option than under the "Sustainable" policy alternative. Land use; it is discussed in four groups as built up area, agricultural areas, forest and pasture and semi-natural areas. (Lavalle, Gomes, Baranzelli & e Silva, 2011).

encompasses the implementation and further development of an integrated The model includes the implementation and further development of an integrated modeling framework to assess the economic, environmental and social impacts of land use changes at various scales, taking into account global factors such as demography, economic growth and climate change. Land use; the built area is divided into four groups: agriculture (includes arable land, irrigated arable land and perennial plants), forest and pasture, and semi-natural (combining these two classes plus abandoned grassland and abandoned arable land) (Lavalle et al., 2011).

European coastal areas are under various pressures such as urban growth, pollution, habitat loss, resource overuse, coastal erosion and coastal flooding. The evolution of these problems is inherently linked to the future development of land use, which has been suppressed by the dynamic interaction between natural and human processes. It is emphasized that future land use changes have a strong impact by minimizing or amplifying these environmental problems. Land use changes and especially the growth of residential areas are taken as the main measure to assess the pressure on coastal areas. The share of residential areas in coastal areas is almost twice that of the overall EU continental surface. This is also confirmed by the results of the simulations (Lavalle et al., 2011).

Another example is the work done to design specific assessment tools for urban sustainability policies in the Mediterranean tourism regions of Spain. Three characteristics determined for tourism regions are discussed in eight thematic approaches. These; land occupation, complexity of activities and open spaces. In this context, existing indicators were adapted and new ones were included to better fit the coastal urban areas. Thus, a new special tool was obtained (Marti, Nolasco-Cirugeda & Serrano-Estrada, 2017).

Low density and discontinuous urban areas are the most prominent features of existing urban sprawl settlements in coastal tourism regions. Because of their natural attractiveness, they are often located near coastal areas of the highest natural value. Although low-density and dispersed buildings are more in harmony with nature, the overuse of urban sprawl models endanger natural and undisturbed coastal areas. A high rate of land use poses a problem not only in terms of unsustainable growth but also because it has a large ecological impact. At this point, three points are taken into consideration. First, an increase in manmade land means an increase in soil impermeable surface area, which in turn creates an impermeable surface covering, altering the hydrological cycle. Secondly, it is the balancing of population and land occupancy to avoid excessive land use. Third, because coastal areas are areas of great ecological and environmental value, their features should remain as undisturbed as possible. Therefore, designing sustainable urban growth strategies and avoiding urban sprawl patterns will result in more compact touristic cities that will ecologically benefit coastal systems and processes (Marti et al., 2017).

4.4. Integrated Coastal Zone Management Approaches

It is seen that subjects such as monitoring and evaluation of sustainable land use in coastal areas are mostly handled within the framework of ICZM. In particular, the EU has pioneering and important studies in this regard. Some important studies on indicators within the framework of ICZM are as follows;

- Manual for Assessing Progress in Coastal Management (1999)
- A recommendation for the implementation of ICZM in Europe was adopted (European Council and Parliament 2002)
- The EU ICZM Expert group established a working Group on Indicators and Data (WG-ID 2004)
- Progress indicators COREPOINT
- Sustainable development indicators DEDUCE (DEDUCE Consortium, 2007)
- Handbook for Measuring the progress and Outcomes of Integrated Coastal and Ocean Management was established (IOC, UNESCO, 2006)
- European INTERREG-IVC-Project SUSTAIN created fully implementable policy tool to measure sustainability (SUSTAIN Partnership, 2012)

 QualityCoast program - award for sustainability destinations (2014)

Information on the indicators created within the scope of these studies is summarized below by the author (Table 3).

First Name	Purpose	Scope
Progress	It is a new set of model indicators,	The stages of ICZM were
Indicators -	consisting of 4 phase 26 indicators	defined and indicators were
COREPOINT	to measure progress in the	determined in terms of
	implementation of ICZM.	evaluating the existence and
	•	content of ICZM on a national,
		regional and local scale over the
		vears.
DEDUCE	It is a basic set of 27 indicators	-Main Factors-Socioeconomic
Project	consisting of 46 measurements	Indicators
	(variables) to monitor the	-Area Demand-Marine and
	sustainable development of the	Coastal Area Requirement
	coastal zone.	Indicators
		-Use of Resources
		Environmental Status Indicators
		-System Vulnerability-Risk
		Indicators
Handbook	It aims to contribute to the	-Management Performance
published by	sustainable development of	Indicators
UNESCO	coastal and marine areas by	-Ecological Indicators
	promoting a more results-	-Socioeconomic Indicators
	oriented, accountable and	
	adaptive approach to integrated	
	coastal and ocean management.	
SUSTAIN	To develop a tool of high practical	It consists of 4 categories and 23
	value for coastal municipalities to	subjects: Economy, Ecology,
	assess their sustainability	Social and Management.
	performance in order to measure	
	and promote sustainable	
	development.	
QualityCoast	Sustainable tourism destinations	It consists of 5 categories and 20
Label	and has been developed for	topics: Nature, Environment,
	coastal municipalities.	Tourism and Business, Home
		Ownership and Security, and
		Identity and Culture.

Table 3. Indicators of ICZM Approaches

It is emphasized that there is no agreed set of indicators that can be used to measure sustainability, there is limited opportunity to measure the progress and success of ICZM and marine spatial planning initiatives, and the ICZM and sustainability indicators have insufficient practice. However, it is stated that it provides the development of frameworks and methods to help raise awareness about the sustainability of coastal areas and to report ICZM initiatives. For the future, it is emphasized that the tool should be developed further, the indicators should be adapted to different needs, and the indicators should be divided into basic and optional (Karnauskaitė, 2017).

When these studies are examined, it is seen that indicators related to sustainability are evaluated under different headings. Indicators related to land use are generally included under categories such as environment, ecology and economy.

4.5. Good Environmental Status (GES) Assessment

GES is a qualitative description of the state of the seas that the EU Marine Strategy Framework Directive requires member states to achieve or maintain by 2020. It includes an assessment of the current environmental status of member states of marine waters, a definition of good environmental status, a set of environmental objectives to achieve good environmental status, monitoring programs and a program of measures aimed at achieving or maintaining good environmental status with all exceptions (European Environment Agency [EEA], 2022). In this context, evaluations are made to ensure environmental sustainability in marine areas with the environmental indicators of member countries. The Ecological Objective (EO8) aims to "sustain the natural dynamics of coastal areas and protect coastal ecosystems and landscapes". Indicator 16 under the Common Indicators for Coastal Ecosystems and Landscapes for this objective has been determined as "the length of the coastline subject to physical degradation by the impact of man-made structures". Indicator units are km of artificial coastline and its percentage (%) in total coastline length and percentage (%) of natural coastline in total coastline length. Indicator 25 is titled "Land Cover Change". With this indicator, it is emphasized that man-made land cover changes, especially land changes due to urbanization, will cause irreversible effects in coastal areas.

In this context, it is suggested that no more construction should be built in the back coastal region in order to preserve the integrity and diversity of coastal ecosystems and landscapes, and to minimize linear coastal development with balanced vertical development, to reverse the urban land use dominance by changing the coastal land use structure, and to protect and increase landscape diversity (United Nations Environment Programme Mediterranean Action Plan [UNEPMAP], 2019).

4.6. Vulnerability

The first step in making cities more resilient to climate change is to identify city-specific vulnerabilities, as city-specific vulnerabilities require city-specific design of policies for combating climate change and adaptation (Kaya, 2018). Coastal cities have their own vulnerabilities to climate change. For this reason, it is necessary to create indicators according to the characteristics of coastal cities. It is possible to examine these indicators under factor groups such as physical, economic, social, environmental, institutional and so on.

In order to determine the vulnerability of coastal cities spatially, the physical characteristics of coastal cities and the features of their built environment are discussed. Vulnerability in coastal areas is an element of analysis of the exposure, susceptibility and resilience of any endangered coastal system. Accordingly, by dividing the current situation obtained by multiplying the exposure and sensitivity, which constitute the negative indicators, by the resilience, which constitutes the positive indicators against vulnerability, the vulnerability was basically calculated and indices were created (Balica et al., 2012).

In the studies on the determination of vulnerability in coastal areas, indicators were examined under the headings such as physical, morphological, hydrogeological, social, economic, institutional and political. Indicators determined under these headings are grouped according to exposure, susceptibility and resilience factors. In the studies, it has been seen that the indicators that constitute spatial vulnerability are handled physically and morphologically. For example, altitude, sea level rise, low altitude coastal area and forest areas are considered as physical indicators.

Indicators such as the length of the built area built along the coast, the average distance of the built area from the sea, the density of construction in the urbanized area, and access to infrastructure services were evaluated as morphological indicators. Excess urbanized area in low-lying 0-10 meter coastal areas has been associated with high vulnerability, while parks, forests and urban spaces in these areas are associated with low vulnerability. Factors such as the length of the built-up area along the coast, the density of buildings in this area, the lack of parks and urban

spaces, and the small distance of the built area to the sea also increase the morphological vulnerability (Gökçe, Pancar & Türk, 2018).

When the studies are examined, it is seen that the physical indicators are generally determined according to the geographical location of the city due to the rise in sea level in the coastal areas. Morphological indicators are determined according to the structuring dynamics on the geographical location of the coastal city. It consists of indicators such as the state of construction in coastal areas and other areas of the city, building density, building quality, informal settlement areas, transportation system, opengreen areas. It is possible to diversify and elaborate the spatial indicators of vulnerability of coastal cities by taking into account the unique characteristics of coastal cities.

5. Conclusion and Suggestions

It is possible to consider the coastal areas, which are the place of conflict between ecological values and economic growth, in two basic parts as natural and artificial. Conflict in coastal areas causes a decrease in natural areas and an increase in artificial areas. Due to the lack of any criteria regarding the limitation of land use, the coasts, which are public spaces, are rapidly deteriorating, as well as many different features. The most important factor causing this deterioration is the construction.

In order to determine the indicators of sustainable land use in coastal areas, it is necessary to determine the land cover in artificial and natural areas in all parts of the coast and the uses on this land cover. When we look at the studies on sustainability, it is seen that the indicators are generally handled in main categories such as ecological, environmental, economic, socioeconomic and management, although there are different approaches. It is seen that coastal areas are mostly evaluated under environmental categories.

In studies on climate change, on the other hand, it is evaluated in the categories related to carbon calculation, which takes into account the elements related to the built environment such as housing, transportation, industrial structures, and energy structures. In some studies, it is seen that the land use change itself is considered as an indicator. In the proposed model, it is envisaged to categorize the indicators within the framework of land cover as it is based on sustainable land use. Because, in order to ensure sustainable land use in coastal areas, it is necessary to reveal how to establish the balance between artificial and natural areas spatially. In this framework, it is aimed to make the spatial reflection of how much economic activity and how much population can be together by protecting natural resources in the coastal area, which is considered as a system and whose borders are determined.

It is envisaged that each land use type should be evaluated within the framework of the indicators determined by taking into account the areal size, and the variables affecting the land use characteristics should be taken into account as the multiplier effect. These variables are the positive or negative elements of land use. Thus, it will be possible to reveal the effect size of the land use type in the calculation of sustainability in coastal areas. This effect size will be positive or negative depending on whether the land use type and the variable that affects the land contribute positively or negatively to sustainability. Considering that it is not possible to protect all coastal areas as natural areas, calculating the sustainable spatial capacity that will provide the balance between the protection of natural

areas and land use demand will help in making rational decisions regarding land use in coastal areas.

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Architectural Sciences and Recent Approaches and Trends in Urban and Regional Planning

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CHAPTER-6

Harmonizing Tourism Development with Urban Conservation Policies: The Case of Taraklı

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1. Introduction

The unique form and pattern of urban living spaces are shaped over time through the dialectical interaction of the local population and their authentic character. Throughout history, the environments constructed by different societies with diverse cultures have become among the most significant values reflecting humanity's past. The respect for the built environment formed by these diverse cultures has given rise to a consciousness of conservation, leading to the emergence of multi-layered cultural spaces.

The fundamental principle of conservation, which aims to transmit cultural heritage values to future generations, is known as a dynamic process rather than a static one. Due to its variable nature and comprehensive scope, different methods and techniques are adopted for conservation in each era. Additionally, the dynamic nature of conservation action prompts constant updates. Elements to be preserved/conserved are determined based on the socio-economic, cultural, political, and religious conditions of the time, while the method of conservation is shaped by the artistic and aesthetic understanding of the era. Conservation efforts began in the 15th century, especially in Italy, through the collection of ancient inscriptions and artworks. Later, in the 17th century, portable artifacts were collected and preserved through the practice of collecting. It is known that the establishment of the Louvre Museum and the French Monuments Museum after the French Revolution in the 18th century marked the initial steps in the conservation of monumental works.

In the second half of the 18th century, with the Industrial Revolution, ruralto-urban migration increased, leading to rapid urbanization. The escalating effects of urbanization were particularly felt in historical environments and among the communities living there. These urban settlements and cultural heritage values are regarded as the most representative components that portray and embody society. Preserving historical environments, seen as reflections of past societies, and passing them on to future generations are among the best ways to understand our history. To achieve this, developing a consciousness of conservation and defining its various aspects is necessary (Ebrahimi, 2015).

Factors like urbanization necessitate sustainable and adaptable solutions to prevent the deterioration or transformation of historical environments (Ardakani & Oloonabadi, 2011; Eren, 2021). Within this scope, international efforts have begun, and the earliest written text on conservation is the Athens Charter published by the International Charter for the Conservation and Restoration of Monuments and Sites in 1931 (Figure 1).

The Venice Charter, published as a final report in 1964, is considered a turning point from a focus on individual buildings to an urban-scale conservation approach. Also, the Venice Charter of 1975 facilitated the transition from the concept of "monument within the city" to "city as a monument" (Koca, 2015). Subsequently, numerous reports, charters, and documents have been published. Through these documents that attest to the dynamic nature of conservation, concepts like sustainability, multiplicity, and the spirit of place have entered the literature, shaping the understanding of conservation, which now comprehensively addresses all dimensions of historical sites and stands as the cornerstone of sustainability in today's context.



Figure 1. International Documents on Conservation Approaches Over the Years

Conservation efforts in Turkey began with the enactment of the Asar-1 Atike Act in 1869, and until 1973, there were not many significant changes in its content (Figure 2). In 1973, the concept of "site" was introduced through the Ancient Monuments Law, and in 1983, the Legislation for the Protection of Cultural and Natural Possessions was organized, leading to the inclusion of Protection-Oriented Zoning Plans in our country's conservation literature (Özdemir, 2005). With the inclusion of area management in the conservation law in 2004, our conservation legislation took its current form (Ulusan, 2016).



Figure 2: Factors Contributing to the Change in Conservation Perception Over the Years in Türkiye

The conservation approach varies according to each era's artistic and aesthetic understanding, as well as its socio-economic and political structure. Historical areas, perceived as economic input zones nowadays, have become indispensable sectors of the tourism industry. With the proliferation of mass tourism in the latter half of the 20th century, many tourist destinations, particularly seaside tourism, have gained significance. As seaside tourism emerged as a pioneering sector, people started seeking various types of tourism. The cultural identities, characters, and built environments of traditional settlements became subjects of interest. The increasing demand for historical environments prompted local administrations to take action, leading to investments to enhance tourism potential.

However, perceiving historical environments, particularly by local administrations, as avenues to generate revenue (Erdoğanaras & Öztürk, 2016) has given rise to a strong relationship and contradiction between tourism and conservation concepts. In these areas, used as tools for capital accumulation, cultural heritage values have been consumed rapidly and improperly (Akpınar, Saygın & Karakaya, 2011; Oncu & Weyland, 1997; Sağıroğlu, 2016; Şenol, 2006; Şenol, 2007). The incorrect management of the coexistence of "tourism" and "conservation" can lead to significant consequences, including the potential disappearance of historical environments.

Establishing conservation and tourism policies to ensure the sustainability of historical environments and effectively managing commercialization can prevent the deterioration of traditional buildings and socio-cultural contexts. Notably, in prominent historical areas in Turkey such as Safranbolu and Beypazarı, investments focused on conservation have led to increased tourism revenues, turning tourism into a driving force for conservation. However, the commercialization of heritage values has resulted in disruptions in both the physical and socio-economic environment (Koca, 2015).

The purpose of this study is to evaluate the impact of unplanned tourism activities on traditional fabric and local communities in historical sites. In this context, the question "What is the impact of increasing tourism activities on the concept of conservation in Taraklı?" has been identified as the central issue of the research. Within the scope of the study, Taraklı District, located in the south of Sakarya Province and one of the smallest districts in the city, has been selected as the study area. According to Zengin & Eker (2016), the city is rich in terms of cultural heritage values and is one of the most important historical and tourist areas in its region. With financial support from the Ministry of Culture and Tourism and the provision of tourism incentives, Taraklı is expected to become one of the most significant tourism regions in the future.

Having served as a settlement area since the 6th century BC, the city's continuous use over time has resulted in a multi-layered cultural environment. Its potential for significant tourism stems from the traces of socio-economic buildings of the past. Within the study area, spatial analyses have been conducted, and the SWOT analysis method has been employed through face-to-face interviews with individuals working in public institutions, as well as local residents in Taraklı, to determine how the increasing tourism activities have affected the physical and socio-economic environment of the town.

The forthcoming conceptual framework section of this study will address the phenomenon of tourism and theoretical discussions related to the conservation of historical sites. In the third section, the field study will cover the introduction and potential of Taraklı, the conservation process in the town, the research methodology, and the process of conservation and tourism development in Taraklı. The article will conclude with an evaluation and conclusion section, presenting the original findings and insights derived from the study.

2. Conceptual Framework: Tourism and the Future of Conservation of Historical Urban Sites

The increase in wealth and leisure has led to a rise in tourism activities, thereby prompting momentum in the planning of historical sites. Similar to many economic activities, tourism utilizes resources and exerts environmental impacts. Additionally, when these effects lead to the degradation of these resources in terms of quality and quantity, it is considered that this level of activity has reached the point of exploitation. Newby (1994) notes that within the complex relationship between conservation areas and tourism, culture transforms from a shared value to an exploited one, and in the most extreme cases, culture takes on the form of a created value.

In situations where culture is a shared value, conservation and tourism coexist, with the profits from tourism sustaining and preserving the value of historical environments. However, in cases where culture is exploited and created, commercial values gain a distinct dominance over conservation values, and tourism assumes a central role in the local economy. In this scenario, "cultural heritage" becomes a consumed product, and the choices of international organizations and consumers (tourists) interested in marketing heritage areas become increasingly restricted, designed according to trends and preferences.

The globalization and neoliberal policies have been decisive factors in opening up architectural heritage and heritage areas to tourism, shaping the developments in the conservation process. While until the 1980s, industrialization and urbanization aimed at preserving heritage values and passing them on to future generations, today, due to the prominence of globalization and the influence of neoliberal policies, the economic benefit aspect of the conservation concept takes precedence (Nasser, 2003).

Starting from the 1970s, the concept of heritage has expanded beyond individual buildings to encompass the interactive environment, integrating not only the buildings but also their functions into conservation theories and the architectural heritage conservation plans of local authorities. Since the 1980s, architectural heritage has been perceived as a tool to address the social, political, and economic needs of communities (Ashworth, 2011). With this change in approach, the emphasis on the symbolic aspects of heritage has shifted towards highlighting the performance of heritage and the significance of practices in heritage areas (Haldrup & Boerenholdt, 2015; Smith, 2006). Within this framework, understanding what the needs of today are and how heritage can meet those needs has gained importance (Ashworth, 2011).

In today's context, the connection between the conservation of the past for its distinctive value and the utilization of heritage as a resource for modern society's commercial activities has been highlighted (Ashworth & Tanbridge, 1990). Fundamentally, heritage has been influenced by neoliberal economics and marketing from the 1980s onwards, transforming into a commercial product (Orbaşlı, 2017). Historic buildings, once viewed as obstacles to urban development until the 1980s, have since been integrated into urban planning, becoming catalysts for change (Pendlebury & Porfyirov, 2017).

The implementation of urban renewal projects has taken on the framework of "heritage-led regeneration" or "conservation-led regeneration" in the UK and has subsequently spread to other countries (McCarthy & Doyle, 2011; Pendlebury, 2002). Consequently, conservation and renewal have become two complementary processes. One significant approach has been the adaptation of historic buildings for new uses. Recent studies show that in renovation projects within historic neighborhoods, old buildings are repurposed to transform these areas into global tourism destinations, utilizing heritage-led tourism as a tool for urban renewal and development (Orbaşlı, 2007, 2017, 2019; Pendlebury, 2002; Rezaei, 2017; Timothy, 2014; Uysal & Özden, 2012).

Elements such as monuments, squares, and examples of civic architecture within historic environments significantly impact a city's economic development. The renewal of historical areas through heritage conservation yields positive effects such as increased tourism-related employment, local job opportunities, revitalization of traditional skills, enhanced value of local products, and appreciation of historical properties (Strange &Whitney, 2003; Fouseki & Nicolau, 2018). Serving to balance seasonal fluctuations and provide supplementary job opportunities, historical and cultural heritage areas also play a major role in the social sphere.

Socially, these effects include strengthening local identity, promoting local community's cultural uplift through developing national creativity and traditions, fostering a sense of belonging and local pride, enhancing security, and improving quality of life through service enhancement (Pendlebury & Strange, 2011; Reeve & Shipley, 2014). On a physical and environmental level, the improvement of heritage and heritage sites involves prohibiting the demolition of historical buildings and cleansing and beautifying the surroundings (Fouseki & Nicolau, 2018; Nasser, 2003). However, alongside these positive effects, the renewal of historical neighborhoods can also yield undesired consequences, such as gentrification risks, reduction of local services, overcrowding, and insecurity (Florida, 2017; Lees et al., 2013; Zukin et al., 2009).

Gentrification's most common form in historic neighborhoods is tourismrelated gentrification. Although gentrification as a concept has existed since the 1960s, tourism-related gentrification emerged in the 2000s as a relatively new concept. Throughout the process of tourism-related gentrification in residential areas, pre-existing living, working, and business spaces are transformed into consumption spaces for tourists. These evolve into hotels, restaurants, cafes, art galleries, and souvenir boutiques (Gonzales-Perez, 2020; Gotham, 2005; Nasser, 2003; Um & Yoon, 2021). Particularly in this process, tourists' demands and roles are highly influential (Cócola Gant, 2015).

Such global trends are not only observed in developed countries but also in many developing nations. These developments have been noted in cities such as Aleppo (Syria), Al-Salt (Jordan), and Kashan (Iran) in recent years (Daher, 2005; Khirfan, 2014; Rezaei, Alborzi & Alilou, 2019). Tourism revenue is being generated in most of these countries, leading to increased job opportunities (Robinson, 2001). Globally recognized institutions such as the World Bank, among others, as well as local governments, support the organization and funding of these processes, thereby endorsing this trend. Apart from global trends and funding countries, the economic and geopolitical conditions of regions have also caused shifts in the attitudes towards heritage areas in these countries (Orbaşlı, 2017).

Even in these cities, when there is no planned and manageable development of tourism, the growing interest of the private sector and its efforts to promote tourism, often driven by the management and local authorities, have resulted in the gentrification of tourism and subsequent neglect of the needs and demands of many original inhabitants, causing them to move away from their neighborhoods (Rezaei et al., 2019). Local governments that fail to strike a balance between preserving and utilizing historical values can inflict significant damage on both the development of tourism and heritage values (Akova, 2006). Consequently, local governments should prioritize the conservation of historic environments and the well-being of the resident communities, viewing tourism as a secondary source of income.

However, urban conservation encompasses interrelated physical, spatial, and social objectives (Orbaşlı, 2000; Nasser, 2003). The physical objective is tied to the conservation of buildings. It aims to create a recognizable unit by combining the city's past, present, and future, demonstrating its development and continuity. This pursuit involves improving the old environment and adapting it to modern use in the city. Achieving this challenging task requires investment without squandering the past. Spatial conservation considers the city as an integrated structure, encompassing its spatial relationships, usage, as well as transportation and traffic dimensions. The third objective, often neglected, pertains to users, local communities, and the urban population. Although difficult to define, achieving this objective is crucial for the sustainability of urban life, which is intertwined with conservation.

Much of the literature on nationally and internationally registered historic areas primarily emphasizes the physical and economic aspects of conservation-tourism relationships. However, the concentration of tourism activities in protected areas inevitably leads to social changes that are perceived differently by various segments of society (Coşkun & Okuyucu, 2022). Within this context, the problems in the tourism infrastructure and the unpreparedness of the local people for incoming visitors are seen as deficiencies (Cihangir Çamur & Bozkaya Yetkin, 2019). The concept of "genius loci" entered conservation literature through the 2008 ICOMOS Quebec Declaration, underscoring the significance of preserving historic areas in conjunction with their communities and measuring the social structure's perception of tourism activities in tourism planning.

The impact of tourism on historic environments has been assessed through five different perceptions of social structure: Resistance, Isolation, Emphasis on Boundaries, Revitalization, and Integration (Roney, 2011). These perceptions include resistance to tourism development, isolation with a focus on nurturing one's culture while opposing tourists, a positive view on tourism's development by emphasizing boundaries, a mindset contributing to tourism development through revitalization, and a focus on foreign cultures at the expense of one's own, characterized as integration (Avcıkurt, 2009). Therefore, planning changes resulting from tourism's influence on the social structure in a way that contributes to conservation and fostering the community's perception can strengthen the connection between the local population and tourism.

Especially during the conservation process, strategies related to selection, limitation, expansion, effective usage, and economic feasibility tend to be more product-oriented, focusing on the physical attributes and commercial potential of the product. However, it is observed that these strategies often do not address users, local inhabitants, property owners, and those dependent on the area for their livelihoods. Nonetheless, these factors provide a guiding framework on how historical qualities and individual identities can be reasonably preserved without unnecessarily hindering basic growth and modernization (Nasser, 2003).

2.1. Period and Identity (genius loci) Selection

In the conservation process, the concept of "spirit of the place (genius loci)" is one of the fundamental principles. While individual buildings contribute to the overall quality and character of a settlement, they cannot be considered the foundational elements of the place's character. Visually, many settlements derive their identity and personality, whether in good or poor condition, from buildings. Together, the overall atmosphere of the place and the recognizable local urban landscape form. To assess and prioritize the conservation of the spirit of the place, it is necessary to determine the level of the settlement's identity. However, the determination (selection) process is influenced by differences in interpreting these values. Even fashion and trends can impact this process.

Especially in architectural styles, shifts and contradictions can occur based on the architectural preferences of influential individuals. Sometimes, even with the "facadism" movement, historic areas are visually preserved, but the forms behind the restored facades can be adapted to modern functions. This process, which can lead to the merging of parcels, results in the loss of the spirit of the place (Larkham, 1990).

On the other hand, debates about authenticity have emerged from the need to accurately represent a building's historical period. Ashworth & Tunbridge (1990) have defined authenticity as a highly flexible concept. According to them, authenticity is a result of the existing historic building stock's type, used materials, the condition of the regions and towns where the building is situated, natural disasters, and socio-economic pressures. They note that several factors (such as budget constraints, changing regulations, and lack of historical documentation). have compromised the authenticity of conservation from the very beginning. Consequently, they have emphasized the challenge that restoration encounters in determining "which historical period to restore?" (Nasser, 2003).

2.2. Boundaries, Restrictions and Expansion

Laws are used to implement the outcomes of the selection process. The description, limitations, and design of these areas vary from country to country. Nonetheless, determining the conservation area within the context of the settlement's relationships with other areas reveals its physical and social importance. Within this framework, buildings in the area are listed according to their specific historical and architectural features, thus providing an administrative protection shield to control changes (Nasser, 2003).

As a building ages, it undergoes functional and economic changes that lead to changes in the urban fabric. Structural and functional decay is a natural process of deterioration that diminishes a building's effectiveness. Reconstruction significantly extends a building's lifespan, but without it, neglect, decay, and collapse occur. However, conservation areas and distinctive buildings are largely exempt from significant destruction and reconstruction processes.

Restoration is a rebuilt form of an area or building. Functional decay is realized by seeking suitable alternative uses for an old building. In this case, conservation prolongs the building's life. This situation affects historical traditional centers through limitation and expansion. These limitations result in spatial demands and inappropriate uses leading to developments in other parts of the city. Such a tendency also carries the risk of development-seeking environmental areas and changing the urban core and central business district along with it (Worskett, 1969).

2.3. Effective Use and Economic Feasibility

One of the ways to further extend the lifespan of preserved buildings is through appropriate reuse (Nasser, 2003). Efficient usage and economic feasibility are intertwined in these areas. For a building to operate efficiently, it must not only be reliable for use but also allow usage at a reasonable cost. In this case, direct or indirect economic forces come into play. Direct economic forces might not necessarily make appropriate new uses cost-effective (such as energy conservation in the building, cost differences between new and old buildings, etc.).

When considering options for renewing cities, rehabilitating decaying buildings is often more economically and socially feasible and less disruptive than demolition (Fitch, 1982). While insisting on a building's original use would be ideal for conservation, it's likely that its use will change in the long term. If a building is very strong, changing land use will have less impact. On the other hand, if there is no demand for the building regardless of the environment, it will remain empty. Within this framework, efficient use of any historical building requires either existing demand or the creation of new demand (Worskett, 1969).

In combination with conservation, sustainable tourism offers a way forward. While sustainability implies a state that can be maintained, continued, or even unchanging, tourism represents a dynamic process of change that caters to consumer demands. Sustainable tourism must be economically viable, environmentally sensitive, and culturally appropriate.

2.4. Sustainability and Tourism

There are two approaches towards sustainable tourism. The functional approach analyzes tourism and views its impact on the tourism destination as a cultural resource. The second approach, known as the political economy approach, involves the nationalization of the tourism industry and direct marketing of the product to minimize the negative aspects of exploitation for host countries and communities (Nasser, 2003).

While tourism is often seen as a non-polluting activity, it exhibits many characteristics that impact property resources. Furthermore, the income generated from tourism is mainly spent on transportation, accommodation, and food and beverages, with a very small portion allocated to the conservation of the natural and cultural heritage resources that tourism relies on (Nasser, 2003). However, in examples of sustainable tourism,
tourism development supports both conservation and local development with its small-scale, locally owned activities that consume resources without depleting them (Furze et al., 1996). Additionally, locally owned, and operated businesses are distinct from multinational Western corporations in that they tend to use more local products, materials, and labor. Their profits also stay within the local area rather than flowing to foreign countries or organizations (Cater, 1994).

Nevertheless, Butler (1997) emphasizes that due to the competitive nature of tourism, tourism areas change based on consumer preferences. He highlights the necessity of altering a destination's features to make it appealing to tourists and notes that this is a way to ensure the sustainability of tourism. This situation contradicts the conservation approach that ensures the transmission of historical heritage to future generations without degradation. In the literature, the process of how destination areas frequently change, often resulting in decline or, in some cases, complete disappearance, is referred to as the "tourism area life cycle."

Butler (1980) defined this phenomenon with a model consisting of six stages (Butler, 1980, cited in Coşkun & Okuyucu, 2022):

- Exploration Stage: The stage when tourism volume is low, and tourism activities are just beginning. The few tourists are considered guests, and services are provided according to their needs.
- Involvement Stage: The stage when an unrecognized region starts to become a recognized tourist area.

- Development Stage: The stage when the number of tourists exceeds the local population and the region's primary economic source becomes tourism.
- Consolidation Stage: The stage when the tourist capacity reaches its maximum, resulting in the emergence of social, economic, cultural, and environmental problems.
- Stagnation Stage: The stage when the region's carrying capacity is exceeded, leading to wear and tear, and the region starts to lose its tourist appeal.
- Rejuvenation Stage: The stage when the worn-out cultural heritage is revitalized, and the region becomes functional for tourism again by using its urban attractive features.

Furthermore, tourism destinations can exceed their capacity due to tourism and the developments it causes. After this point, problems start to arise, and without taking necessary precautions, a decline in visitors occurs. In this context, the carrying capacity in historical areas becomes a tool for managing heritage. This concept determines the maximum utilization of any place's resources, community, economy, culture, environment, and lastly, visitor loss, without negatively affecting them. However, determining carrying capacity due to the impact of tourism is almost impossible within a specific time frame, and successful practical examples are limited.

The political economy approach highlights structural inequalities in global trade, particularly the unequal distribution of income and profits from the tourism sector against the backdrop of neighboring countries. To address these disparities, government interventions in the market are necessary.

These interventions should involve integrated planning and implementation, while also encouraging the participation of local stakeholders. This criterion also indicates pathways to achieve sustainability. It envisions interventions to address dimensions that would negatively impact the environment, such as taking measures against tourism enterprises, resorting to financial measures, and implementing taxation for environmental protection. Charging foreign visitors fees at heritage sites, having lower fees for local residents, and directing the collected fees towards sustainable tourism development are important considerations.

Finally, to ensure sustainability in tourism development, increasing local involvement is essential. Sustainable development is positive socioeconomic progress that does not harm the economic and social systems on which the community relies. Its successful implementation involves integrating planning and social learning processes, and its political validity is dependent on full public support. Thus, the community will influence governments, social institutions, and their specific activities.

Based on the conservation of cultural resources, the local perspective is generally more long-term, whereas external entrepreneurs are often focused on short-term profits. Moreover, a long-term perspective ensures respect for traditions and ways of life. These factors serve as the foundation for revitalizing local employment and the local economy. Such an approach extends beyond mere economic survival; it encompasses environmental conservation and socio-cultural integration, enabling the community to find contentment within its own resources. (Furze et al., 1996).

In brief, the functional approach to sustainable tourism emphasizes the significant economic importance of tourism to all participants. It outlines ways to enhance its efficiency and minimize negative effects through effective management and appropriate policy measures. The political economy approach highlights the need for the tourism industry to assume financial responsibilities for the long-term maintenance of historical sites. In this process, it points to the necessity for governments and local communities to have a greater stake in tourism and the management of historical resources.

3. Field Study: Evaluating the Impact of Tourism on the Conservation Process of Historical Areas Through the Case of Tarakh Town
3.1. Geographical Location and Historical Significance of Tarakh City Tarakh, which is examined in terms of the relationship between protection and tourism, is situated in the Marmara region, to the south of Sakarya Province (Figure 3). The central population of the town is 2238 people, and its main livelihood is based on agriculture and animal husbandry.



Figure 3. Taraklı's Location within the Country and its Historical Urban Fabric

Although Taraklı used to be an important trade point on intercultural routes in the past, it has now remained distant from the main axes. It is located close to Ankara and İstanbul. However, due to the lack of intercity roads, railways, or maritime transportation options, it is known as a city that has not developed significantly. Taraklı is also rich in terms of its variety of conservation areas (Figure 4).



Figure 4. Urban Sites, Archeological Sites and Natural Protection Areas in Taraklı

Within Taraklı, there is an "Urban Site Area" that largely involves the city center and consists of two different parts. Among these urban conservation areas, there is a 1st Degree Archaeological Conservation Area located in between. Additionally, there is a Qualified Natural Protection Area within the 3rd Degree Archaeological Conservation Area and a portion of the 1st Degree Archaeological Conservation Area in the western and southern parts of the town. Within the historical Taraklı town, there are 95 examples of civilian architectural buildings, as 3 registered mosques, 5 registered inns and baths, and 3 registered fountains.

3.2. Urban Protection and Planning Efforts in Taraklı

The oldest accessible urban planning study in Taraklı dates back to 1965. During this period, there was no study aimed at the conservation of cultural heritage values within the city, as identification and registration efforts had not yet started. Particularly, the fact that proposed road axes within the urban fabric could potentially harm registered buildings today poses the biggest obstacle to the implementation of the plan. Tekeli (2011) stated that in the 1980s, due to development policies, the importance of tourism increased, and cultural heritage became a part of tourism. However, at that time in our country, investments were made in coastal tourism rather than cultural tourism, resulting in tourism not playing a significant role in many planning studies conducted for historical areas.

In the 1992 conservation-oriented urban plan, the conservation of the traditional urban fabric was taken as a fundamental element, and planning recommendations were developed accordingly (Figure 5). The plan notes generally emphasized spatial practices related to conservation and produced protection decisions under four subheadings: conservation of registered buildings, conservation of roads and squares, conservation of the historical commercial center, and conservation of gardens and elements.

The unique examples of traditional wooden-framed houses were registered as immovable cultural assets; however, this was not enough to preserve them in their original states. Baytok, Elbeyi and Soybalı (2017) noted that after the 1980s, with the beginning of the development of cultural tourism, historical areas began to be planned for marketing purposes. However, in the 1992 plan for Taraklı, no planning decision was made for the development of tourism. The plan mainly focused on the concept of pure conservation and is still used today with a few modifications. As the effects of tourism are slowly being felt today, developments have begun to take place in conservation and planning efforts, integrating functions such as tourism-focused commercial areas and exhibition spaces into the plans.



Figure 5. 1965 and 1992 Urban Development Plans of Taraklı

3.3. Method

To reveal the impact of tourism on the protection process in Taraklı, a SWOT analysis has been conducted. In this study, how tourism affects conservation has been evaluated. Strong points, weak points, opportunities, and threats related to the Taraklı Center's urban conservation area were identified through fieldwork alongside discussions with public institutions, local organizations, and residents.

SWOT analysis utilizes both internal and external assessment parameters to identify strengths, in addition to weaknesses that potentially hinder achieving our goals, opportunities that can help us achieve our objectives, and threats that can obstruct our goals. Maintaining our strengths, proposing different solutions for our weaknesses, capitalizing on opportunities, and avoiding threats can aid in developing sustainable strategies for cultural heritage and offer a supportive approach to the conservation of heritage sites.

Moreover, SWOT analysis helps organizations and individuals change routine problems, bring a new approach to traditional strategies, and assist decision-makers in sharing and comparing ideas.

3.4. Conservation and Tourism Development in Taraklı

The central urban conservation area of Taraklı covers an area of approximately 25 hectares, with a total of 602 buildings. Out of these, 106 buildings are registered, accounting for 18% of the area's buildings. When examining the spatial distribution of registered buildings, it becomes evident that they are primarily located in the city center, particularly within commercial areas. Since the collective registration process began with the declaration of the conservation area in 1989, there have been no recent registrations. Among registered buildings, 42.4% have undergone restoration, and 31.1% have undergone maintenance and repair (Figure 6-7). In total, 73.5% of buildings have received some form of conservation intervention. Restoration efforts accelerated with the increasing impact of tourism in the city, and many of them were completed by 2010.



Figure 6. Registration Status of Taraklı

Figure 7. Status of Cultural Heritage Conservation

Around 73% of the buildings in the city are of good quality, while 4 registered buildings and 34 unregistered buildings are in a ruined state (Figure 8). Additionally, 76.1% of unregistered buildings have been constructed in accordance with the existing fabric (Figure 9). The most significant factor disrupting the fabric is the conversion of buildings into tourism facilities, resulting in contradictory designs and increased floor heights due to capacity expansion. Especially in the city center, where tourism activities and trade are concentrated, the construction of buildings incongruent with the surrounding fabric seriously damages the city silhouette.





Figure 8. Structural Stability in the City

Figure 9. Compatibility of New buildings with Historical Environment

Approximately 59.4% of registered buildings in Taraklı have been preserved in their original form up to the present day (Figure 10-11). Buildings that are among the most attractive tourist sites in the city, such as the Kadirler Mansion and Yunus Paşa Mosque, have been better preserved, while buildings used for personal purposes have not been given as much importance. When considering the authentic use of cultural heritage, 10% of buildings have lost their authenticity completely. In recent years, projects such as thermal hotels and observation points have been developed in Taraklı, leading to a continuous increase in the number of local visitors. The rise in visitor numbers has prompted the local population to use their properties for commercial purposes. Many historical buildings have started to transform into boutique hotels, souvenir shops, and dining places for tourists.



Figure10.AuthenticallyFiPreserved Registered BuildingsHi

Figure 11. Level of Originality of Historical Buildings

When examining urban uses, it is observed that the concentrated commercial areas in the center have spread haphazardly as tourism volume increases, resulting in a loss of authenticity by transforming into mixeduse buildings, particularly residential and commercial functions.

Another significant issue is that the high frequency of property transactions affects various dimensions of urban conservation (Figure 12). Between 2010-2013, 59 properties were bought and sold; between 2014-2017, 66; and between 2018-2021, 71 (Figure 13). As tourism activities increase, both the local population and investors from outside the city are attempting to change the functions of properties purchased mainly in the city center and its surroundings. The emergence of this situation due to the development of tourism hinders the sustainability of both the physical and social dimensions of the conservation phenomenon.



Figure 12: Existing Urban LandFigure 13: Property TransactionUsesConcentration

In order to demonstrate the impact of tourism on the conservation process in Taraklı, a SWOT analysis has been conducted. Strengths, weaknesses, opportunities, and threats related to the Taraklı central urban conservation area were identified.

In the SWOT analysis, the conservation process under the influence of tourism in the Taraklı central urban conservation area has been comprehensively assessed in its environmental, social, economic, and managerial dimensions. As tourism activities have not yet heavily concentrated in the city, many factors possess both strengths and weaknesses. For instance, the conservation process of the traditional fabric has been accelerated by tourism activities, but this has started to lead to deterioration in the traditional fabric. Additionally, although many opportunities for tourist attractions exist in the city, their non-homogeneous distribution throughout the year and even within a day poses an economic threat.

When examining the weak points and threats identified through the SWOT analysis, it can be seen that with an appropriate planning approach, all negativities can be overcome. The key role in overcoming the city's weaknesses and the threats affecting the city lies in collaboration between the local community and governance. Prioritizing the identified strong points and urban opportunities is essential for improving the preservation of historical surroundings and enhancing tourism potential.

Establishing a balance between conservation and tourism is one of the fundamental challenges in preserving historical sites for the future. It is imperative to anticipate the outcomes of any intervention or investment aimed at revitalizing the tourism sector in the city. Since Taraklı lacks a comprehensive tourism plan, it is still a region that hasn't attracted substantial investment, raising curiosity about how it will handle this process.

The most significant investment made in the city so far is the thermal hotel, a small city-like complex with 1500 rooms/apartments, cafes, sports facilities, markets, and restaurants, located 750 meters west of the urban conservation area. Prior to the thermal hotel, tourists visiting the city primarily stayed in boutique hotels converted from historical buildings within the traditional fabric, and they did their shopping in the city center. Nowadays, with tourists preferring the thermal hotel, the number of tourists staying in the traditional fabric has decreased, and even their shopping has shifted to the sales outlets within the hotel premises.

Businesses like markets and restaurant-type establishments located within the traditional fabric have suffered customer losses, resulting in capacity reductions in some boutique hotels. Apart from these negative effects, the rise of the thermal hotel as a tourist attraction has led investors to consider investing outside the traditional fabric. To ensure a positive impact on urban conservation and development, future investments such as these need to be thoroughly evaluated from all factors and planned accordingly (Table 1).

Strengths		Weaknesses	
•	The presence of natural, archaeological, and urban conservation areas together Intact traditional fabric	 Lack of tourism infrastructure Replacement of traditional handicraft products with mass- produced goods 	
•	Abundance of civil architectural examples	 Insufficient highlighting of tourist attractions 	
•	The majority of restoration works being completed	 Inadequate promotion of historical values 	
•	Unique urban view offered by the panoramic viewpoint on the hilltop	Difficulty in accessing cultural areasAbsence of urban amenities	
•	Preservation of local identity among the residents	(signage, lighting, etc.)Outdated protective zoning plan	
•	Continuation of thermal tourism activities throughout the year	• The presence of unprofessional service quality	
•	Ministry-supported investments for the development of tourism	• Intrusive and incompatible constructions altering the city	
•	Existence of events like fairs and festivals to boost tourist volume	skylineLimited diversification of tourism	
•	Increase in conservation-focused practices due to the revival of the tourism sector	activities in the cityLack of pedestrian pathways connecting historical sites	
•	Ongoing economic activities in the historical district		

Table 1. SWOT Analysis of Taraklı Central Urban Conservation Area

Threats
 Inadequate planning of tourism infrastructure according to carrying capacity Limited investments from local investors due to financial constraints Presence of construction damaging cultural heritage values General slowdown of the tourism sector after the summer season Tourists leaving due to the lack of nighttime activities Destruction of cultural heritage through ill-informed restoration practices Absence of comprehensive area management plan by local administration Lagging behind in technological

Cihangir and Şeremet (2020)'s study for Edremit produced similar results, and it is revealed that local businesses and tourism representatives have a positive outlook on the evolving tourism process, and they are in agreement regarding the diversification of tourist products and their presentation from an innovative perspective. However, challenges such as collaboration, collective action, and participatory management are seen as weaknesses in their journey towards becoming a resilient tourism community.

4. Evaluation and Conclusion

After examining the results of spatial analyses and SWOT analyses, it becomes evident that the absence of a comprehensive urban plan for the city's tourism development, which includes preservation goals and managing tourism growth, is beginning to have a detrimental impact on cultural heritage. The existing conservation-oriented zoning plan being centered solely around building and physical conservation is leading to unplanned tourism development. The reckless degradation of cultural heritage, an unsustainable resource, for economic gain disrupts our connections between the past and the future. As Tuncer (2000) and Cihangir Çamur (2016) indicate that, planned, systematic and multidimensional conservation and enhancement of historical environments with millennia-old legacies can prevent numerous threats.

With the influence of globalization, the role of the local community, local governance, and the tourism industry professionals is significant in preserving historical sites affected by increasing tourism activities. Collaborative efforts and coordination are necessary to raise the awareness of these stakeholders about conservation. The local population's perspective, especially regarding tourists, indicates how much tourism can develop in the city.

According to Roney's (2011), classification of social perceptions regarding historical environments, Taraklı falls under the "emphasizing boundaries" level, which positively views tourism development. However, as tourism activities deepen in the city, the rising income level of the local community will likely shift their perspective to the "vitalizing" level in a short time.

In today's conservation context, it is evident that relying solely on conservation is insufficient. Under the influence of neoliberal trends, historical sites in cities are being perceived as sources of income, turning the tourism sector into an essential element. In Taraklı, this process has contributed to urban conservation through cultural activities that reflect the city's unique character and identity without losing its authenticity. However, the presence of such activities strengthens the city while their unplanned implementation disrupts both the physical and social structure of the city.

Especially for large-scale enclosed facilities like thermal resorts, their locations within the city need to be thoroughly examined and structured in a way that supports the historical center. Therefore, such uses should be integrated into the city through planning and their impacts should be thoroughly analyzed. Both the city's scale and the investment's scale need to be considered during the planning phase. In small-scale cities like Tarakli, the advantages of keeping the scale of such facilities smaller and executed by local entrepreneurs should be utilized. Instead of creating isolated spaces within the city, they should be designed to be integrated with the city and historical surroundings. Above all, the utilization of architectural heritage and heritage areas should be a priority in the dynamics of development.

According to Butler's (1980) six-stage life cycle model, Taraklı has transitioned from the "exploration stage" to the "development stage," and if tourism activities continue to increase, it is predicted to eventually enter the "consolidation stage" in the medium term.

Spatial analyses indicate that tourism-induced disturbances are already present, and SWOT analysis identifies negative factors affecting the historical environment, indicating that tourism planning and management are not just a necessity but a requirement for the sustainable conservation of the city, which has yet to reach the consolidation stage. Therefore, after prioritizing the conservation of the historical environment in Taraklı, planning for visitor management should be carried out to prevent the degradation of the traditional fabric. Incentives should be designed to strengthen the link between urban conservation and tourism by supporting tourism activities that provide additional income and job opportunities for the local community while preserving the historical environment.

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This e-book chapter is based on some figures of the master's thesis titled "*Tarihi Çevrelerin Korunmasında Sürdürülebilir ve Bütünleşik Yaklaşım: Taraklı Örneği [Sustainable and Integrated Approach in the Conservation of Historical Sites: The Example of Taraklı]*" conducted by Muhammet Terzi at Gazi University, Institute of Science and Technology, Department of Urban and Regional Planning in 2022. Indeed, the conceptual framework has undergone a substantial transformation, focusing on the delicate and complex relationship between tourism development and sustainable urban conservation. The methodology and outcomes have been meticulously reevaluated, leading to an entirely original perspective. Consequently, the resultant study has matured into a profoundly distinct form, offering fresh insights into the subject matter.

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Architectural Sciences and Recent Approaches and Trends in Urban and Regional Planning

Water Management and Rainwater Recycling

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1. Introduction

The world population is increasing day by day. According to the calculations made, the world population will reach 10 billion by adding another 31% of the population after forty years. Since the population growth rate is too high, the existing natural resources will be insufficient to meet the need. Water, which is one of the most needed natural resources, cannot meet the needs even today and remains insufficient. Considering all these, we must handle water with a sustainable approach to benefit from water resources both today and in the future. Domestic wastewater is very important in the management of water resources.

There are various alternatives for the management of domestic wastewater. Gray water is obtained by collecting together or separately the water obtained from the bathroom, shower, kitchen sink, dishwasher, washing machine, and sink, which are part of the domestic wastewater outside the toilet. Since gray water is treated and reused, it has a renewable feature and is very important for the sustainability of water. Gray water has different uses. Water cannot be used for drinking water purposes, such as for irrigation or as siphon water. There are two types of fractions of gray water, weak and strong. The collection of gray water obtained from the shower, bath, and sink together creates weak gray water, while gray water obtained from sources such as the dishwasher, washing machine and sink creates strong gray water.

The main reason why gray water is described as strong or weak is the pollution rates. While weak gray water has less pollution than strong gray water, it is more easily treated than strong gray water. Various analyzes

are carried out to measure the gray water quality. Thanks to microbiological analysis, the quality of gray water is measured.

Microbiological analyzes were made with bacteria such as enterococci indicator and fecal coliform. Studies have shown that physicochemical processes can also be used in the treatment of gray water. As a result, studies such as membrane and sand filters have been carried out. Various experiments were carried out on pepper seedlings to test the purified gray water used as irrigation water.

The characteristic properties of gray water obtained from different structures were also investigated. It has been observed that the characteristics of the gray water obtained from the dormitory and the hotel are different. It was concluded that the gray water pollution values in the university dormitory are much higher than in the hotel. When the gray water sources obtained from the dormitory in the hotel are compared with the gray water pollution values in the residences, it has been determined that they contain less pollution than the subject. It was determined that the gray water pollution values did not vary depending on the seasons. While high levels of microbiological bacteria were present in untreated gray water, these bacteria were not found in treated gray water.

To save water on a domestic scale, first of all, waste and excessive consumption of water should be avoided and water should be obtained through alternative sources. In cases where the use of drinking water is not mandatory, alternative water sources provide significant savings. Even in unnecessary situations, the use of drinking water causes limited and expensive wastage of drinking water. This situation poses a great danger to living things. Considering that 54% of the world's population lives in cities and that this rate will reach 60% in 10 years, it shows the urgency of taking measures regarding water as soon as possible. In this study, various methods of reducing the consumption of water resources have been examined, various saving measures for water conservation have been mentioned and the advantages and disadvantages of gray water treatment technologies have been examined. The important thing in wastewater treatment is to obtain quality water at low cost and reuse it. Obtaining the energy to be used in purification from suitable renewable energy sources will be beneficial in terms of sustainability. Alternative renewable energy sources used in buildings include geothermal energy, wave, wind and especially solar energy (Gülçelik & Diri, 2021).

2. Worldwide Water Resources

It is possible to list the water resources as swamps, oceans and seas, glaciers, lakes, underground waters, streams, and swamps. The change of state between water sources takes place in cycles. The water vapor, which evaporates from the sea and river surfaces and is formed by the transpiration of plants, cools and condenses when it rises. The other part forms groundwater by infiltrating. As a result of the melting of snow and glaciers, the waters reaching the seas and underground again are in a constant repetitive motion and this event is called the water cycle. Figure 1 below shows the amount of water resources in the world.

Place of water on land	Amount (million km³)	Ratio of total freshwater amount
Glaciers	24	1.74
Groundwater	23	1.66
Lakes,Streams, Atmosphere	1	0.10
Total	48	3.50

Figure 1. Water Resources in the World (Aksungur & Firidin, 2008) Seas and oceans constitute 97% of the earth's waters. Glaciers contain more than half of the freshwater. Freshwater resources on earth are very few compared to saltwater resources. The scarcity of freshwater resources prepares the ground for water crises and future water wars. Some countries suffer from extreme water shortages. When the current water resources of the world countries are investigated, Turkey is a country experiencing water scarcity. This increases the importance of water for our country even more.

Lands and waters on Earth are not evenly distributed. 29% of the world is covered by land and 71% by water. Oceans make up most of the hydrosphere. Oceans separate the continents. The world's largest ocean is the Pacific Ocean, called the Pacific Ocean. The ocean where the date change line and the deepest trench in the world are located in the Pacific Ocean. Compared to the land on earth, it has the feature of being larger than all of them. In the second place is the Atlantic Ocean. It separates the African and European continents (Young, Luo & Reig, 2015). Countries such as Libya, Arabia, Yemen, and Pakistan also have water shortages. Figure 2 shows the distribution of world water resources and fresh water usage areas.



Figure 2. World Water Resources Distribution and Fresh Water Usage Areas (Turan & Bayrakdar, 2020)

The world water scenario in 2040 was compared to 2010, and it was revealed that countries such as Kuwait, San Marino, Qatar, Bahrain, Palestine, United Arab Emirates, Israel, and Singapore will experience the most water stress. Turkey, on the other hand, will be in the 41st place in terms of water scarcity in 2010 and 27th in water stress in 2040. We see this map in the Figure 3.



Figure 3. Representation of the Water Stress of the World Countries in 2040 on the Map (Turan & Bayrakdar, 2020).

When the countries on the map with water scarcity are examined, it is seen that there are sectarian, political, and ethnic conflicts in these regions. Our country is among these regions. When we look at the future scenarios in these areas where oil wars have been experienced for years, there is a possibility that there will be water wars. Security problems in possible water wars and deterioration of international unity are also included in all of these.

Most of the fresh water in the world is used in agriculture. Apart from this, it is also used in domestic and industrial areas. Figure 4 shows the ratio of water usage areas around the world.



Figure 4. The Ratio of Water Use Areas Worldwide (Güleç, 2022)

2.1. Water Stress and Precautions in Turkey

Since the average rainfall per capita in Turkey is in the range of 1000-2000 m³, our country is a country that suffers from water scarcity. When evaluated in terms of water stress, it is in the medium-risk group. It is predicted that the population in Turkey will be 100 million in 2040 and the amount of usable water per capita will decrease from 1.400 m³ to 1.120 m³. For this reason, managing water resources in a sustainable way in Turkey is an issue that concerns everyone.

In the 2019-2023 Development Plan, it has been stated that a Climate Change Action Plan will be prepared covering all regions in Turkey. To reduce the negative effects of climate change, it has been announced that the construction of underground water basins and dams will continue to reduce water losses caused by evaporation. To use water effectively, plans such as river basin management plans, basin master plans, flood and drought management plans, and protection of drinking water basins will be completed and water protection will be ensured. According to the National Climate Change Adaptation Strategy Action Plan, it is possible to list the objectives of water management as follows: Integrating water resources conservation and management plans with climate change adaptation policies, strengthening cooperation between institutions on water resources management, scientific studies on this subject, It is necessary to consider and manage water resources as a whole and to create renewable energy resources in a way that can adapt to climate changes.

Groundwater resources are under threat, as most of the water, approximately three quarters of which is used for agricultural irrigation. When the irrigation methods in Turkey are examined, flood irrigation is used in 82%, and sprinkler irrigation method is used in 17%.

Our water resources are decreasing daily due to wild irrigation methods. Dissemination of the drip irrigation method is an important issue both in terms of erosion and water resources. In Turkey, water stress will increase over time, and metropolises, which are large cities where the population is very dense, will experience more intense water problems. Since there will be a water scarcity in countries bordering Turkey, this shows the different dimensions of the problem.

3. Water Efficiency in Buildings

There are various studies on the reuse of domestic wastewater. Gray water and rainwater harvesting methods are frequently used in this regard. Rainwater harvesting is the collection of rainwater and its use when necessary. Gray water, on the other hand, is the purification of domestic wastewater and its reuse for various purposes. Gray waters are divided into strong and weak characters. Weak gray water refers to low-polluted gray
water, and strong gray water refers to high-polluted gray water. It has been observed that the water-saving rate due to gray water treatment methods is around 38%. The geographical location of the building and the amount of precipitation are also important issues in rainwater harvesting.

The Ministry of Environment, Urbanization, and Climate Change addressed the issue of water efficiency in buildings in the Planned Areas Zoning Regulation. With an arrangement made in 2022, the design of the hot water installation was based on the central sanitary hot water systems, water efficiency, and the availability of hot water.

To save water, the use of faucets or taps should not exceed 6 liters per minute for sinks and sinks and 8 liters per minute for showers, and these should be shown in the installation project and site list.

4. Measures on Water Conservation

When we look at the world in general, we can see that the places that consume the most energy are cities. Buildings are responsible for 40% of the world's energy consumption. Buildings also cause a 12% depletion of drinking water. Buildings have a potential of 30% to 70% to reduce the consumption of natural resources. Good management of buildings with this potential in terms of water conservation is very important for the protection of water resources. Figure 5 is the water management system chart.





4.1. Ensuring Water Saving in Equipment

The amount of water used in buildings varies according to the number of people, sanitary systems, and other factors. Low-flow photocell armatures, biocomposite toilets, use of sensor faucets, photocell urinals, and use of treated water for garden irrigation, relieve the treatment load in the network by giving purified water to the sewer system significantly reducing water consumption. The use of censored tap heads in public spaces, against the risk of faucets being left open, provides 60%-80% water savings. Figure 6 is the sensor faucet system.



Figure 6. Sensor Faucet System

Thanks to the highly efficient reservoirs produced with technological developments, water consumption has decreased from year to year. Thanks to regular reservoir maintenance and the prevention of leaks, 2,200 liters of water are saved every month. Thanks to the hybrid systems, the reservoir and the sink are designed together and the water used in the sink is recycled and reused in the reservoir.

Figure 7 presents hybrid water systems:



Figure 7. Water Reuse with Hybrid Systems (Delibaş Mısırlı, 2017)

To save money on equipment, leaks in flow organs are prevented and water leaks are prevented. To save water, using the double-flow toilet, shower mixers, sink, and flow regulator, armatures being sensitive to movement, using waterless urinals and compost and vacuum toilets reduce excess water consumption. The destruction of the pipes due to the increase in pressure in the network systems, the old age and the corrosion of the connection point, and the malfunction of the valves are the causes of water losses in the network systems. To be able to prevent water leaks, unbalanced pressure formation in the networks should be prevented by using anti-corrosion materials.

4.1.1. Aerator

The use of aerators at the end of the faucet mixers saves 60% of the water. Thanks to the aerators used in sink faucets, the water consumption is 12 liters per minute, while it drops to 5 liters when the aerator is used. Aerators also have features such as pressure balancing and water purification.

4.1.2. Flow Regulator

Because the mains water is used in different environments at the same time, a pressure difference occurs in the mains and the flow rate of the water decreases.

The low flow of shower heads is important for water conservation. Aerators or flow regulators located in the shower head, which ensure equal mixing of air and water, save water. Shower heads without flow regulators consume 20 liters of water per minute, while shower heads with flow regulators consume 7-8 liters of water per minute, which is an indication of 60% savings.

4.1.3. Gesture Taps

With technological developments, motion-sensitive faucets have started to be used in many places. There is a significant amount of water consumption while washing hands. Sometimes, water consumption is caused by forgetting to turn off the tap. Two taps that are motion-sensitive and non-motion-sensitive with the same tap flow rates were compared and the consumption of 4.5 liters of water per minute in the classical faucet is 0.6 liters in the motion-sensitive faucet. This provides significant water savings.

4.1.4. Coin - Operated Showers

Before starting to use it in prepaid showers, the user can activate the shower head by throwing coins according to the desired time. Since the payment is made in advance for the time it will be used, unnecessary consumption of water is prevented and it is tried to be used consciously.

4.1.5. Counter faucet, reservoir, and shower head

In these systems, the water consumption in the flow organs is shown by the meter. Thanks to the electronic indicator, users can see the amount of water they consume and provide self-control on water consumption.

4.1.6. Reservoirs

The reservoir located behind the toilet provides water storage. Water consumption in toilets today is much less than before. Since the 1990s, it has been forbidden to consume more than 6 liters of water for each use.

4.1.7. Using Two-Button Flush in Toilets

Thanks to the double-button siphons, which are widely used in our country, water consumption is reduced by 60%. Thanks to the small button for liquid waste and the large button for solid waste, 20 thousand liters of

water are saved in one year. While each used 6 liters of water is consumed in the big button, it is between 3-4.5 liters in the small button.

4.1.8. Vacuum Toilets

Wastes are sent by the pressure in the vacuum system. A small amount of water is used as washing water. Compared to conventional toilets, 80% of water is saved.

4.1.9. Compost Toilets

Compost toilets are a type of toilet that uses an aerobic method to compost people's solid and liquid wastes. Since these toilets do not have washing water, they are called dry toilets in general, they work with electricity, and the wastes are turned into ash. Figure 7 is composting toilet system.

4.1.10. Waterless Urinals

While 3-6 liters of water is consumed in classical urinals, a liquid that does not consume water and is lighter than urine is used in waterless urinals. The disinfectant is combined with the help of a liquid with a low density in the siphon. The substance with a low density rises above the liquid waste and thus the urine is sent to the sewer. Figure 8 is schematic representation of the waterless urinal.

4.1.11. Photocell Urinal

In these urinals, there is a washing system that is sensitive to movement, thus saving water. The sensor that detects the person during use washes and the water consumption is between 1.2-3 liters.

4.2. Blackwater

Domestic wastewater forms black water. Black water forms septic tank waste from toilets. The purification of black water is much more difficult than the treatment of other waters because the nitrogen contained in it has a polluting effect and the nitrogen consists of 90% black water. Toilet reservoirs make up some of the black water. Various methods such as oxygenated, biological, ultrafiltration, chlorinated treatment, and ultraviolet disinfection are used for black water treatment. After purification from black water, it is used for garden irrigation, car washing, and use in toilets for siphoning and agricultural activities.



Figure 8 Schematic representation of the waterless urinal

4.3. Gray water

Gray water is domestic wastewater excluding the water coming from the toilet. Gray water is obtained from washing machines, sinks, showers, bathtubs, and dishwashers. Figure 9 is daily domestic water consumption rate.



Figure 9. Daily Domestic Water Consumption Rate (Ekrem, Üstün & Tırpancı, 2015)

The gray water used without treatment spoils the structure of the soil. Directly used Gray water is used for garden irrigation. The gray water used without treatment deteriorate the structure of the soil. Filtration and sedimentation are carried out before chemical and biological treatment. Treated gray water with a chemical treatment method is used in toilet reservoirs.

5. Recycling Rainwater

Due to the scarcity of freshwater resources and their rapid depletion, the rain harvesting method is also widely used today as an alternative to gray water treatment. In airports, military zones, stadiums, and touristic areas, rainwater from buildings with sufficiently large roofs is collected and made ready for use after a simple purification process. In arid areas with water problems, the method of garden irrigation with rainwater is important in terms of water conservation. The application of cisterna is also a good method for these uses. The cistern method is aimed to find a solution to the water problem of areas with limited water opportunities underground and above. Cisterns are used in rural areas, semi-arid and scattered settlements. Typical cisterns have four components, as shown below;

- Collection of rainwater from building roofs or ground
- Transmission of rainwater with the gutter system
- Accumulation of rainwater in warehouses
- Conveying the building with simple treatment methods

With the rainwater tank, swimming or ornamental pools can be filled and a search and washing process can be carried out. It is used for the irrigation of gardens and toilet reservoirs with additional piping. With the purification of water, it is used in washing machines and for showers. Figure 10 is a schematic representation of the rain harvesting system.



Figure 10. Rainwater Harvesting System Water Resources Chapter Notes - Social Studies (SST) Class 10. (n.d.)

In addition to all these usage areas, rainwater can also be used in storage tanks in fire systems. The rainwater storage technique is very advantageous because it is both easy and cheap. These systems are suitable for any slope. If rainwater is used, 50% savings can be achieved in buildings. It is also used for washing buildings, cooling towers, fire extinguishing, and house cleaning.

The rain harvesting method, which is used for water supply if needed, increases productivity in meadows and lands where precipitation is insufficient and meets domestic water needs. When harvesting water, courtyards, streets, roofs and soil surfaces, and sloping basins can be given as examples. Water storage is divided into two. These are;

- Underground Storage of Water
- Storage of Water on the Soil Surface

Soil, cistern, and sediment are used in the underground storage of water. Tanks, pools, and reservoirs are used as storage places on the soil surface.

5.1. Rainwater Distribution System in Buildings

Figure 11 is a schematic representation of the rainwater distribution system.

The quality of water in the building as drinking and utility water changes according to the need. Rainwater collected from roofs can be used with or without treatment. While it needs to be purified for use as drinking water, it is used untreated for utility water. Rainwater is used for domestic use in areas such as house cleaning, fire extinguishing, garden irrigation and laundry, pool filling, toilet cleaning, cooling towers, and vehicle washing. It is used after purification for activities such as cooking, dishwashing, and bath-shower.



Figure 11. Schematic representation of the rainwater distribution system (Pradhan & Sahoo, 2020)

5.2. Using rainwater outside the building

The domestic water in the buildings is 78% of the domestic water. Of this, 59% is used in non-residential areas such as garden irrigation, and 19% is used indoors. The use of rainwater outside the residence will reduce the cost, as the establishment of two different mechanisms to use rainwater as both drinking and utility water will cause an increase in the cost. The water coming to the roof is collected in the rain tank by passing through the rain gutters and transmitted to the garden by being given out of the tank using a submersible pump.

5.3. Rainwater use inside the building

Rainwater is used in the washing machine and toilet reservoir in the building.

If the network line is to be used as a backup source feeding the rainwater, it is necessary to prevent the mixing of rainwater and water in the network. If rainwater is to be used in the building, the rainwater is filtered and collected in the tank and pumped to the place to be used in the building. The distribution of lime water in the building occurs in two different ways:

- Direct feeding system (Feeding the main network and rainwater flooring)
- Combining rainwater and mains water in a tank in the building or between the roof

• Use of rainwater and flooring in commercial areas inside the building by feeding from each other

The water obtained by feeding rain and mains water from each other through the direct feeding system is used in washing machines and toilet reservoirs for domestic use within the building. Figure 12 is a schematic representation of rainwater use with a direct feed system.



Figure 12. Schematic representation of rainwater use with a direct feed system (Rainwater Harvesting Systems - Great Home., n.d.)

5.4. Rainwater Storage Systems

Tank and cistern methods are used as rainwater storage systems. Both methods have some advantages and disadvantages. Precipitation regime, storage size, materials used and costs, and suitable workforce should be determined and which system will be used should be decided.

5.4.1. Tank Storage Method

Two different systems, aboveground and underground, are used for the storage of rain and gray water collected by the Tank (Storage) method. When choosing this storage method, the amount of water needed is calculated by taking into account the roof size of the building to be stored and the annual precipitation of the province, and it is chosen as an additional method independent of the main source water supply.

The place where the storage tank system will be installed should be flat and not damage the tanks. The place must be chosen correctly in the underground tank system. Pipe costs should be minimized. Since the water in the underground tank system will be in a cool place, its evaporation is less. In addition to all these, they are more functional and provide more advantages compared to above-ground systems, and maintenance and repairs are difficult after installation (Güleç, 2022).

5.5. Cisterns

Water cisterns are conventional rainwater collection methods. Cisterns are water tanks that are usually constructed underground to collect rainwater, and the walls are plastered with special mortars (Güngör, 2017). Cisterns are important for sustainability (Yetkin & Akman, 2021). Water cisterns can be constructed open or close. Figure 13 is water system with cistern.



Figure 13. Hugo city corridor rain garden project (Sert, 2013)

Residential water cisterns are built to store rainwater. Residential water cisterns are usually made of durable materials such as plastic or concrete. The size of the cistern may vary depending on the needs of the house. Rainwater is usually collected from the roof to supply water to residential water cisterns. A storm water drainage system diverts rainwater from the roof to the catchment system. This water is then cleaned using a filter system and stored in the water cistern.

5.5.1. Open Cistern

Open cisterns are very old structures. Since they are very old, it is possible to reach only their remains today. It cannot be said that open cisterns preserve clean water very well but this cistern help closed cisterns in terms of water accumulation (Kuban, 2004, pp. 30-31).

5.5.2. Closed Cistern

Closed cisterns are water collection systems with a rectangular form. In terms of easy access to water, they were constructed under crowded or important structures such as palaces, churches, madrasas, and mansions. It is more hygienic than open cisterns.

Closed cisterns serve as a solid foundation for the structure to be built on as well as water storage (Kerim & Süme, 2018). The materials used in the construction of the cisterns are materials such as stone, brick, sand, tile, marble, granite, and wood. On the outer wall structures of the cisterns, it is observed that the stones are often constructed.

5.6. Rain Garden

Rain gardens; are very beneficial for the environment as they can remove pollutants, store excess water and capture heavy metals.

In rain gardens, local plant species are usually arranged in a similar way to their natural ecosystems. It increases the natural water absorption and filtration abilities of the soil, allowing water to penetrate underground. Rain gardens have many advantages. First, it helps to conserve water resources by collecting rainwater and penetrating it underground. They are arranged using aesthetically appealing plants and natural design elements. In addition, rain gardens can reduce the effect of hot islands created by concretization in cities and improve the microclimate. Construction of rain gardens; consists of preparation, construction, planting, and maintenance processes (Yetkin & Akman, 2021). Natural plants should be used in rain gardens. The example below is a rain garden project for Hugo City Hall (Sert, 2013).

5.7. Wet and Dry Swale

Grassed channels are suitable for smaller areas of up to 1 acre. They are the cheapest and easiest option, but they are not very effective at removing pollutants (Environmental Protection Agency of Water, n.d.).

Swale is an open raceway with vegetation designed to take advantage of rainwater (Yetkin & Akman, 2021). It is economical compared to traditional systems (Ünal & Akyüz, 2017, pp.71-82). It contributes to the increase of water quality and biodiversity. A swale can be designed as wet or dry. Wet swales are preferred in rural areas. Figure 14 is schematic presentation of swale.



Figure 14. Schematic Presentation of Swale (Yetkin & Akman, 2021)

Swales are more advantageous than traditional storm drainage systems. Swales established in agricultural areas should be generalized and used in cities. Figure 15 and Figure 16 present wet swale section and dry swale section.



Figure 15. Wet swale section (Ünal & Akyüz, 2017)



Figure 16. Dry swale section (Ünal & Akyüz, 2017)

Dry swales are like rain gardens that can both filter and transport storm water, instead of just filtering it. They are usually planted with vegetation and used in urban areas.

6. Comparison of Rainwater Recycling Methods

When we compare rainwater recycling methods in terms of cost, contribution to ecology, water quality, ease of maintenance and repair, sustainability, adding aesthetic value to the environment, and feeding underground water resources, we see that rain gardens and dry rain ditches are very advantageous systems. Although open water cisterns are systems used in ancient times, they are advantageous in terms of cost, adding aesthetic value to the environment and storing underground water resources.

Water quality is lower than other systems because it is exposed to environmental influences too much. Although closed cistern systems are expensive in terms of cost, they are advantageous systems due to water quality, adding aesthetic value to the location, feeding, and maintaining underground water resources. When dry and wet rain ditches are compared, they are advantageous in terms of contributing to ecology, cost, water quality, sustainability, and feeding groundwater resources. Dry rain ditches are more difficult to maintain than other systems. Rain tanks are also systems that are cost-effective, sustainable, easy to maintain, and repair for rainwater storage. Besides adding aesthetic value to the environment, rain gardens have many advantages such as low cost, water quality, and ecological contribution.

	COMPARISON OF RAINWATER RECYCLING METHODS					
	Open Cistern	Close	Rain	Rain	Wet	Dry
		Cistern	Garden	Tank	Swale	Swale
Contribution to ecology	*	х	~	х	~	~
Cost	~	х	~	~	~	~
Water quality	x	~	~	*	*	~
Easy to maintenance	x	~	~	*	х	~
Sustainable	*	~	~	~	~	~
Feeding groundwater	~	~	~	x	~	~
Add aesthetic value	*	~	~	х	~	~
Store surface flow	~	~	~	~	~	~

Table 1. Comparison of Rainwater Recycling Methods

7. Conclusion and Suggestions

Considering that water resources are being depleted day by day, water treatment systems and efforts to prevent water pollution are very important in terms of protecting water. Water is one of the primary sources of Middle Eastern culture, where the most beautiful first garden examples are designed. In Turkey and the world, water is mostly used for agriculture, industry, and domestic purposes. Policies related to water conservation should be established by ensuring national and international coordination regarding the protection of water resources (Kırtorun & Karaer, 2018).

Today, there is a serious water problem. While water scarcity is evident in some countries, water problems have emerged in our country. In the next 50 years, the problem of water scarcity will increase in our country. Natural resources are rapidly polluted and consumed. Although water resources are of vital importance, they continue to be consumed unconsciously. All people have to reduce water consumption and use water resources efficiently. All buildings should be designed with an emphasis on water conservation systems.

Gray water and rainwater recycling methods should be used and water loss should be minimized. Rainwater recycling systems; Many factors should be considered for comparison in terms of cost, ease of maintenance and repair, water quality, and contribution to ecology. Among these factors; are precipitation amount and distribution, land structure and slope, soil type and permeability, vegetation and landscape design, water requirement and usage purpose, and existing infrastructure and regulations. Cisterns are used to recycle rainwater. They are very old traditional systems (Yetkin & Akman, 2021).

Cisterns prevent flooding in irregular rainfall. Cistern technologies are very important for the sustainability of water both today and in the future (Yetkin & Akman, 2021). Closed cisterns are easier to maintain than open cisterns as open cisterns are more exposed to environmental effects, water pollution, and algae. Since open cisterns are directly affected by sunlight, evaporation, and water loss are high. Implementing a rain garden in urban areas is not only easy and economical, but also very effective in terms of stormwater management. Swales, rain gardens, and rain tanks are examples of sustainable urban drainage systems used for rainwater harvesting.

According to the research in the literature, swale and rain gardens are more economical than traditional cisterns (Ünal & Akyüz, 2017). Wet swales are more difficult to maintain than dry swales. When designing rain tanks and rain gardens, using appropriate materials and paying attention to design criteria reduces the cost (Ünal & Akyüz, 2017). Wet swales require more maintenance than dry swales, open cisterns cause more water loss than closed cisterns and the ecological benefits of swales and rain gardens are further than traditional systems. To prevent water waste as much as possible, all water conservation methods should be taken into account. When choosing a method for water conservation, a choice should be made by the area to be designed. Factors such as cost, land use status, and applicability should be considered and the most appropriate water conservation method should be selected.

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Architectural Sciences and Recent Approaches and Trends in Urban and Regional Planning

CHAPTER-8

Logistics Analysis of the Mediterranean Region in Turkey

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1. Introduction

Countries depend on global trade to increase the sales of their domestic products in international markets. Naturally, the trade volume between the two countries depends on the attractiveness of the exporting country and the needs of the importing country (Göçer et al., 2022). Transportation, which contributes more to the world economy day by day, is becoming increasingly connected with global trade (Fernández et al., 2022).

Establishing an efficient transport system is key to a country's economic growth because transport infrastructure promotes a region's economic growth (Wang et al., 2021). Transport infrastructure (roads, ports, railways and airports) and logistics are key elements that support successful trade facilitation at the local level (Sénquiz-Díaz, 2021a). If the transportation network such as sea, air, and railway develops, trade will also develop (Ismail & Mahyideen, 2015). Logistics, which includes the transportation, storage and handling of products from a raw material source to the point of use (Wysokiński et al., 2020) and covers the planning and management processes of each stage (Atalay et al., 2017).

It is one of the important sectors of global trade and is an important factor that increases the competitiveness of a country and supports its economy (Nguyen et al., 2021). In many studies, it has been concluded that there is a strong link between logistics activities and the national economy (Göçer et al., 2022) and it has been concluded that logistics contributes to increasing the competitiveness of exports and imports in all countries of the world (Nguyen et al., 2021).

The logistics center application is an important infrastructure work for the development of trade and is supported for the development of country

trade as well as city logistics (Atalay et al., 2017). According to a study, it is estimated that 100 million people migrated to cities in a short period of two years and that the proportion of people living in cities to the entire world population will reach about 70% by 2050 (Rao et al., 2015). For this reason, access to basic needs in the city should also be easier and more systematic.

In this study, a logistically comprehensive analysis of the parameters of foreign trade, distance to logistics centers, population, agriculture, tourism and transportation systems belonging to provinces located in the Mediterranean Region of Turkey was carried out.

The Mediterranean region in Turkey includes the provinces of Adana, Antalya, Burdur, Hatay, Isparta, Kahramanmaraş, Mersin and Osmaniye. The strengths and weaknesses properties of provinces compared to each other. In this context, to easy trade, a new logistics center based on agriculture and industry was proposed for Antalya province, taking into account the logistics centers where international freight transportation is performed.

2. Material and Method

Logistics infrastructure development plays a key role for the long-term national strategy (Wang et al., 2021). In this part of the study, the relationship of logistics with foreign trade, population, agriculture, tourism and transportation systems and the effect of logistics infrastructure on these variables were examined.

2.1. Foreign Trade and Logistics Relationship

When the variables of foreign trade and logistics are examined, it is concluded that the logistics system has an impact on foreign trade (Keşir, 2021), and developments in the logistics sector affect foreign trade positively alternately, and developments in foreign trade affect the logistics sector (Koca, 2021). Logistics contributes to increasing the competitiveness of exports and imports in all countries of the world and supports the development of the economy (Nguyen et al., 2021). The competitive advantage in terms of logistics performance increases international trade.

While competitive advantage encourages enterprises allowing expansion into new markets, inefficient systems of transportation, logistics and trade-related infrastructure seriously hinder a country's potential to compete on an international scale (Göçer et. Al., 2022). In addition, logistics costs are among the most important cost items for gaining an advantage in international competition (Ors & Mammadov, 2016). According to estimates, the logistics system accounts for 20-25% of gross domestic product, and a 1% loss in this system leads to a 10% decrease in production (Muhammedrisaevna & Kahramanovna, 2022). For this reason, reliable and economical transportation in the shortest possible time will contribute to the development of global trade.

2.2. Population and Logistics Relationship

The increase in population density has brought with the need for urban logistics. The increase in population-related needs and the easy accessibility of these needs are directly related to the developed logistics network. Logistics activities in cities, on the other hand, reveal emission problems caused by traffic (Güngör & Uray, 2021). In recent years, the importance of the concept of sustainability has been increasing due to factors such as the increasing population, the number of vehicles, and air

pollution (Alkan & Merdivenci, 2021). For these reasons, the need for a logistics network that is both more systematic which provides easy access and is more environmentally friendly is increasing.

2.3. Agriculture and Logistics Relationship

The proper functioning of agriculture is related to the effective functioning of supply logistics (Kruszyński, 2025). Agricultural products must be stored with appropriate logistics (harvesting, collection, storage and transportation) and storage conditions from production to consumption. In the process from agricultural enterprises to houses, 25% of agricultural products may be lost because of the wrong storage. This situation is considered as a loss in terms of economic and product (Albayrak et al., 2020).

At the same time, the demand for agricultural products is also increasing due to factors such as increasing population and tourism demand. In this case, promoting the agricultural sector will contribute to the country's economy (Bilgiçli & Cantimer, 2017). With the increasing demand, it has become necessary to plan and implement agricultural production in a way that ensures food security (Dayıoğlu et al., 2020). Increasing food safety is proposed as a strategy of superiority in marketing (Albayrak et al., 2020).

In addition, timely delivery has an important share in foreign trade, and a one-day delay in transportation leads to a 7% decrease in the export of agricultural products (Emrullah, 2020). For this reason, proper logistics (harvesting, collection, storage and transportation) and timely delivery for agricultural products are very important in terms of economic return. A systematic logistics network that ensures the proper storage and

transportation of products also supports more sustainable transportation by reducing the use of fossil fuels (Dayıoğlu et al., 2020).

2.4. Tourism and Logistics Relationship

Tourism is one of the activities that provides integration of local peoples and economies for many regions and has a great contribution to development (Frias et al., 2015). The tourism sector has become one of the most important sectors with the increase in transportation and has become one of the sectors that constantly uses logistics. The relationship between tourism and logistics mainly focuses on activities such as transportation, nutrition, accommodation of passengers and tourism programs (Muhammedrisaevna & Kahramanovna, 2022). The tourism sector accounts for 10% of global employment (Rodrigue, n.d.) and contributes to the solution of the unemployment problem, while it has a direct or indirect spillover effect along with transportation, trade, construction, accommodation, food and beverage sectors and other sectors (Şahin, 2017). Tourism is also related to urban logistics, with increasing demand in activities such as culture and trade (Erdir, 2013).

2.5. Transportation Systems and Logistics Relationship

Logistics is a method of design, planning, implementation and control operations for efficient and efficient transportation (Fernández et al., 2022). The transportation and logistics infrastructure is a rapidly developing system in modern society (Saparovna Mukhtarova et al., 2018) and the transportation infrastructure supports economic growth and trade by increasing (Sénquiz-Díaz, 2021a). The quality of transport systems, international competitiveness and better integration are the

cornerstone of a country for the global economy and development (Beghin & Schweizer, 2021).

The logistics sector is a sector with a growth rate of 7-10% in Europe, 20% in Asia and 15% in America (Akçay, 2005). While the logistics cost in developed countries is 10%, the logistics cost in undeveloped countries can exceed 20% (Saparovna Mukhtarova et al., 2018). According to this, it is understood that the cost of the logistics network will decrease as the development of the country increases. In this part of the study, railway, sea, air and land transportation systems were examined separately from a logistical point of view.

2.5.1. Rail transport and logistics relationship

Railway transportation which supports sustainable transportation (Seminole Gulf Railway, n.d.) is environmentally friendly because it uses different types of energy from oil. Railway transportation, which is usually used for transporting products with a low unit value, is more advantageous than other transportation systems due to the length of time use of its infrastructure (Akçay, 2005). The development of railways is carried out on the basis of long-term perspective plans (Railway Turkey, 2021). The delivery time by rail (16-20 days) is much shorter than by sea transportation (up to 45 days). For this reason, the transportation of suitable valuable goods by railway (for example, vehicles and electronic goods, textiles and seasonal products that need to be delivered quickly and at the same time as cheaply as possible) takes place (Saparovna Mukhtarova et al., 2018).

For logistics centers, the railway connection also creates a positive impact for economic development. Because opportunities such as the construction of new production and service equipment, a decrease in unemployment and an increase in the attractiveness of the region are provided. At the same time, railway transportation contributes to the national economy by reducing traffic congestion. The cost of road congestion is estimated at 1% of the EU gross national product (Dolinayová & Kendra, 2010).

2.5.2. Seaway transport and logistics relationship

Seaway transportation is used for high volume and limited goods with lower values that cannot be shipped by air (Sénquiz-Díaz, 2021b). As an important part of sea transportation, ports represent an increasing share of international trade and global production and are essential components of many supply chains. It has a major role in international distribution (Notteboom, 2006). For many countries with some of the most developed economies in the world, ports represent the main access gates for trade (Mondragon et al., 2012).

Over the years, ports have come to be understood as logistics centers that integrate industrial, commercial, regional and logistics, as well as internal transportation and maritime transportation, logistics and distribution functions (Saruchera, 2020). The competitiveness of ports concerns not only economists, but also businesses, governments and international organizations. This is due to the fact that ports (especially container terminals) are the realizers of international trade and play a role in the economic development of countries, regions and the world (Kaliszewski, 2020).

2.5.3. Airway transport and logistics relationship

Airway transportation (Saparovna Mukhtarova et al., 2018) provides safe transportation of perishable products such as fish, flowers, fruits and vegetables, live animals such as zoo animals, newspapers, magazines, works of art, gold, money, valuable documents in a short time (Samson, 2021) as fast and expensive. 80-90 % of the international movements of new economy products such as microelectronics and pharmaceuticals are made by air (Yuan, 2010). The airport area provides a great potential for cargo transportation companies and manufacturers in the region in order to increase production and reduce the cost of products.

Airports are increasingly recognized as centers of general urban activity, which, in addition to being critical components of efficient urban infrastructure, are key structures for cities and regions as economic generators and investment catalysts (Boloukian & Siegmann, 2016). The aviation sector, which is an important sector that creates employment and creates value for the economy, also provides an important input to the rapidly growing global economy (Yuan, 2010). Airport capacity refers to the ability of an airport to manage all its operations (Polater, 2020). The airport's ability to compete globally depends a large extent on passengers' and cargo's access to efficient networks. High-capacity airports with more than 10 million passengers are more efficient than medium-capacity airports with 5 to 10 million passengers (Boloukian & Siegmann, 2016).

2.5.4. Highway transport and logistics relationship

Door-to-door transportation is provided by highway transportation without transfer between the starting and destination points. The initial construction cost of this type of transportation is faster and cheaper than other types of transportation. With this type of transportation, which is quite flexible, transportation can be made even to the most difficult areas. This type of transport, which consumes the most fuel, also causes environmental pollution. The fact that road maintenance is costly is one of its negative features (Doğan & Beller Dikmen, 2018). The preference of highway in freight transportation increases the costs (Gümüş, 2013).

3. Findings and Discussion

In this part of the study, the data obtained from the relevant institutions belonging to the provinces located in the Mediterranean Region in Turkey were examined according to the parameters of population, foreign trade, distance to logistics centers, agriculture, tourism and transportation systems.

3.1. Foreign Trade in the Mediterranean Region

The foreign trade parameter of the study was determined as the export and import values, the number of exports and number of countries engaged in foreign trade of the provinces located in the Mediterranean Region in Turkey.

3.1.1. Export and import values of provinces

Table 1 shows the export and import values of the provinces for the year 2021 (thousand US dollars) (Turkish Statistical Institute [TUIK], 2022). In Figure 1, the export and import values of the provinces are shown. When Table 1 and Figure 1 are examined, the highest export and import values are realized in Hatay province. The highest profit belongs to the province of Antalya.

3.1.2. The number of countries where provinces conduct foreign trade

Figure 2 shows the number of countries to which provinces export and import in 2021 (TUIK 2022). According to Figure 3, Antalya province interacted with the most countries in foreign trade among the Mediterranean Region provinces in Turkey by exporting with 313 countries and importing with 201 countries in 2021.

Provinces	Export	Import	
Adana	2545435	3546599	
Antalya	2429203	1561351	
Burdur	294847	37531	
Hatay	4428691	6659897	
Isparta	289782	52187	
Kahramanmaraş	1318582	1260026	
Mersin	4203848	3947656	
Osmaniye	418703	794633	

Tablo 1. Export and Import Value of Provinces



Figure 1. Export and Import Values of Provinces (TUIK, 2022)



Figure 2. Number of Countries with Foreign Trade (TUIK, 2022)

3.2. Distances of Provinces to Logistics Centers in the Mediterranean Region

Logistics centers opened for operation in the Mediterranean Region in Turkey are located in the provinces of Kahramanmaraş and Mersin. The distance between the centers of the provinces located in the Mediterranean Region in Turkey and the nearest logistics center that has been put into operation is shown in Table 2 (Ministry of Transport, 2023). While the distances of the provincial centers to the provincial center where the logistics center is located were found, the web page of the General Directorate of Highways was used (General Directorate of Highways, 2022).

According to the Table 2, the maximum distance is between Antalya and Denizli with 220 km. In regional logistics centers, the distance between two regional logistics centers should have a minimum road distance of
100 km and at least one intermodal terminal. In international logistics centers, the distance between another international logistics center and the international logistics center should have a minimum road distance of 200 km and at least two intermodal terminals (Utikad, 2020).

Provinces	The nearest logistics center that has been put into operation	Distance (km)
Adana	Mersin	69
Antalya	Denizli	220
Burdur	Denizli	150
Hatay	Kahramanmaraş	174
Isparta	Denizli	165
Osmaniye	Mersin	156
Kahramanmaraş	The logistics center in Kahramanmaraş is open for operation.	
Mersin	The logistics center in Mersin is open for operation.	

Table 2. Distance from where the Logistics Center is Located

3.3. Population in the Mediterranean Region

The population size of the provinces located in the Mediterranean Region in Turkey according to the year 2021 is shown in Figure 3. As stated in this figure, when the populations of the provinces are examined relative to each other, the highest population belongs to the province of Antalya. Antalya province is also ranked fifth in Turkey in terms of the number of inhabitants (TUIK, 2022).



Figure 3. Size of Population (TUIK, 2022)

3.4. Agricultural Activities in the Mediterranean Region

When the export and import ratios covering foreign trade are examined on a sectoral basis, it is understood that the highest ratio belongs to the manufacturing sector (TUIK, 2022). Figure 4 shows the organized industrial zone areas (ha) of the provinces located in the Mediterranean Region in Turkey (Ministry of Industry, 2021).



Figure 4. Organized Industrial Zone (TUIK, 2022)

The share of the agriculture, forestry and fishing sector in Turkey is 4% in exports and 5% in imports (TUIK, 2022). It is expected that the export rate will increase and the import rate will decrease with the efficient use of the large agricultural lands. For this reason, many studies are being carried out to improve agriculture. Contribution to the development of the agricultural industry will be provided with specialized organized industrial zones based on agriculture, which have recently been completed and are continuing in Turkey (Can & Engindeniz, 2018).

According to Table 3, there is no new specialized industrial zone based on agriculture projects the investments of which have been completed in the provinces within the region and there are new specialized industrial zones based on agriculture projects which are under construction in Hatay and at the project phase in Kahramanmaraş (Ministry of Agriculture and Forestry, 2021). Table 4 shows the percentage ratios of total agricultural area, planted and fallow cereals and other plant products, vegetable gardens, fruit, beverage and spice plant area and ornamental plants area (decare) of the region provinces relative to each other (TUIK, 2022).

Agriculture riojects in Turkey							
Specialized industrial zone based	Ongoing specialized industria	l New specialized industrial zone					
on agriculture projects whose	zone based on agriculture	based on agriculture projects					
investment has been completed	projects						
Amasya-Suluova (Fattening)	Yalova-Çiftlikköy (Florist)	Malatya-Yazıhan (Fattening)					
Ankara-Çubuk (Fattening)	Hatay-Altınözü-Enek (Dairy	Erzincan (Fattening)					
	Farming)						
Diyarbakır (Fattening)	Kars (Fattening)	Zonguldak-Çaycuma (Conservatory)					
Elâzığ (Animal Products)	Ağrı-Diyadin (Conservatory)	Gümüşhane-Kelkit (Fattening)					
Gaziantep-Oğuzeli (Fattening)	Samsun-Bafra (Conservatory)	Adana-Karataş (Conservatory)					
Eskişehir-Beylikova (Fattening)		Adana-Karataş (Aquaculture)					
Denizli-Sarayköy (Conservatory)		Çorum-Alaca (Fattening)					
Şanlıurfa-Merkez (Fattening)		Kastamonu-Devrekani (Fattening)					
		K. Maraş-Elbistan (Fattening)					
		Elâzığ (Fattening)					

Table 3. Specialized Industrial Zone Based onAgriculture Projects in Turkey

When the ratios in terms of agricultural areas are examined as given in Table 4, the province with the largest ratios in total agricultural area and cultivated area is Adana with 21.76% and 26.21% ratios, respectively. In the areas of fallow land, vegetable gardens and ornamental plants, the largest area belongs to Antalya province with 26.16%, 32.00%, and 57.61% rates, respectively. The fruit, beverage, and spice plant area belong to Mersin province with a rate of 27.15%.

3.5. Tourism Activities in the Mediterranean Region

In Figure 5 (TUIK, 2022), the percentage rates shown in the graph were found according to the ratio of the number of overnight stays in the accommodation facility of each province in the region to the total number

of overnight stays in the accommodation facility of all provinces in the region.

Provinces	Total area	The field o and other v product	f cereals /egetable s (%)	Vegetable garden area	Fruit, beverage and	Orn. plants [*]	
	(%)	Planted Fallow area (%) (%)		(%)	spice plant area (%)	area (%)	
Adana	21,76	26,21	5,23	20,32	15,84	12,05	
Antalya	15,89	13,28	26,16	32,00	14,98	57,61	
Burdur	7,09	9,47	5,14	3,38	2,90	1,34	
Hatay	10,51	7,86	3,71	14,91	17,48	1,45	
Isparta	8,66	8,82	19,62	2,75	6,96	17,02	
Kahramanmaraş	15,79	18,41	20,85	4,78	11,16	0,15	
Mersin	14,80	8,64	18,68	20,16	27,15	10,01	
Osmaniye	5,51	7,30	0,61	1,70	3,53	0,37	

Table 4. Agricultural Areas in the Mediterranean Region

* Ornamental plants



Figure 5. Rates of Overnight Stay in Accommodation Facilities (TUIK, 2022)

As shown in Figure 5, Antalya province has the highest overnight stay rate in accommodation facilities with 67.92%.

3.6. Transportation Systems in the Region

In this section, information is provided according to the data received from the relevant institutions belonging to the railway, seaway, airway and highway transportation.

3.6.1. Railway transportation

Figure 6 shows the railway lengths (km) of the provinces located in the region (TUIK, 2022). Adana province has the highest length with 183 km. Because there is no railway network in Antalya, it is not shown in Figure 6.



Figure 6. Railway Lengths in the Region (km) (Fidan, 2019)

3.6.2. Seaway transportation

Port of registry offices in the Mediterranean Region in Turkey are located in the provinces of Antalya, Hatay (İskenderun) and Mersin. Table 5 shows the distribution of the Turkish flagged fleet belonging to the ports of registry.

(Ministry of Transport, 2022) Piece (%) Provinces Piece DWT DWT (%) 957 46,61 1.861 27,05 Antalya Hatay 379 18,46 508 7,39 34,92 Mersin 717 4.511 65,56

Table 5. Turkish Flagged Fleet Distribution

When Table 5 is examined, the highest number of Turkish flagged fleets in the registered ports of the Mediterranean Region in Turkey belongs to the province of Antalya with a rate of 46.61%. The highest percentage of DWT, known as the maximum load that a ship can carry, (Wikipedia, 2021) belongs to Mersin province with 65.56%. Table 6 shows the capacity information of the port facilities in the region. The port facilities are owned by private companies and are listed alphabetically for this reason. The facility with the largest capacity is selected for each province and shown in Table 6. Ship length means that it is the longest ship length that has ever docked at the port facility, while ship tonnage refers to the maximum amount of cargo that can be transported (Fidan, 2019).

According to Table 6, Hatay and Adana has a higher capacity in terms of ship length and ship tonnage respectively (Fidan, 2019). In terms of capacity and handling, general cargo is classified as solid bulk (tons), liquid bulk cargo (tons), container (TEU) and number of vehicles.

Drovincos	Port	Waterfront	Ship Weight	Ship	Ship	
TTOVINCES	Facility	Area	(DWT)	Length (m)	Tonnage	
Antalya	А	-	-	294	93.558	
Adana	В	-	80000-320000	332	320.000	
		Length:552,				
Hatay	С	En:33	80.000-90.000	367	90.000	
	D	Length: 500	200000	-	200.000	
		Length: 500				
Mersin	E	Deep:15,8	-	-	130.000	
		Length: 521				
	F	Deep:9,5	-	-	80.000	

Table 6. Capacity of Port Facilities in the Mediterranean Region

Figure 7 shows the handling and capacity analysis including general cargo, solid bulk, liquid bulk, containers and the piece of vehicles of the ports in the Mediterranean region as a percentage (Fidan, 2019).

According to the classifications indicated in Figure 7, it is observed that Mersin province uses its capacity in sea freight transportation at the highest rate in the region. Figure 8 shows the number of countries of the region having ports conducting foreign trade between 2013 and 2020 (Ministry of Transport, 2022).



Figure 7. Handling and Capacity Utilization Rate of Ports (Fidan, 2019)



Figure 8. Number of Countries in the Mediterranean Region with Ports Having Foreign Trade (Ministry of Transport, 2022)

According to Figure 8, Mersin province has been in trade with more countries in all years. It is understood from the Figure 8 that international

interaction tends to increase in general according to the number of countries in Antalya province.

3.6.3. Airway transportation

In this section, information about the capacity, the amount of cargo they carry and the number of countries belong to airports, where they do foreign trade are available, which are located in the Mediterranean Region provinces in Turkey, Table 7 shows the amount of cargo transported (tons) and the ratio of cargo carried of each province according to the total amount of cargo transported in the region by year with airport transportation (Ministry of Transport, 2022). Accordingly, Antalya province ranks first in all years.

the Wednerranean Region by Tears (Winnstry of Transport, 2022)								
	2019		2020		2021		2022	
Provinces	(tons) Feb.	2019 (%)	(tons) Feb.	2020 (%)	(tons) Feb.	2021 (%)	(tons) Feb.	2022 (%)
Adana	7224	25,29	6913	23,55	3863	32,27	6429	26,58
Antalya	18039	65,19	19319	67,65	6514	57,78	15255	65,50
Hatay	2065	7,23	2052	6,99	1004	8,39	1625	6,72
Isparta	290	1,02	176	0,60	31	0,26	96	0,40
Kahramanmaraş	366	1,28	356	1,21	156	1,30	193	0,80

 Table 7. Cargo Carrying Capacity of Airports in

 the Mediterranean Region by Years (Ministry of Transport,2022)

Table 8 provides information about the capacities of the airports located in the region (General Directorate of State Airports Authority [DHMI], 2022). Table 8 shows the distance to city centers in terms of ease of access, airport terrain information in terms of expansion potential, total passenger capacity, cargo terminal area and the amount of cargo transported by cargo traffic (tons). Gazipasa Airport, located in Antalya, is one of the closest airports to the city center after Adana. The airport in Adana province has the largest area in terms of cargo terminals. Antalya Airport, on the other hand, has the highest share in the Mediterranean Region in Turkey both in terms of total land area and passenger and cargo volume.

Figure 9 shows the number of countries where airports export and import (DHMI, 2021). As given in Figure 9, Antalya is the one that interacts with the most countries in the region.

Distance to the Provinces city center where it is		Airport total land inf. (m ²)	Term	inal capacity ((thous	(passengers/ye and)	Cargo terminal (m ²)	Cargo traffic (tons)			
	located (km)			Internal	External 1	External 2	Total		2019	2020
Adana	4 km		2.471.70	2.000	1.000		3.000	9600	3593	3341
Antalya	13		15.180.000	10.000	10.000	15.000	35.000	4636	7705	2924
Gazipaşa (Alanya)	Antalya 40	Gazipaş 5	a				1.500		0,2	1,1
Hatay	27		2.709.129				4.000		11	24
Isparta	35		2.200.000	750	750		1.500	1000	7	2
Kahramanmaraş	7		1.750.000	2.000			2.000		56	21

Table 8. Capacity of Mediterranean Region Airports (General
Directorate of State Airports Authority (DHMI), 2021)





3.6.4. Highway transportation

Figure 10 shows the road lengths (km) of the provinces in terms of highways, state roads and provincial roads in the region (TUIK, 2022).

Antalya province has the widest highway network in terms of state roads and provincial roads. The longest highway belongs to Mersin province.



Figure 10. Road Length in the Region (km) (TUIK, 2022)

4. Conclusion and Suggestions

In this study, the provinces located in the Mediterranean Region in Turkey were examined according to the parameters of foreign trade, distance to logistics centers, population, agriculture, tourism and transportation systems in terms of logistics center installation. These parameters mentioned in the study are the parameters evaluated by experts for logistic centers taken into account by the relevant institutions for the selection of logistics center province.

According to the International Maritime Organization, maritime transport, which is the most widely used type of transport in international trade, carries out about 90% of world trade. For this reason, ports, which are the centers of maritime transportation, are playing an increasingly

important role in promoting international trade and regional economic development (Utikad, 2013). Statistics prove that 31 of the 35 international cities in the world have developed thanks to ports, and 50% of the world's wealth is concentrated in coastal port cities. Ports have strategic importance for the development of economy by meeting the export and import needs of a country, and at the same time they can increase economic prosperity by strengthening the competitiveness of a city (Wan et al., 2021). For this reason, when the provinces located in the Mediterranean region in Turkey are evaluated in terms of logistics centers, it is envisaged that trade will develop further with the establishment of logistics centers in coastal regions.

When the coastal provinces in the region are evaluated, it is observed that the utilization capacity of the ports in Mersin is the highest. In addition, Mersin is province that interact with the most countries in the region. Mersin is the only coastal city that has a logistics center in the region. From here, a connection can be established with the logistics center located in the coastal provinces, which have a positive impact on transportation and trade.

Adana, Hatay and Antalya provinces, which are on the sea coast in the region, need logistics centers. But when the distance of these provinces to the nearest logistics center is evaluated, the maximum distance belongs to Antalya province with 220 km. This distance is above the required distance for both regional and international logistics centers (Utikad, 2020). For this reason, the establishment of a logistics center in Antalya has great importance in terms of transportation and logistics activities for

the provinces located in and around Antalya compared to other provinces.

Antalya province has the highest population among the provinces in the region and is also ranked fifth in Turkey in terms of population. In terms of tourism, Antalya province has great potential both in the Mediterranean Region and in Turkey. When evaluated in terms of foreign trade, Antalya was among the provinces whose export value exceeded import value in 2021 and the province that generated the most income was Antalya in the region. In addition, when the export and import countries are examined, it is this province that does trade (export and import) with various countries. For this reason, the trade potential of Antalya province is high.

The manufacturing sector has a large share in Turkey, as in many countries. The development of industrial activities will be accelerated with the logistics center, which can be a junction to the Antalya-Burdur-Isparta provinces covering the Western Mediterranean part of Turkey and has a railway connection that can be connected to the port. The agricultural sector is a strategic sector that produces the food necessary for human life (Dellal, 2021).

The Mediterranean Basin has a high capacity in agricultural production. The Mediterranean basin, which has a large share of favorable agricultural lands where many fruits and vegetables are grown, has 90% of the 900 million olive trees found in 45 different countries around the world and is also advantageous for under cover agriculture due to the climatic characteristics of the region. Turkey ranks second in Europe after Spain in terms of undercover agriculture vegetable growing, and fourth in the world after China, South Korea and Spain. Antalya, on the other hand, is the province where the most under cover production is carried out in Turkey (Küden & Daşgan, 2021) and also has an important area in terms of vegetable production (TUIK, 2022).

Each country directs the agricultural sector with the appropriate policy in order to ensure its own food independence (Dellal, 2021). By encouraging producer branding in the agricultural sector (Küden & Daşgan, 2021), policies that will increase exports should be determined and investments should be provided. The expansion of Turkey's agricultural production range, irrigation investment management, clean food production, seed breeding and food technology research are strategic importance for the future (TDM Institute, 2018).

There are logistics centers connected to agricultural areas in the world, and Sogaris Logistics Village located in France, which is one of the first examples of logistics villages/centers, can be given as an example. Sogaris Logistics village is very close to the largest agri-food market in Europe and transportation is supported by airport connection (Erol, 2015). In addition, the establishment of a specialized industrial zone based on agriculture in the region, the establishment of a logistics center in Antalya to connect with mixed and specialized industrial zones based on agriculture, the connection of rail, port and seaway in addition to the airway will greatly contribute to be logistics base of the region in the coming years.

Aviapolis, an airline-connected center in Finland (Wikipedia, 2022), provides employment for 35,000 people in the logistics sector (Saparovna Mukhtarova et al., 2018), is an example of logistics centers that provide high employment. With the two airports located in Antalya, the international transportation system can be realized faster and easier.

Antalya province comes after Istanbul in plane traffic. In air transportation, the city is ranked first in the Mediterranean Region in terms of both area and capacity and the number of countries where transportation is carried out (DHMI, 2022). In terms of the road network according to the state road and provincial road, Antalya province is at a better level than other provinces in the region. There is no railway in the province, but the projects related to the railway are supported by the relevant institutions.

When the Ankara, Konya and Karaman high-speed train network reaches to the Antalya, more mobility will be provided in the tourism sector. This mobility in tourism sector provides contribute to the economy. With the high-speed train providing clean, cheap and fast transportation, the use of road transportation will also decrease. With the establishment of a railway-supported logistic center in the Antalya province, the activity of sea transportation, which has a large share in world trade, will increase, more sustainable transportation will be provided, and more environmentally sensitive transportation will be realized.

Thanks to logistics centers, land use will be more efficient, traffic congestion, air pollution, and irregular urban construction will be prevented (Tanyaş, 2015). With the logistics center that can be established in the region, employment opportunities will be provided to the people of the region and migration to the coasts will be prevented.

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Architectural Sciences and Recent Approaches and Trends in Urban and Regional Planning

CHAPTER-9

Urban Risk Management and Resilience

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1. Introduction

Even though in many countries design standards and guides have been used as a part of the planning process for many years, they are regarded as new tools of planning in Turkey. The main emphasis of the study is that these tools will create a new approach in the design of safe settlement areas rather than only being used for space organization. The important thing is the (re)production of existing spaces with an interactive and conscious process.

The study aims to bring up a multi-disciplinary approach necessary for the design of safe settlement areas within the framework of disaster and risk management. To reach this aim, a common language will have to be developed between disciplines and working areas such as city planning, urban design, geological engineering, civil engineering, architecture, and management.

2. Material and Method

Dönertas (2006) examined legal developments within the planning framework and disaster/risk management are briefly examined, together with examples from international practices, as well as urbanization, planning, and design processes for the planning of safe urban areas and improving design standards. This section is a study on the relationship between disaster management and resilience furthering the specified discussions.

To plan safe settlement areas, discussions related to sustainable and resilient urban planning were briefly examined. Because of the reason that the urban study is multidisciplinary, the subjects that necessitate the company between planning and other areas are considered within the study. One of the indicators that define the fundamental characteristics of a resilient city is considered to be the reduction of vulnerability by effective land use planning. In this context, the developments within the planning framework and disaster management were summarized with examples of international discussions. In general, resilience has to be incorporated into urban planning, urban construction, disaster prevention and mitigation, and urban governance (Eren, 2019). Moreover, sustainable urbanization has to be a decision-making process that promotes an integrated approach to the social, economic, and environmental pillars of sustainability. It is useful to discuss these concepts together in the context of disaster management.

The necessary data for this study has been carefully gathered from pertinent sources, carefully assessed, and carefully analyzed. The study employs a descriptive analysis methodology, drawing on relevant literature and digital resources. In this context, first, the scopes of the concepts related to risks, disasters, and their management will be explained, and the concepts of urban and urban risk management will be elucidated. Subsequently, the relationship between disaster management systems and urban planning will be examined. The conclusion will include recommendations after the debate about approaches to resilience, sustainability, or safety in the context of disaster management.

3. Risks, Disasters, and their Management

3.1. Risks

Risk, which is widely used especially in the banking and finance sector, is generally defined as a phenomenon and event that cannot be fully known or predicted (uncertainty), changes over time, and is manageable. The basic components of risk are; It is the probability of occurrence and to what extent it will affect the outcome if it occurs. For risk in the financial sector in general; The definition of a situation involving the possibility of loss or danger that could cause harm and uncertain danger is common. In this context, risk is defined as a function/relationship between probability and impact.

In this context;

RISK = f (probability, impact)

Risk also refers to the expected level of loss that may occur in a risk element, in the future period, in a certain danger (Akbulut & Aytuğ, 2005). Earthquakes and floods are dangers, and these dangers can turn into disaster risks when the vulnerability feature emerges. The frequency of occurrence of the loss ratio in risk is important.

In this context

RISK = probability of loss x loss

3.2. Disasters

We can briefly list the general characteristics of disasters as follows (Yılmaz, 2003, pp. 3-4).

- It inflicts losses on human communities and human settlements; causes confusion, panic, shock, injury, disability, and death; causes infectious and epidemic diseases,
- It affects the settlement unit by disrupting and disrupting human activities, destroying social infrastructure,
- It delays the long-term investments planned by the state for the region,
- It can take days, months, and sometimes even years for the effects

of disasters on individuals and societies to end. These effects may be physical, psychological, and/or social,

- When a disaster occurs in a certain region, the "solution" usually cannot be found by the region's resources but comes from outside the region.
- Many disaster events especially for underdeveloped countries with limited resources and insufficient professional staff occur because the country does not have the necessary information, resources, and equipment to cope with its resources; It has the characteristics of a global danger that can only be overcome through international cooperation.
- There is a parallel between disasters and population growth,
- Losses of life and property caused by disasters in underdeveloped countries are higher than in developed countries.
- When a disaster that occurred in the past occurs with the same severity today, the loss of life and property caused by it is much higher than in the past.

As can be understood from its definition, disaster is related to the consequences rather than the event itself, and its magnitude is measured briefly by life and economic losses (Gülkan et al., 2003). The primary factors that determine the magnitude and impact of disasters are as follows: (Yılmaz, 2003, p. 41);

- Physical magnitude of the disaster
- Distance of the disaster to densely populated areas
- Poverty and underdevelopment

- Rapid population growth
- Rapid and uncontrolled urbanization and industrialization in dangerous areas
- Destruction and misuse of the environment
- Ignorance and lack of education
- The level of protective and preventive measures that society can take against disaster events in advance.

For an event to be called a disaster, it must cause losses to human communities and settlements and affect one or more settlements by stopping or interrupting human activities (Gülkan et al., 2003). It is necessary to prepare the necessary information bases for determining the effects of the factors such as the size of the disaster and the level of relationship with the settlement within the scope of "Risk Management" before the disaster, determining their characteristics, modeling the interaction with the living environment, and developing strategy plans.

In some cases, this series of events creates a chain disaster situation that follows each other and can develop cumulatively. Factors of natural origin that affect the magnitude of the disaster; the physical size of the event, its distance from residential areas, and human-related factors; Poverty and underdevelopment, rapid population growth, rapid and uncontrolled industrialization in dangerous areas, destruction or misuse of forests and the environment, ignorance and lack of education are the levels at which the protective and preventive measures that the society can take against disaster events can be reached (Ergünay, 1995).

Briefly; Disasters that cause changes in the settlement and built environment as a result of the formation will be evaluated within the scope of the thesis. These steps, which are considered within the scope of a normal disaster management sequence, can be considered as the design process to be developed and defined for the evaluation of the built environment.

3.3. Disaster and Risk Management

It is necessary to consider and define the crisis and the disaster that created this crisis in its general context. In this section, what disaster and crisis are, the phases of the series of events that define a disaster, disaster management, new technologies, and the innovations that these technologies bring to planning within the scope of disaster management, etc. Basic information and concepts such as will be briefly defined and explained.

3.3.1. Disaster Management

Preventing disasters and reducing their damage is possible by establishing and implementing an effective disaster management system. It is obvious that the studies on "Disaster Management", which started in our country in the 1940s, have not been brought to the level of effective implementation in the past 60 years. Practices in Turkey have focused especially on the work that needs to be carried out after a disaster, and the legal, administrative, and practical work before the disaster has remained insufficient.

Disasters create crises depending on their reasons. The concept of Disaster Management lies based on management defined to transform the crisis that occurs as a result of rapid or slow change in the current situation into normal conditions and to minimize the change. As a result of the rapid population accumulation in the Marmara Region, especially in the 1940s, the increase in urbanization and construction speed accompanied; It has brought increased demand for agricultural and forest areas, coastal and water basins, and unsafe and unqualified building stocks in high-risk areas for settlement. This urbanization and construction process has revealed the need to develop and strengthen the integration of "Disaster Management" studies, which aim to reduce losses, with "Risk Management" processes, which should be carried out especially before the event occurs and aim to eliminate hazards. Although implementing institutions, concepts, specialties, and activities differ from each other (Balamir, 2002-1), it is necessary to develop systems that are aware of and follow to other in both management processes.

In this context, "Disaster Management"; is a very broad concept that requires all institutions, organizations, and resources of the society to be managed in line with this common goal to direct, coordinate, and implement the work to be done at different stages of a disaster event to prevent disasters and reduce their damage (Ergünay, 1995). In particular, determining urban risks and scenarios and defining Action Plans according to these determinations constitute the cornerstones of risk and disaster management (Şengezer & Kansu, 2001).

Disaster management, which should be designed as a constantly evolving process that will enable the use of all resources by coordinating them through planning, organizing, managing, and controlling processes, is different from management models defined in certain periods such as crisis, emergency, and emergency management. In addition, each of the pre- and post-disaster phases should be considered as separate areas of expertise. The methods developed for each of these areas should become increasingly specialized, but it is very difficult to achieve this differentiation in practice. In today's practices, it is very difficult to ensure coordination among the many existing institutions and organizations and their disaster-related units (Gülkan et al., 2003).

In recent years, disaster management has gained a new approach and has been developed by including the concept of "Risk Management", its field of work, and techniques. The commonly known phases of 'Preparedness' -'Emergency Response' and 'Restoring Life to Normal' and Reconstruction - 'Harm Mitigation' define their areas of expertise. What is important at this point is to gather these levels with different expertise in a correct coordination structure and to associate urban risks at all levels (Gülkan et al., 2003).

3.3.2. Risk Management

When we evaluate the sustainable human settlement project in modern society within the scope of disaster, the priority condition (Ergünay, 1993; 1995); Conducting risk analyses, determining safe and suitable areas for land use plans and development, concentrating resources and key infrastructure elements to increase their resilience, especially after disasters, applying risk mitigation principles in new infrastructure planning and projecting, developing precaution and emergency mechanisms of local communities, It stipulates that local communities should be educated to provide them with skills that can reduce risks, and that development should only occur as long as the load capacity of natural and man-made systems can handle it. In general, to reduce risk, vulnerability and urban risk sectors must be kept away from defined danger. The definition of vulnerability is the loss that may occur in the risk element if a predicted hazard occurs at the predicted damage level (Coburn et al., 1994) and the ratio of the level of damage that occurs as a result of a certain hazard. For example, it is the difference in the behavior of structures against earthquakes in seismic studies. Risk management can generally be defined as taking the necessary precautions, developing projects, and performing activities to reduce the effects of natural disasters or to raise the risk to acceptable levels (Figure 1).



Figure 1. General structure of the risk management process Risk Management is defined as "taking and ensuring the implementation of measures that will eliminate or minimize administrative, natural or technological disasters, social or economic dangers and damages to humans and their environment." In technical terms, risk is a joint expression of the probability of the danger occurring and the level of values that will be lost in danger (Balamir, 2002-1). Risks in modern society are classified by ISoCaRP (2014) as natural risks, environmental risks, and technological and social risks.

In this context:

RISK = Danger x Risk element x Durability

In general, to reduce risk, vulnerability and urban risk sectors must be kept away from defined danger. The definition of vulnerability is the loss that may occur in the risk element if a predicted hazard occurs at the predicted damage level (Coburn et al., 1994) and the ratio of the level of damage that occurs as a result of a certain hazard.

Maps and documents prepared on an urban scale for risks should be prepared as an "urban natural hazard map", which includes, in addition to ground and seismic surface zoning, a three-dimensional underground model, landslide and liquefaction zones other than earthquakes, floods, and climatic statistics (National Strategy, 2002). Urban defects that will turn into urban risks should also be integrated into this system. This structure should include macro form, urban texture, land and building use, hazardous units and usage patterns, infrastructure systems, building stock, open spaces, and urban management deficiencies (National Strategy, 2002) (Figure 2).

3.4. Disaster and Risk Management and the City

Evaluating the disaster formation process that develops depending on the cause-and-effect relationship within a system and defining the functional structuring of this system depends on the pre-definition of scenarios and strategic and practical action plans against possible disasters. The relationship between Risk and Disaster management is clearly defined in the National Earthquake Report (Figure 3).



Figure 2. Risk management and data relationship (Chen, Blong & Jacobson, 2003, p.548)



Figure 3. Cycle Showing the Main Phases of Natural Disaster Management (Adapted from Ergünay, 1995 and METU, 2002)

As can be easily seen from the duties and responsibilities chart that first comes to mind when Disaster Management is mentioned, central and local governments have duties and responsibilities at almost every stage of disaster management, either in terms of rulemaking and supervision or actual implementation.

This shows that even though there are different intervention and implementation systems, "Risk and Disaster Management" primarily falls within the responsibility area of local governments and local institutions/organizations. In particular, preparing the city for earthquakes within their zoning authority and making and implementing decisions against urban risks fall within the jurisdiction of municipalities.

3.5. Urban Risk Management

To rank urban risks, the following elements should generally be evaluated (Türkoğlu et al., 2002);

- Determination of settlement characteristics (population, facilities, infrastructure) that are likely to turn a defined and specific hazard into a potential risk.
- Geographical features (such as soil, and topography),
- Security and adequacy of infrastructure and vital lines (such as transportation network, bridges, communications), response facilities, condition and adequacy of critical facilities (healthy
- facilities, schools), the status of hazardous material storage facilities, their structure and usage characteristics and quality, population density and movements, accessibility
- Determination of severity levels and creation of risk coefficients.

After risk identification and examination for mitigation, the risk groups for which spatial, financial, or management policies should be developed by the relevant administrations generally include the sectors described below (National Strategy, 2003). Avoiding seismic hazards as a whole of activities that keep the city afloat is multi-factorial in both mitigation and damage. Apart from the Risks of Production Loss (National Strategy, 2003), which means avoiding the greatest support of a sector in the process of returning to normal after the disaster, the sectors listed below should also be examined by the urban planner (Balamir, 2002-1, p. 23-26);

- Macroform analyses: Evaluation of city parts in terms of density, areal size, risks posed by fragmented land use, geomorphological structure, micro-zonation, and examination of natural features,
- Urban texture analysis: Transportation system, road network, and distribution, parcel structure, the density of buildings, ownership structure, ground conditions,
- Usage Analysis: Continuity of use, horizontal and vertical neighborhood shape, buffer zone analyses, hazardous areas due to fire and structural features, infrastructure zones, proximity and distance to residences,
- Hazardous Unit and Use Analysis: Structures, facilities, and spatial distribution in terms of function, storage and materials, microzoning, determination of risk loads according to stock capacities,
- Special area analyses: Analyses of areas that directly overlap with risks due to their geographical location such as coasts.
- Infrastructure Systems Risk Analysis: Studies on the materials, structuring, direction, and service areas of the infrastructure system, etc.
- Building Stock Risk Analyzes an examination of building construction features, years, construction styles, inspection conditions for the year of construction, ownership status, use and changes in use, density, the relationship between buildings and design,
- Special Buildings and Urban Environments Analysis: Analyzes historical, symbolic, and cultural units and areas,
- Key Elements Security and Distribution Analysis: Analyzes of institutions and organizations that need to provide priority service in emergencies and priority structures in terms of their service areas, capacities, relationships with each other, and competencies.
- Open Space Asset Analysis: adequate proximity, size, continuity, inspection and regulation,

- Urban Management Inadequacies and Emergency Management Competence: Management, operation, supervision, implementation competence, intervention and action competence, organization and authorization ability,
- Urban Development Analysis: Taking necessary precautions for the constantly changing system and directing them according to risks,
- External Factors Analysis: Risks arising from human and technology-related criminal activities that require pinpoint intervention, or climatic and atmospheric conditions,
- Emergency Service Units Adequacy Analysis: Adequacy and accessibility of structures designed specifically for emergencies,
- Urban Systems Performance Analysis under Disaster Conditions: Infrastructure and spatial adequacy, distribution.

The inadequacy of the necessary infrastructure and technologies in the planning of construction and site selection decisions, in the project and implementation, and the control problem have become a facilitating factor in turning the risk factor into a disaster. Especially in the re-evaluation of areas to be opened for new construction and the existing built environment, risk identification methods for reducing disaster damages and intervention in emergencies need to be determined and implementation tools need to be developed.

With the growth and increase in the number of cities in Turkey, the possibility of encountering technological disasters has become quite high (Bayındırlık ve İskan Bakanlığı, 2004). So much so that identifying urban risks in different sectors according to their causes and taking precautions

according to sectoral needs has become a form of approach that considers rational specialization and the future (Figure 4).



Figure 4. Risk reduction and planning relationship between planning and the occurrence of disasters (Wamsler, 2002 p.18)

The most legitimate field of urban risk management is urban planning, and the most accurate scale of management specific to earthquake risk, which is one of the priority risks in Turkey, is the settlement scale (Balamir, 2002-2). In addition, urban risks consist of differences and multidimensional systems depending on location and example, containing unique risk structures (Balamir, 2002-2).

Urban Risk Sectors in the Earthquake Council (National Strategy, 2003) has stated that although the determination of natural conditions in urban areas reveals a part of the local danger source, it is also necessary to separately determine the dangers arising from human-made structures and uses, both from natural conditions and the damage they may cause due to accidents, negligence or purposeful behavior.

Informing the resident population is very important in assessing risks. All relevant parties should be informed and their active participation in the audit and decision process of both the plan and the construction should be ensured. For this reason, the National Earthquake Council (National Strategy, 2003) stated that all urban risk assessment tools, 'earthquake hazard micro-zoning maps' and 'urban risk analysis documents, should be kept open to everyone's information, and the precautions brought by the prepared avoidance/prevention and zoning plans and programs should be transparently monitored and zoning development plans should be made available to everyone. He stated that representatives of local communities and the boards formed by them should be included in the creation of plan decisions within the system.

The tools and resources defined within the scope of disaster management should guide the risk work areas to be determined as a priority. Risk work areas must coincide with the tools and resources determined within the scope of disaster management.

Multidisciplinary studies and research are needed to determine and evaluate the types of risks that will occur in cities where different systems consisting of dynamic, social, and spatial infrastructure overlap. it is necessary to determine the scope and purpose of risk sectors, the method by which risks will be determined, and which organizations are responsible for risk management. With this approach, the steps that constitute "Risk Management" in the urban area and need to be addressed in a holistic structure are briefly as follows;

- Identifying the danger,
- To determine the probability of occurrence,

- Estimating the effects of the hazard on the social and physical environment (creating multi-sectoral damage/risk maps)
- Identifying measures to reduce risk,
- To reduce the hazard, develop appropriate disaster prevention and mitigation strategies and emergency management processes.

Within the scope of "Risk Management", the following issues should be taken into consideration to determine and rank the natural hazards and risks that will affect the settlement units (UDK, 2002);

- Reliability and suitability of infrastructure and transportation network,
- Settlement macro-form and of the texture danger micro-regions structuring
- Texture features (structuring type, densities, land-parking lot and road relations, etc.),
- Locations of uses containing hazardous substances,
- Adequacy and locations of emergency personnel uses such as hospitals and schools,
- Urban areas are affected by earthquakes, possible landslides, liquefaction, floods, tsunamis, fires, etc.
- The adequacy of urban systems such as transportation, infrastructure, open space, etc. under emergency conditions, etc. should be taken into consideration.

The general steps of the method to be followed in the studies are briefly as follows:

• Identification of urban risk sectors,

- Identifying risk factors in every sector,
- Database creation method for risk sectors,
- Interested parties, management conditions, resources, timing of each sector.

4. Disaster Management Systems and Urban Planning

It is necessary to design an information system that allows the planning, management, and control operations at all levels of all developed countries to be carried out accurately, quickly, and effectively, and will generally support managers. Developing possible disaster scenarios by analyzing urban systems and assets, systematizing the work to be done within the scope of disaster management, and developing a geographical information system that can be used in damage mitigation studies (Dönertas, 2006).

A multi-purpose and intelligent (questionable) Geographic Information System created using reliable and up-to-date data is a useful and effective system for solving complex problems. In particular, it is necessary to provide up-to-date spatial information to carry out urban activities in a healthy way.

Monitoring and managing Disaster and Emergency Management activities depend on determining current information about the current situation and creating a detailed information system that can be used by different institutions by creating a database. For Disaster and Emergency Management, a base information system should be developed that will enable the healthiest, most reliable, and up-to-date data to be produced as quickly as possible and transmitted to the coordination center to initiate implementation studies. This system should be a system that can constantly renew itself and be improved according to updated data.

For the Disaster Management Information System to reach valid and accurate results, the data and information to be used as a basis must be prepared by the scope of the system. In particular, all inputs to be used as a guide for coordination and decision-making mechanisms must be organized and systematized by the purpose (Dönertas, 2006). In this context, data source, data format, and quality become especially important. Plans and projects prepared for disaster preparedness purposes that complement each other and are obtained from different institutions and organizations to be used within the scope of the system (Disaster Transportation Plan, Emergency Response Plan, Projects for Disaster Prevention, etc.), physical and social infrastructure data, areas of duty and authority/ All data with different qualitative and quantitative characteristics, such as information, should be defined in a database organization with a common data language. This system should be supported by environmental systems where different users can filter / query / analyze the necessary information through a common database.

The main information components to be created such as; neighborhood sketches, current maps and development plans, infrastructure maps, buildings and attribute information (number of floors, ground structure, foundation type, etc.), population distribution information, cadastral information, aerial photographs and satellite images, geology, hydrology, hydrogeology, geotechnics, fault, landslide, slope and drainage maps and experimental parameter result information, groundwater information, open areas and public properties, information on important public service areas and buildings, analysis and application technical results, prevention and precaution plans, information on intervention and areas of responsibility, disaster action plans and implementation studies and special information systems (transportation, infrastructure, cemetery, disaster, real estate, etc.) etc. (Şengezer & Kansu, 2001).

There are 6 priority stages within the scope of the information system developed at the Disaster Management Center in Japan (HYOGO, 2002) (Figure 5);

- 1. Phase: data collection combination of geological geotechnical seismic data
- 2. Stage: GIS definition and mappings
- 3. Stage: micro zoning maps
- 4. Phase: construction and infrastructure inventory
- Stage: earthquake scenarios and probability calculations, vulnerability studies
- 6. Phase: Urgent Action and Master Plan preparations, development of strategies.



Figure 5. HYOGO Disaster Management Center Information System Flow Chart (HYOGO, 2002)

In addition, defined tools have been developed to produce certain application and intervention tools within the scope of the information system developed at the Disaster Management Center (HYOGO, 2002). These subsystems are mapping and database, visualization, situation and statistical data collection and evaluation, disaster prevention and communication support system, emergency management plan, damage scenarios, and micro-zonation maps, evaluation of economic-social-value damages.

In another example of the application of GIS in terms of disaster management and urban risk assessment, the distribution of different natural disasters across the country has been mapped in the information and data atlas prepared for Canada. In addition, sub-regions have been determined within the scope of disaster management and actions have been prepared for these sub-regions. All these studies can be followed on the Internet and the studies, updates, and maps carried out by subadministrative units in this context can be accessed.

Effective disaster and risk management requires using data from different specializations as input and quickly accessing accurate information from this data. GIS is an important decision-support tool in collecting, storing, analyzing, and presenting large volumes of spatial and non-spatial data. For this reason, GIS is an important tool for evaluating the necessary data, determining risks, and carrying out studies and information flow within the scope of disaster management (TÜBİTAK MAM, 2001-2010).

The evaluation of GIS and management chain structuring within the scope of disaster management is briefly as follows (HYOGO, 2002);

• Planning: Disaster Management begins with defining the problem and location. In this process, GIS can keep the database in realtime and plays an important role in predictions. After the disaster, the necessary emergency action plan is designed by associating it with other data maps and information. Disaster, risk,

- It has the advantage of planning, spatial modeling, query and application matrix, visualization, and simulation.
- Mitigation: It is necessary to define measures to reduce the risk. As
 a result of terrestrial studies, GIS can visualize different layers of
 information for damage estimation in prioritized areas and define
 zoning and buffer areas for critical activities. Harm reduction
 analyses are supported by value data such as socio-economic
 development trends, demographic structure, and infrastructure.
- Preparation: Many questions about the adequacy of the studies at this stage can be answered thanks to GIS.
- Response: With the help of GIS and GPS, real-time effective and alternative solutions are produced, and the effectiveness of the work can be measured. This process guides the generation of better solutions, coordination, and optimization. The rapid response depends on field selection, route, and dispatch.
- Recovery: GIS helps to record time, type, and size with GPS in the short term, and helps with prioritization, investment, and restoration, selection, and planning in the long term.
- GIS-Based Management System: Identification of risk areas related to construction and land use and building coding, questioning the adequacy of existing service infrastructure, developing a methodology for decision makers of the emergency decision support management system, graphic and non-graphic spatial/geographic - related support infrastructure, etc. collection of data, correlation, overlapping and analysis of data, system

proposal, determination of risk zones; population, land use and building characteristics, accessibility determinations; infrastructure, density, speed.

 Identification/determination of risk factors and risks: It consists of land use, indoor/outdoor use, transportation, climate/ geology/socio-economic data, communication system, data sharing infrastructure network system, seismological information collection network, observational information collection and distribution system, early warning system, mapping/visualization system... Studies prepared in the GIS environment have the advantage of identifying risks, urban planning, spatial modeling, query and application matrix, visualization, and simulation.

4.1. Urban Planning

Planning evaluates activities in public spaces in a multi-disciplinary manner (Friedman, 1987). In this context, the primary field of study is public spaces, and the primary field of study is to adopt a multidisciplinary approach based on the development of scientific and technical partnerships.

Planning as a tool of geographical and spatial applications has three objects: people, place, and process. In particular, modeling the functions and planning processes of urban development such as change-productionconsumption-renewal and developing the application tools of these models, defining legal and organizational structures, and developing interfaces and partnership models between stakeholders and practitioners are among the priorities of the planner. When evaluated from this perspective, we need to talk about a planner-designer who can solve the system of relationships between plan-project, planning-projection-design, user-stakeholder-designer-implementer subject, and its elements in every thematic field.

Meeting these demands and requirements requires an open-shareableauditable-objectual planning and design process. In this context, new systems and application tools need to be developed (Dönertaş, 2006). Perhaps, at this point, technology is one of the important assistants after a certain point in the planning and design process.

The most important solution criteria for both subjective and public solutions are to prioritize correct information and data, to be able to define them to the user, and to open the discussion of mutually shared solutions. This attitude stems from physical or strategic planning.

It should be applicable at different scales, up to the urban design scale. Especially in cases such as disasters, where priorities and obligations are previously defined scientifically and technologically for both the physical built environment and the socio-cultural environment, the variables of the design process should be clearly defined and systematized with changing input data. In cases where all factors must be evaluated, the process in which the feasibility of this design is defined is a successful design process.

Another example of using GIS to assess urban risks and land use is the identification of iso-risk areas, specifically determined by the spatial distribution of the impact of risks. In this study, industrial areas, which are considered urban risk factors, were evaluated within the scope of the land use plan, and the risks they would cause were determined. In this study, population density, industrial areas, and infrastructure distribution,

existing land use, natural and cultural heritage, underground and surface water reserves, locations of emergency response centers, distribution of urban green areas were entered into the system as data for the decisionmaking process.

To determine risks, physical-chemical information of industrial facilities and climate information of the residential area is integrated with the system. Additionally, as a result of the assessment of risks arising from industrial facilities, iso-risk areas were determined, and existing land use and alternatives were evaluated depending on risk factors and distance to the impact area. In the study of Papazoğlu et al. (2000), scenarios based on different industrial risks were prepared to determine different land use areas and urban texture according to the impact of the identified risks on the area.

Finally, it is very important to share information and develop a partnership model within the scope of Disaster Management. Urban-scale studies have demonstrated that overlapping contents of authorization among institutions is a problem area and lead to competence chaos. However, in the case of disasters, it is necessary to develop a coordinated implementation method for these disruptions. Disaster Management Information Systems will achieve success with correct and coordinated work based on harmony between institutions and a defined organization.

The Disaster Management Coordination Center and data/information bank must have a structure that will ensure central and local coordination and effective and sufficient legal powers and facilities to ensure coordination. It is necessary to develop a plan and program that determines the principles of action program cooperation, especially before and after the disaster.

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Within the scope of this study, information problems arising from lack of coordination, such as possible incompatibilities between the Disaster Information System and the Emergency Transportation Action Plan, will also be resolved.

For such a model to work, the primary thing that needs to be done is governance and determination of coordination The aim is to establish a consortium with the participation of all partners who will provide support in all technical and administrative fields to develop the information sharing and partnership model to be defined by all relevant stakeholders within the scope of the project.

4.2. Urban Risk Management and Urban Planning Relationship

What needs to be prepared as a result of Urban Risk Management studies; preparation of necessary evaluation reports and Prevention Plans - SP, Local Action Plans -YEP for "developing sectoral risk management and necessary policies" and prioritizing detailed micro-zoning studies. Mitigation Plans that have a special content and format in which Urban Risk Sectors are examined separately, are an important tool in this context. Four-dimensional "urban risk maps", where all natural and human resource risks are evaluated according to space-time, and a database where sectoral analyses can be made within the scope of current/possible risks, need to be prepared in a data bank format. Especially the existing built environment stock; It is necessary to develop an application tool that can be evaluated as identifiable elements within the scope of historical - technological - infrastructure - use - texture - form - user - form - distribution - frequency - management - ownership - transformability - changeability.

5. Resilience, Sustainability or Safety with Reference to Disaster Management

The Making Cities Resilient Campaign (2010) by the UN Office for Disaster Risk Reduction (UNISDR), has promoted a structured approach to increasing resilience to disasters (UNISDR, 2012). The results of the Making Cities Resilient Campaign were subsequently embedded in the UN Sendai Framework for Disaster Risk Reduction, 2015–2030.

The United Nations developed the Sendai Framework and the Hyogo Framework, which are composed of four areas: understanding disaster risk, improving disaster-risk management, strengthening disaster-risk preparedness, and building urban resilience (Xiang et al., 2023). In short, The Hyogo Framework for Action (HYOGO, 2010) suggests developing policies that promote risk reduction and resilience, such as adopting a resolution that makes your city a "Resilient City," committed to reducing disaster risk, including the risk of climate change.

Resilience also became an established part of the literature on disaster management, particularly in the context of developing measures, beyond the discourses dominated by traditional disaster management and emergency-planning interpretations (Shaw & Maythorne, 2013, Coaffee et al., 2008).

Different definitions of interdisciplinary are listed below (Urban Resilience Initiative, 2020, Kapucu et al., 2021)

 In terms of Risk Management, Resilience is defined as 'The capacity of social, economic, and environmental systems to cope with a hazardous event or trend or disturbance, responding or reorganizing in ways that maintain their essential function, identity, and structure, while also maintaining the capacity for adaptation, learning, and transformation (IPCC, 2014, p.127).

 In terms of Urban Planning, Resilience is defined as 'Urban resilience implies a physical capacity to bounce back from a significant obstacle, much like a rubber ball dropped on the pavement' (Vale & Campenella, 2005, p.335).

Resilience focuses on enhancing the performance of a system in the face of multiple hazards, rather than preventing or mitigating the loss of assets due to specific events (CRF, 2015).

Just as the concept of resilience has evolved significantly over time and across diverse disciplines, the frameworks for comprehending it have also progressed. According to AESOP The Thematic Group "Resilience and Risks Mitigation Strategies - RRMS", resilience is accepted as a hybrid concept by both the Planning and Disaster Risk Management, both regard it as a concept that involves collaboration between with different related fields such as economics, sociology, and political science (AESOP, 2012). Urban planning should seek to measure performance against both resilience performance Indicators and urban sustainability indicators. There are specific approaches related to resilience indicators listed in urban areas, which are combined with land use and urban planning (ICLEI, 2018; UNISDR, 2012; UN-Habitat, 2018; CRF, 2015). There are also ISO standards that complement each other to ensure sustainable cities and communities with resilience performance. The First International Standard that provides a set of indicators on resilience by which cities can measure where they stand is ISO 37123 which was developed with the involvement of the United Nations Office for Disaster Risk Reduction (UNDRR) to

ensure that it aligns with the Sendai Framework for Disaster Risk Reduction.

As emphasized by the Urban Resilience Initiative (2020), resilience has become a very visible term in urban governance and planning, gaining traction during the last year (2019-2020) when the spread of COVID stress was particularly impacting urban areas (URI, 2020, Kapucu et al., 2021). In addition to that, "multi-hazard, multi-sectoral and multi-stakeholder approach" discussions started after the last climate change, natural disasters, and COVID stress, which need global consensus and local actions together (The Safe Cities Index, 2021). Before COVID stress, international initiatives on urban sustainable development criteria such as the "Sustainable Cities Index" which was associated especially with ecological and spatial criteria, later began to discuss "resilient" cities that are healthy, resistant, and have a low level of vulnerability (Yıldırım, 2022).

The effects of COVID stress on cities have revealed the necessity of understanding their inherent vulnerabilities and ensuring that they are more resilient in the future. Therefore, while the pandemic has raised serious questions about the sustainability and resilience of cities, it has also provided multiple discussions on the way forward (UN-HABITAT, 2022). Building both a sustainable and resilient city should be the goal of the post-pandemic city. At present, cities in some developed countries have begun to explore the path of building resilient cities and seek mitigation and adaptation solutions to address the urban risks of climate change and man-made disasters (Wang et al., 2023).

5. Conclusion and Suggestions

While the argument "For a city to be sustainable, it must be durable" is discussed, will the cities of the future be "smart" enough to be safe, resilient, and sustainable?

Urban Risk Management and Resilience Strategy (UNDP, 2021), a structured approach for UNDP to further engage in urban resilience and risk management, and to contribute to a global goal (SDG 11 – Sustainable Cities and Communities) while advancing implementation of the Sendai Framework for Disaster Risk Reduction (DRR), the Paris Agreement and the New Urban Agenda.

One of the 17 Sustainable Development Goals (SDGs) agreed then was to make cities 'inclusive, safe, resilient and sustainable' (SDG 11). Making cities inclusive, safe, resilient and sustainable: implementing United Nations Sustainable Development Goal 11.

It has become clear that a more "holistic" approach than sustainability is needed to integrate urban resilience planning and urban resilience measures to ensure a "safe city". With challenges about perceptions of whether a city is 'safe' or 'well prepared', resilience is described as the ability of a system to survive and thrive in the face of a complex, uncertain, and ever-changing future (RPA, 2013). According to this description, a resilience approach must provide a proactive and holistic response to risk management, which is also a companion to sustainable development. The aim is to ensure the continuity of environmental quality and human wellbeing, as well as the advancement of economic prosperity (RPA, 2013). The Stockholm Security Conference on the theme of 'Secure Cities – 2016' had a discussion to identify the new challenges that cities are facing,

and as a result, three interrelated themes emerged as elements of urban security: inclusiveness, resilience, and safety (Anthony, 2017).

The need for a comprehensive strategy towards urban resilience and adaptation planning has been established as a worldwide agreement following the Talanoa Dialogue – 2018 (ICLEI, 2018).

The UN-HABITAT (2018) launched discussions on safe and inclusive cities, which include disaster management, and this cross-cutting issue also means urban safety, promoting equity, citizen participation and creating more inclusive urbanization processes.

Therefore, the concept of resilience has started to be discussed with the ability to robustness. The concept of "urban sustainability" have to be discussed about "robustness", "vulnerability" and "risk" (Yıldırım, 2022). As a noteworthy note, it has been claimed that risk-based approaches and the risk management methodologies used are far from adopting an evolutionary understanding of resilience (Davoudi, 2012). Contrary to the resilience way of thinking, risk management implies that an ideal state of the system is one where disturbances can be avoided or kept to a minimum. Briefly, the reason for its recognition is stated to be due to its connection to other broadly used terms such as adaptation and more positive connotation than "vulnerability" (URI, 2020; Kapucu et al., 2021).

The concept and language of resilience is thought to have been adopted because it has more positive connotations than the impacts of climate change, and vulnerability (McEvoy et al., 2013; Prosser & Peters, 2010). Compared with "adaptation," "vulnerability reduction," or "countering climate-related threats," the notion of resilience may have more positive connotations (Chen et al., 2022, p. 2).

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As a new pathway for urban development, "urban resilience management" can preserve or swiftly reinstate essential operations in response to disruptions, the capacity to adapt to variation, and the capacity to enhance constrained adaptive and resilient systems (Xiang et al., 2023; Meerow & Newell, 2016).

According to The City Resilience Framework (CRF, 2015), It moves away from traditional disaster risk management, which is founded on risk assessments that relate to specific hazards. Instead, it accepts the possibility that a wide range of disruptive events – both stresses and shocks – may occur but are not necessarily predictable. Risk assessments and measures to reduce specific foreseeable risks will continue to play an important role in urban planning.

It is well known that urban resilience is a highly multidimensional concept. The integration of urban resilience into disaster risk reduction strategies needs to be discussed. The concept of urban resilience needs to be integrated into the urban planning, urban development, and disaster risk governance model.

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Architectural Sciences and Recent Approaches and Trends in Urban and Regional Planning

Future Cities

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1. Introduction

The need for sustainable cities and communities and sustainable urbanism (Eren, 2021) is greater than ever as the world's population gets more urbanized. The world's population is projected to increase to 9.8 billion people by 2050. Nearly 70% of this rapidly expanding population will be urban population (6.7 billion) (National Geographic, 2023). As a consequence of the current accelerating population growth, human settlements will be changing, developing and expanding horizontally and vertically (Ghafouri & Weber, 2020). Urban problems and costs are related to formal and physical aspects, polycentric structure, social and cultural aspects, and economic aspects and increase with densification (Angel et al., 2021).

Cities, while expanding in scale are undergoing rapid transformations (Schubert, 2019), face impoverishment caused by wars, economic difficulties, urban decay, high levels of internal and external migration, and an aging population. Changes in urban areas result in alterations to the morphological, functional, visual, and contextual characteristics of the urban built environment (Cihangir Çamur et al., 2022; Ünlü, 2006).

Cities, city administrations, investors, and urban planners are actively developing innovative and advanced technologies and high-tech cities to address emerging problems and global issues such as housing crisis and climate change. This involves proposing innovative solutions for the current problems of traditional cities. The city, urban life, and urban theory continue to exist while virtual futuristic cities as seen in Figures 1.a-e, future cities, smart cities, futuristic cities, and virtual spaces are being created.



Figure 1. Examples of virtual cities(a-d. Behance, 2023; e. Freepik, 2023)a (Top, left) Peera, Wireless network and connection cityb. (Top, right) Cyberpunk city 2: Blade runner, Alex Feliksovich.c. (Middle, Left) SCIFI CITY, Maxon Red Giant, 2023 Demo reel.d. (Middle, Right) Digital city life shines under futuristic sunsetgenerated by AI (Al-Imran Bokul)e. (Bottom) Digital city and futuristic sunset generated by AI (Freepik)

Internet of Things (IoT) technologies and the use of metaverse or artificial intelligence (AI) structures the process. These transformations often result in the loss of urban historical texture and identity, while simultaneously

witnessing the formation phase of Doxiadis' (1942) Ecumenopolis. Ecumenopolis envisions the entire world becoming one giant city.

The advancements in architectural styles, such as parametric, biophilic, smart or green architecture, as well as the utilization of new building materials, construction methods, and urban planning techniques, have resulted in the emergence of new proposals for smart buildings, cities, or city districts. Smart cities are future cities or in another word, the cities of the future and gained popularity in an accelerating manner. They are introduced as a solution to urban challenges (Frost & Sullivan (a), 2023; Boykova et al., 2016) such as traffic congestion, environmental deterioration, and socioeconomic inequities. This solution is advocated for in order to create more efficient, sustainable (Ruckelshaus, 1989; Lovell & Taylor, 2013; Eren, 2021), and livable human habitats (Ahmed et al., 2019) worldwide.

As technological advancements progress in the same process, smart cities, initially introduced as solutions to urbanization problems or limitations in architectural and planning services. Projects reduced the solutions to either singular architectural structures or mere sculptural analyses. Within the process smart cities are often mixed with futuristic cities. Urban planning and design have also undergone a revolution by artificial intelligence (AI) (Bibri, 2021), which has made it possible to build smarter, more efficent cities (UNEP, 2012). This may be the reason where the confusion comes from.

Artificial intelligence also plays a crucial role, by enabling more efficient and sustainable use of resources (Ullah et al., 2020). The widespread digitalization of cities in urban transportation, utility, and support services has brought about the illusion that cities have become "smarter" or are "smart cities". There is no common understanding of the smart city or future city concepts or general knowledge on the efforts to create and define future cities just like the concepts of sustainability (Eren, 2021), environmental literacy (Disinger & Roth, 1992), and smart city.

It is important to emphasize that a definite certainty exists: The concept of a future city is in a state of evolution, with distinct attributes and applications likely to differ across cities. These variations will hinge on individual city goals, contextual factors, priorities, and the level of technological advancement. Al-Saidi and Zaidan (2020) call this as planned cities megatrend.

Current cities are not only controlled by the urban planner or public authorities responsible from urban planning. The poor sections of the society create urban areas illegally built against urban plans (Şenyapılı, 1981; Tekeli, 1982). In the same vein, the investors, the real estate markets, and related institutions attain a decision-making position and support project-based, fragmented (Keskinok, 1999; Keskinok & Ersoy; 2020, 2022; Eren, 2007) urbanization and smart, strategic, or green planning approaches or projects. This is *de-facto*-urbanization. And, this process supports the emergence of more futuristic projects of architecture, cities or city parts.

As a result of this new urban layout and contents of the project proposals, the concept of the city itself becomes ambiguous and appears in three different forms: The first one is the city that is created from scratch as a singular systemic structure or city sections. And generally, the proposals are architectural structures that confine the city and urban life within them. The second type of city is a structure where illegal and non-compliant constructions integrate with modern and postmodern planned textures and landuses. The third type of city structure is the one that has been fully or partially destroyed, abandoned, or significantly damaged as a result of wars or climate change and global warming.

The study of how future cities should be is one of the main areas of focus within the discipline of urban planning. There is a need to difficultate emerging concepts of future cities, futuristic cities, sustainable cities, and smart cities. This is demanded in order to create strategies and policies for designing and planning the future of cities, as well as to address the ambiguity in the concept of the city.

There are limited academic studies available regarding the developments in cities and about the future of cities. In addition to various proposals on space, analysis and studies based on a subject area or case studies are being conducted. Studies on future cities with a holistic approach are also missing. Several existing modern cities or utopias can be named as future cities. As per Goel et al. (2021), critical and welfare thinking, combined with socioscientific research and transdisciplinary knowledge, are essential for promoting holistic development. This approach aids individuals in expanding their intellectual capacities, understanding the world, and recognizing feasible pathways toward an improved future. Therefore, the subject of this study is future cities.

The aim of this study is to assess the concept of future cities and establish a comprehensive viewpoint for projects developed from the ground up. The objective of this study is to make a contribution to the forthcoming proposals or cities under construction regarding future cities and the evolving morphology of urban areas. The critical evaluation of the feasibility and applicability of these proposals forms an integral part of the study.

The examination of futuristic city proposals is undertaken due to their emergence as a novel advancement in smart and AI-driven human habitats, presenting a potential solution for enhancing sustainability and resilience. This chapter delves into the potentials and challenges inherent in the design of future cities. It is determined that the attainment of a fully functional and sustainable future city necessitates the meticulous consideration of both advantages and obstacles. The benefits of AIassisted design, such as enhanced efficiency and sustainability, alongside the drawbacks, such as ethical concerns and the necessity for human supervision are discussed.

The study will commence with an elucidation of its materials and methodology in the initial stage. The subsequent conceptual framework will encompass an exploration of the meaning, features, and characteristics inherent to future cities. The elucidation will extend to encompass AIassisted design within the realm of future cities, smart city concepts, and the creation of self-sufficient smart cities. This exploration aims to foster a comprehensive comprehension of the overarching concept.

Moving on to the fourth section, numerous instances of future cities and futuristic projects—constructed, designed, or imagined, within both rural and urban contexts—will be presented. These examples will serve as the foundation for subsequent analysis in the concluding section. In conclusion, the presented projects will be thoroughly evaluated, culminating in a critical discussion regarding the evolving significance of

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cities and the trajectory of their future development. In the appendix section related literature on future is given.

2. Material and Method

Lack of information and literature regarding existing and future city plans and designs served as the foundation for this study. This study focuses on the conceptual foundation for future cities and its most recent proposals. Successively, the conceptual differences between related terminology to future cities, will be discussed. The identification of these will help keep urban planners informed about where today's cities are and what the future will hold for them.

A qualitative search of relevant literature and online sources is conducted. The chosen research method is a case study. The study includes examples of proposed future city projects that have been built from starch or are in the planning stage are selected as the cases. Several futuristic city projects will be mentioned in order to set the difference of understanding and perception of these concepts. There are numerous visionary proposals, but few are stated here in order to explain these kinds of cities.

The cases are originating from Europe, Africa, Northern America and Asia. Project information is gathered from online resources or official project websites. Data is only available from internet sources. Each conceptual proposal's potentials and difficulties have been taken into consideration when conducting the research and evaluated critically.

The analysis also includes a Scopus search based on journal articles with the titles 'future cities' and 'futuristic cities.' When the relevant literature from 2019 to the present is mapped, it is discovered that there are 120 articles titled 'future cities' and 3 documents whose titles include 'futuristic cities' in Scopus.

Other examples of future cities proposing urban transformation regions (London, Amsterdam, and Barcelona) fall outside the scope of this study.

The next section covers the literature search on the future cities.

3. Conceptual Framework

Future cities, known as smart cities (self-sufficient smart cities), AI designed, digital or intelligent cities are ideas that foresee the use of advanced technologies (Bibri, 2018). These are also data-driven strategies to enhance the sustainability, efficiency, livability, and quality of urban life (Ghafouri & Weber, 2020; Bibri, 2018). They must be water sensitive (Görer Tamer, 2020). They are planned to take use of the potentials (benefits/advantages) and challenges (problems/disadvantages) those rising urbanization, environmental concerns, and the expansion of digital technology provide leading to certain features and characteristics.

3.1. Features and Characteristics of Future Cities

Some of the features and characteristics of future cities are stated below:

1. Sustainable Infrastructure: Environmental impact are reduced by utilizing renewable energy sources, energy-efficient structures, smart grid systems, and sustainable mobility options like electric cars and public transportation (Longo et al., 2019).

2. Advanced Connectivity: High-speed internet access and ubiquitous connectivity are prioritized in these cities, facilitating seamless communication and data exchange between locals, companies, and

government agencies. This connectivity supports the implementation of various smart systems and services (Poslan, 2009).

3. Internet of Things (IoT)/ Digital Infrastructure: Future cities incorporate IoT technologies, where everyday objects and devices are used with internet connection (Al-Worafi, 2023) and can collect and exchange data. This integrates and optimizes various urban systems, such as traffic management, waste management, public safety.

4. Data-driven Decision Making: To make decisions, future cities will use a tremendous amount of data that is gathered from residents, gadgets, and sensors. Insights are gained, efficiency is increased, and urban services are improved using data analytics and artificial intelligence tools (Kothari, 2023).

5. Enhanced Mobility and Efficient Transportation: Future cities prioritize efficient and sustainable transportation systems, including intelligent traffic management, bike-sharing programs, electric vehicle infrastructure, and integrated public transit networks. These actions are intended to lessen traffic, increase accessibility, and enhance general mobility (Litman, 2003).

6. Citizen Engagement: These cities encourage active participation and engagement from citizens in urban planning and decision-making processes. Digital platforms, mobile applications, and social media are employed to facilitate communication between residents and local authorities (Rosenberg & Lev-On, 2021).

7. Resilience and Safety: Future cities have an emphasis on resilience against natural catastrophes, climate change, and other possible risks. They incorporate strategies such as resilient infrastructure, early warning
systems, and disaster management procedures to ensure the safety and well-being of their inhabitants (Eren, 2019; 2021).

8. Quality of Life: Future cities strive to enhance the overall quality of life (Bibri, 2018). This includes the provision of adequate housing, accessible healthcare services, green spaces, cultural amenities, and opportunities for education and employment.

9. Improved Urban Planning: Urban planning in these cities takes a holistic approach, with a focus on mixed land use, sustainable architecture, and the creation of vibrant, walkable communities. Planning should be participatory.

10. Mixed-use zoning and compact development

There are ten key principles of future cities (National Geographic, 2023) are Ecology, Economy, Infrastructure, Water, Waste, Food, Mobility, Culture, Energy and Livability. Other principles are;

- Designing to scale (urban hubs) (Green roofs (solar panels, Roof gardens), Rainwater cleansing, Social Transit, Urban farms and gardens)
- Smart Buildings (Sky gardens, Solar walls and gardens, the low glow (low rise buildings allow more light and air), Green streets
- 3. Social Interiors (Room to breathe, Intergenerational Housing, A future city for all, Recycling and reuse)
- Self-contained Neighborhoods (Wetland restiration, Clean Energy Drone Commuting, Flexible Buildings, Underground farming, Strategic Landscaping)
- 5. Afordable housing strategies

6. Biomorphic Urbanism (Gone local, Scaled transit, Connected employment, Half-wild)

These features and characteristics create several potentials and challenges.

3.2. AI Assisted Design of Future Cities: Potential and Challenges

Cities may become more effective, sustainable, and receptive to residents' needs with the aid of AI. Artificial Intelligence is being used in an accelerating mode in urban planning and design of cities, its construction, and the use of buildings and structures. For Hasija and Teo (2022), there have been certain advances in ubiquitous computing and computer vision, with digital technologies (like deep neural networks). These technologies are becoming more efficient in image recognization and interpretation and video data. These are connected to quick decision-making technologies (like deep reinforcement learning), which can exploit the information at a scale to help craft better responses to a city's problems.

AI-generated cities have several advantages such as improved efficiency, sustainability, and livability, as well as potential challenges, such as ethical concerns, privacy issues, and the need for human oversight.

3.2.1. Potentials

There are a number of advantages of AI use in urban planning and development. It can help urban planners and architects build cities, structures, and urban spaces that are more energy-efficient, sustainable, and responsive to inhabitants' demands. Several cities around the world have already implemented AI-assisted design solutions in their urban planning and management. In Helsinki, for example, the city's AI-powered decision-making system has helped to optimize traffic flow, reduce carbon emissions, and improve public safety (Bibri, 2021). In Singapore, the

Virtual Singapore platform uses AI to create a 3D model of the city, enabling urban planners to simulate and test different design scenarios (Sıddiqui, 2023; URA, 2023).

Additionally, by reducing traffic congestion and travel times, it can improve transportation networks. AI-powered smart grids can manage energy usage and distribution, reducing energy consumption and carbon emissions. Optimizing energy usage and reducing waste results in significant financial savings and reduced environmental impact. It can help to enhance transportation networks by lowering congestion and pollutants. Furthermore, by delivering more individualized services and enhancing public safety through predictive analytics, AI can contribute to the development of more livable communities (Wei et al., 2022). Through predictive analytics, AI can improve city livability by providing personalized services and increasing public safety (Chen et al., 2021).

The city of Xiong'an in China is being developed as an AI-powered smart city, featuring automated transportation systems, facial recognition technology, and a digital infrastructure for managing utilities and services (The ChinaProject, 2023). Amsterdam is using AI to optimize energy usage in public buildings and reduce waste through smart waste management (Jha et al., 2022). AI is being utilized to control traffic flows and minimize congestion in Copenhagen (Wolniak, 2023), while AI is being used to improve public safety in Toronto through predictive policing (Reese, 2022).

3.2.2. Challenges

AI-assisted city design offers several challenges (Al-Worafi, 2023). One of the most significant challenges is the ethical concerns related to AI use.

AI systems may perpetuate or amplify existing biases in city planning, leading to inequitable outcomes (Alonso et al., 2020). Additionally, there is a need for human oversight to ensure that AI-generated designs meet the needs of citizens and do not compromise public safety.

AI-generated cities may lead to the loss of privacy, with citizens' personal data being collected and analyzed by AI systems. AI systems require a lot of data, which must be gathered and processed in an ethical and open manner. Finally, the use of AI in sustainable urban development requires collaboration between different stakeholders, including government, private sector, and citizens.

3.3. Smart Cities

Cities have increasing problems in providing efficient and sustainable services to their inhabitants as urbanization continues. Sustainable cities and communities are essential for sustaining globally accepted 17 Sustainable Development Goals (SSDs) and 169 targets (UN, 2023). The 2030 Agenda for Sustainable Development obliges the United Nations (UN) to collaborate with related authorities and communities in renewing and planning human settlements. Here, the goal is to promote innovation and employment while also strengthening personal security and communal cohesiveness. According to the United Nations Department of Economic and Social Affairs (UNDESA) (2023), SSDs target to reduce negative impacts of urbanization on health, the environment, and the climate system while taking account of population trends and projections strategies and policies of development. The Smart City Market is predicted to be valued \$1.56 Trillion USD by 2025 (Frost & Sullivan (b), 2023).

In response to these issues, the concept of smart cities has evolved in order to provide revolutionary solutions that would change the way people live, work, and interact in urban settings. These cities aim to use advanced technologies to create innovative solutions that can create the quality of life for their residents, while also improving sustainability, economic growth, and social equity (Bibri, 2018). Therefore, a confusion of concepts between the smart and digital city is emerging.

A smart city is defined as a city that efficiently and effectively uses own resources, enhances societal well-being, improves business and service processes, and elevates the living standards (Chang et al., 2023). The United Nations Economic Commission for Europe (UNECE) (2020) defines smart sustainable city as an innovative city that uses Information and Communication Technologies (ICTs) and other means to improve quality of life, efficiency of urban operation and services, and competitiveness. These cities meet the needs of present and future generations with respect to economic, social, environmental as well as cultural aspects (See; UNECE (2020) for Trends and Challenges for Urban Futures). This is a future city, but not a futuristic city.

Greco and Cresta (2015) define the smart city as a technologically advanced urban area that can combine "competitiveness" with "sustainability" by integrating several development-related factors (economic, mobility, environment, people, lifestyle, and governance). For urban planners, compact urban growth and neighborhood unit based development is required for smart development.

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The characteristics brought by smart cities vary from one country to another, depending on geographical structures, ecosystems, existing resources, and other factors (Shamsuzzoha vd., 2021).

The creation of smart cities has advanced despite obstacles. Numerous smart city technologies, including smart energy grids, smart transportation networks, and smart waste management, have been implemented by numerous cities across the world. Urbanization and globalization, geographical disparities, urban crises, pandemics and uncertainties, digital revolution, population ageing, climate and environmental challenges, natural and technological hazards are the major issues urban planners and city administrations have to deal to create smart cities. All these are needed for sustaining self sustainable smart cities, which is a newly emerging concept and the next step for urban societies.

3.3.1. Self-sufficient smart cities

Smart cities are, disjointed and reactive (PWC, 2018). Fragmented ones have misaligned goals, no cross-departmental collaborations, and crude data gathering techniques. The objective should be to transform into a proactive smart city and ultimately into a self-sustaining one, whereas reactive smart cities make efforts to accommodate user decisions (Foster & Sullivan (a), 2023).

Kuosa (2023) predicts that in the following decades, cities that are largely self-sufficient may emerge. A self-sustainable status, monetization models that incorporate a variety of stakeholders, and community participation to discover the best fit for the residents are the three main characteristics of smart cities that successfully adhere to the fundamental principles (Frost & Sullivan (a), 2023).

There are many smart city projects. These are generally large-scale projects. However, establishing a city from scratch and their implementation is limited. Smart cities can be created in areas where there is no existing settlement or in regions where previous land use decisions have rendered the functions obsolete. How to transform existing cities into smart cities is a problematic area within the city planning discipline.

A comprehensive strategy involving cooperation between numerous stakeholders, including governmental agencies, urban planners, technology suppliers, and the general public is needed to address potential issues and overcome hurdles. In order to develop a strategy, it is necessary to know the technical and social potentials and challenges of smart cities:

3.3.2. Potentials and challenges

"AI assisted future cities" and "smart cities in potentials and challenges" are similar. Technical Potentials:

Smart cities assist their citizens in various ways. The most important advantage is improved effectiveness. Energy use, traffic flow, garbage management, and other services may all be optimized with the help of smart technology like the IoT. Cost savings, lower carbon emissions, and a more sustainable city can all result from this. Improved public safety is a significant advantage of futuristic smart cities. Smart technology can be used to keep an eye on public areas, monitor criminal behavior, and more quickly handle situations.

The use of smart city technologies can potentially target poverty in a number of ways. For instance, smart transportation systems can enhance low-income populations' access to resources and services such as transportation, lowering the cost and duration of commuting, and enhancing access to employment possibilities (Sıddiqui & Eren, 2022). But it's still unclear how smart cities may affect poverty.

Smart energy systems can make energy more affordable for low-income homes, hence eliminating energy poverty. Additionally, intelligent waste management techniques can lessen the negative effects of waste on the environment, enhancing the health and prosperity of low-income areas.

Access to healthcare and educational services can be facilitated by smart city technologies. For instance, telemedicine and online education can increase low-income populations' access to these services, boosting educational aspirations and health results.

Future-oriented smart cities have numerous challenges:

Technical Challenges:

Future smart cities increase productivity and safety can stimulate the economy. In growing industries like renewable energy, digital services, and smart manufacturing, smart technologies can be utilized to draw firms, encourage entrepreneurship, and create jobs. A more diverse and resilient economy may result from this.

The IoT, sensors, and data analytics are just a few of the technologies that are used in "smart cities." However, there are several technical obstacles that could hinder the growth of smart cities. The lack of standardized smart city technologies is one of the biggest challenges.

Smart city technologies often involve various interconnected systems and devices. Interoperability becomes a pressing concern when there are numerous manufacturers and technologies. Ensuring seamless interoperability between different components and platforms remains a challenge, as it requires standardized protocols and data formats. And, data

availability and reliability can sometimes be problematic when different data sources are not properly integrated.

Cybersecurity presents another technical difficulty. Cyber assaults are more likely when interconnected systems and devices are used in smart cities. Therefore, protecting the security and privacy of data in smart cities is essential to preventing data breaches and cyberattacks.

Concerns of security and privacy emerge from the need to gather, store, and proces massive amount of data in smart cities (Al Nuaimi et al., 2015; Bibri, 2021). Big data on people is also gathered by smart technologies. Protecting personal data and avoiding illegal access or data misuse become a major concern. To secure the personal information of their inhabitants, cities must make sure that they have effective cybersecurity measures in place.

Implementation cost is one of the biggest obstacle. Smart technology installation and upkeep can be expensive, and city authorities may have trouble finding funding for these initiatives. This may result in only wealthier neighborhoods being able to afford smart city services, resulting in unequal access to them. It can be difficult and expensive to create the infrastructure required to support smart city technology. Long-term success also depends on providing scalability to accommodate future expansion and technology developments.

Although the goal of smart city technologies is to enhance resource management and efficiency, the environmental impact of their application should also be taken into account (Shamsuzzoha et al., 2021). This entails cutting back on energy use, limiting waste production, and supporting environmentally friendly transportation choices. Success in achieving sustainability depends on their preserving the natural and cultural attractions (EC JRC, 2011).

Social Challenges:

The issue of public acceptance is another societal problem. The public does not always understand or trust smart city technologies. Building trust and boosting the acceptance of smart city technologies requires ensuring public interaction and participation in planning and decision-making (Goodman et al., 2020).

Engagement of citizens should be given top priority and inclusivity should be maintained (Gigler, 2015). In order to do this, inhabitants must be actively involved in decision-making processes. The digital divide must also be closed and accessibility for all societal groups must be ensured (Gonzales, 2023).

Smart cities struggle with social issues in addition to technical ones. Assuring social equity is one of the biggest obstacles. Smart city programs are created with low-income populations' needs and views in mind. This is another challenge. By favoring wealthy neighborhoods and ignoring vulnerable communities, smart city technologies have the potential to worsen already existing social inequities. They should be developed with an equality focus. It is crucial to guarantee equal access to smart city services. Low-income groups' involvement and representation in the creation of smart city programs become more important (Shichiyakh et al., 2016).

Despite the fact that smart city technologies present enormous prospects to combat poverty, a number of issues need to be resolved in order to guarantee fair access to and participation in the development of smart city initiatives. The digital divide is an emerging problem. The digital divide is getting wider in low-income neighborhoods because they may not have access to the technology or knowledge needed to use smart city services (Habib et al., 2019).

4. Examples of Future and Futuristic Cities - Findings

The fourth section covers the findings of future city examples that have been built from scratch, cancelled, or are in the planning stages, as indicated in Table 1. Additionally, the section presents futuristic cities that are planned or designed, as outlined in Table 2.

The Project	Content	Visual
The Project Mexican Smart City (Smart Forest City) (Mexico)	Content An Italian business (Stefano Boeri) has developed the blueprint for a green metropolis that would be ultra- modern, self-sufficient, and green. It is proposed to build a fully self- sufficient metropolis with Venetian canals, renewable energy, and endless green space. The city will encompass 557 hectares, 400 of which will be made up of green areas with 7,500,000 carbon-absorbing plants and trees. In this area, 130,000 people can live and work. Smart City, Forest Based on Mayan legacy and in its link with the natural and spiritual world, Cancun is a botanical paradise within a modern city, according to Boeri's studio. "An urban ecosystem where nature and city are intertwined and act as one	Visual Visual (Big Think, 16.07.2023) (Big Think, 16.07.2023) (Dig Think, 5tefeng Basei Architetti
	organism (Gibson, 2019).	16.07.2023; Gibson, 2019)
Giant Ring (Dubai)	A giant ring-like structure is proposed to encircle Dubai's Burj Khalifa. A green and natural landmark that acts as a "continuous metropolis" around the Burj Khalifa is the idea put out by the Dubai- based architecture firm ZNera Space as a new kind of contemporary icon for the city. The "Downtown Circle"	

Table 1. Examples of Future Cities

1	1	
	proposal entails building a massive, 550-meter-in length ring-shaped construction around the largest free- standing skyscraper in the world. The building will "investigate how at this crucial juncture in the development of the nation, architects, and urban planners can move away from previous urban models of isolated skyscrapers, towards a more humane typology that seeks to emulate nature and create diverse public spaces." The government of Dubai will invest 5 billion US Dollars. The diameter of the ring is 3 kms. The concept is a reaction to the ongoing population growth around the world and the way metropolitan centers are evolving, particularly in Dubai, where rapid urbanization has sparked a boom in skyscrapers and sprawl. The megastructure, provides an alternative to the isolated highrises that characterize most urban area (Stoubi 2022)	(Stouhi, 2022)
Aladdin City	The project, which is situated in	
(Dubai)	Riggat Al Buteen, Deira, draws inspiration from the stories of Aladdin and Sinbad. The organization in charge of this massive project's development is the Dubai Municipality. Director- General Hussain Nasser Lootah explained the idea behind Aladdin City as "icons of legends of the past with a touch of beauty and tourism, characteristic of the city. When Aladdin City Dubai is	
	finished, it will cover an area of 150.000 m ² . It will have a 27-story hotel connected to an 8-story hotel entrance building, a 19-story hotel	
	with apartments, and an 18-story business building. A swinging bridge connecting all the buildings will go to a 10-story parking structure with 900 parking spaces.	(IDS, 2023)
	tarry tale about Aladdin. The three towers will be connected by moving walkways and air-	

	and the set that are as that was idented	
	conditioned bridges so that residents can conveniently move between them. In addition, the bridge connecting the towers will have a shape reminiscent of the dragons, snakes, and other exotic creatures immortalized in the literature. Plans for Dubai Aladdin City may be found online, and they show amazing structures with gorgeous glass exteriors topped with gold lattice (My baut, 2023). 15 billion US Dollars will be invested for its construction. Dubai municipality is the organisation leading the development of this Project.	(My baut, 2023)
Dubai	Dubai Internet City is located 25	A State of the second s
(DIC)	kilometers south of the city center and is less than 1 mile from the sea	
(Dubai)	coast. It is the regions's tech hub.	
(For thousands of innovators, a	
	setting with the ideal combination of	
	commercial premises, services,	
	The Dubai government created the	(DIC 22.07.2022)
	information technology and	(DIC, 22.07.2023)
	business park known as Dubai	
	Internet City (DIC) as a free	
	economic zone and a prime site for	
	companies looking to tap into the	
	DIC now has over 1.400 companies	
	with over 10,000 employees based	
	in over 1.5 million square feet	
	commercial office space. There are	
	25 office buildings in the region	
	and high rises	
	Companies are able to take	
	advantage of ownership, taxes, and	
	customs-related benefits under the	
	economic regulations of the DIC that	
	are legally guaranteed for 50 years.	
	technology companies. have	
	relocated their regional headquarters	
	to the DIC as a result of these	
	freedoms. Other industrial hubs	
	including Dubai Media City and	
	Dubai Knowledge Park (known as	

	Dubai Knowledge Village) are close	
	by to DIC (Youtube, 22.06.2023)	
Dubai Media	Dubai Media City (DMC), a tax-free	
City (DMC)	area located in Dubai, United Arab	
(Dubai)	Holding The Dubai government	
	created and constructed the DMC	
	and opened it in January 2001	
	(Dubai Media City (a), 2023) to	
	strengthen the UAE's media	
	presence. Since that time, it has	(Telegraph 22.07.2023)
	developed into a regional centre for	(Telegruph, 22.07.2023)
	media companies, including news	
	websites advertising agencies	
	production companies, and	
	broadcast facilities. Infrastructure	
	(such as fiber optic cables) has been	
	built before for businesses to	
	establish themselves, and DMC's	
	are more eased for husinesses	(Dubai Media City (b), 22.07.2023)
	(Dubai Media City, 22.07.2023).	
	With more than 1,300 enterprises	
	registered in the Free Zone and	
	operating from there to serve the	
	entire GCC and Middle East, Dubai	
	Media City has grown to be a	
	sector in these regions (Academic	
	Accelerator, 19.07.2023).	
Masdar City	Masdar City aspires to be one of the	and the second second second second second second second second second second second second second second second
(Abu Dhabi,	greenest urban areas. The city is	
United Arab	designed to operate on renewable	
Emirates	energy and is home to several	15 Service
(UAE))	use of autonomous vehicles and the	JACON
	world's largest solar power plant.	
	The city also includes a research	
	institute that focuses on sustainable	
	technology development. Masdar	and the second second
	City is expected to be more	A Crost and a second
	sustainable, ecologically friendly	and and and and and and and and and and
	This city is a residential community	(Foster and Partners, 17.07.2023)
	featuring shops, restaurants, and	
	open green spaces as well as a clean-	
	tech hub (Provenexpert, 2023). The	
	metropolis, which was planned to be $\frac{1}{2}$	
	six km ² and cost an estimated	
	US\$18-22 Dillion, Was first	

AINama (Saudi Arabia)	proposed in 2006. Eventhough it was planned to be constructed by the year 2009, the first six buildings of Masdar City were finished and occupied in October 2010 after construction on the city started in February 2008. The completion date was postponed because of the global financial crisis. As of 2016, less than 300,000 square meters (0.12 square miles) has been developed, with 2030 being the anticipated completion year. The city is a 44,000-person zero- carbon smart village with 11,000 housing units, diverse education, tourist, and medical hubs in a 10 km ² area. The multipurpose terrestrial network that has been designed for AlNama city promotes biodiversity and works to cool the environment (Cityscape-intelligence (b), 23.07. 2023). The city has positioned itself as an educational and entertainment destination. It was built to maximize the ratio of greenspace while constructing a liveable and car-free community. A car-free city, 37 km of specifically designated running and cycling trails, an autism village and rehabilitation center, a zero-waste city, 100% renewable energy, 100% water recycling, etc. Scalable farms with state-of-the-art biosaline energy, water, and waste management techniques; primary and secondary pedestrian networks that are shaded and connected by	<image/> <image/>
	and secondary pedestrian networks that are shaded and connected by various environmentally friendly modes of transportation. A green spine encircles the entire city (Cityscape-intelligence (b), 23.07. 2023).	
Amala (Saudi Arabia)	It is planned as an exquisite, luxury tourism destination that sets our guests on transformative personal wellness journeys. With a unique heritage, landscape, pristine ecosystems, and world-class	AMAALA
		(Red Sea Global, 22.07.2023)

	yachting opportunities (Red Sea	
	Global 22.07.2023).	
The Red Sea	On the Saudi Arabian northwestern	
Project	coast, an environmentally	
(Saudi	responsible tourism venture is	
Arabia)	planned by the Red Sea Global	The Red Sea
	(RSG). RSG is one of the world's	
	the Public Investment Fund (PIF) of	
	Saudi Arabia	
	The Red Sea Project, which spans	(Red Sea Global, 22.07.2023)
	28,000 square kilometers and	
	includes an archipelago of more than	
	90 islands, is dedicated to carbon	
	neutrality and will be renewable	
	energy powered. By 2030, it is	
	anticipated to contribute \$5.8 billion	
	annually to Saudi Arabia's GDP and	And the second data in the second data
	The project was created by The Ded	
	Sea Development Company	
	(TRSDC) in collaboration with the	(AGBI, 22.07.2023)
	architectural firm Wimberly Allison	
	Tong & Goo and the consultancy	
	Buro Happold, and is scheduled for	
	completion by 2030 (Red Sea	
	Global, 22.07.2023).	
NEOM METROPOLIS	NEOM, a sizable area in the nation's	I Deven Base 1.0
(Saudi	northwest, is gradually evolving into	
Arabia)	a vision of the future. In Saudi	
	Arabia's Tabuk Region, Neom is a	
	NFOM designed islands The	
	undertaking was initially introduced	
	on October 24, 2017.	(AGBL 22.07.2023)
	Neom is planned close to the Red	(1001, 22.07.2023)
	Sea and Saudi Arabia's shared	
	borders with Egypt and Jordan. By	
	2025, the first phase of NEOM is	
	expected to be finished. It is planned	
	Red Sea coast occupying a 26 500	
	km^2 area. It is being constructed at	
	an estimated cost of \$500 billion.	
	and will be powered entirely by	
	renewable energy.	
	The joint-stock firm has made a	the state of the
	flurry of announcements over the	
	past 18 months, despite the fact that	
	not much has been constructed as of	
	yet (AGBI, 22.07.2023).	

	and the Line, a 170-kilometer network of hyperconnected smart towns, were introduced last year.	
SINDALAH (Saudi Arabia)	Sindalah is one of the NEOM islands and will be the first tourism destination (AGBI, 22.07.2023). The Sindalah Project, spanning an area of 840,000 square meters, will feature three hotels focused on luxury tourism, offering a total of 750 rooms and apartments. With an 86-bed yacht marina and 75 additional offshore moorings along The coastal strip is intended to be a superyacht destination. It will be possible to access upscale stores, a beach and yacht club, a spa, and a wellness center (Arkitera, 17.07.2023).	(Hani, 21.06.2023)
TROJENA (Saudi Arabia)	The Tabuk Province's mountains will host the project. Trojena designed by NEOM would have a total size of about 60 square kilometers and will be situated 50 kilometers from the Gulf of Aqaba's coast in a region with an altitude of between 1,500 and 2,600 meters above sea level. The project, which has not yet been built, is already being prepared to host the Asian Winter Games in 2029. The estimated \$500 billion project is expected to be completed by 2026. The project will include an open ski slope throughout the year, an artificial freshwater lake, mountain houses, villas, and ultra-luxurious hotels in the desert city. Trojena is planned to accommodate around 9 million people by the year 2045.	(Arkitera, 17.07.2023)

OXAGON (Saudi Arabia)	Oxagon is planned by NEOM to be the world's largest floating structure. The project is designed to extend into the Red Sea just south of the Suez Canal, which serves as a trade route for approximately 13% of the trade between Asia, Europe, and the eastern coast of the United States. Due to its strategic location, the massive port city is expected to become a center for "advanced and clean technologies" and provide housing for 90,000 residents by 2030. It is planned to operate on 100% clean energy (Neom, 19.07.2023).	(NEOM, 19.07.2023)
THE LINE (Saudi Arabia)	The high and narrow mega- development will be implemented at an elevation of 500 meters above sea level and will have a width of 200 meters. The city will house nine million people. This project of NEOM, considered a revolution in urban living, will connect its residents without the need for cars or roads. Transport system will connect the two end within 20 minutes (Barker, 2022). The objective is to give locals five minutes of walking distance to all of their daily needs, including access to nature. The proposal also intends for the linear hyper-connected, AI-enabled development to be powered entirely by clean energy (Arkitera, 17.07.2023).	(Arkitera, 17.07.2023) (Arkitera, 17.07.2023)
King Abdullah Economic City (KAEC) (Saudi Arabia)	King Abdullah Economic City (KAEC) is a vision-ready investment location that houses a rapidly expanding industrial and logistics hub in a contemporary setting. It offers top-notch urban living and tourism experiences, making it a crucial enabler of Vision 2030. KAEC is a newly developed area conveniently located on the Red Sea coast of Saudi Arabia. KAEC, a 185-square-kilometer city north of Jeddah's commercial center and is	City Map Light Hard

Mina Hi-Tech Tent City (Saudi Arabia)	supported by King Abdullah Port, which is the world's most efficient port according to the World Bank, and KAEC Industrial Valley, which aims to expand the Kingdom's logistics and light manufacturing capabilities. More than 100 international and Saudi businesses have already been relocated to KAEC (KAEC.net, 2023). This tent city is built for 345,000 pilgrims from other countries. It is 8 kilometres to the east of Makkah. For the pilgrims' protection, heat- sensitive water sprinklers with alert systems have been erected and security precautions are taken (Nihal, 2022).	(Bricoleurbanism, 2023)
XZero City (Kuveyt)	A 1,600-hectare complex being built in Kuwait will provide homes, jobs, and services for 100,000 residents. URB's initiative strives to encourage a sustainable lifestyle, high quality living and no negative impact on the environment. The masterplan for the smart city is created to optimize the quantity of green space while simultaneously maximizing the density and distribution of amenities in order to make the city welcoming. This will have a lessening effect on the urban heat island effect and temperature rise. The city will be car-free, with the exception of a ring road that permits only limited	(Nihal, 2022)

	vehicular access. Bicycle lanes and green transit systems will be put in place. Additionally, the city backs a circular economy designed to give locals access to food and energy security (Archdaily (c), 16.07.2023).	(Archdaily (c), 16.07.2023)
THE GATE Mega Trees (Cairo, Egypt)	In Cairo's Heliopolis neighborhood, the Gate project will be constructed. It is a smart multi-use complex. A 450.000 square meter facility will house 1,000 "smart" residences, shopping mall, and offices. Motion sensors will be installed in every home, adjusting the temperature and lighting when occupants are there. It has LEED platinium green certificate (Vincent Callebaut Architectures, 2023).	<image/>
New Administrative Capital (Cairo, Egypt)	In order to relieve congestion in Cairo, the country's current capital, which is quickly expanding, Egypt is currently creating a totally new capital city for up to seven million people. For the privately funded project, which will span 700 square kilometers and include one of the	16.07.2023)

	1	
	largest urban parks in the world, architecture firm SOM created a masterplan. The city will be extended towards the eastward to the coast of Red Sea. It is expected to house seven million residents. In order to blend in with the natural wadi topography, which is composed of ravines that occasionally experience significant rains, more than 100 residential neighborhoods will be created. More than 100 residential areas will be developed to blend in with the natural wadi topography, which is made up of ravines and occasionally receives substantial rainfall (Frearson, 2015).	(Frearson, 2015)
The Orbit (Canada)	Another planned smart city, "The Orbit", will use big data to inform development decisions as it attempts to revolutionize a Canadian farming community through substantial usage of fiber optics, drones, and driverless cars. The garden city movement that started in the UK at the beginning of the 20 th century has been modernized, according to Toronto firm Partisans. It intends to increase the town's population from 30,000 to 150,000 while maintaining a balance between new technology and the traditional rural setting (Cogley, 2019).	(Cogley, 2019)
Helsinki Bunker City (Helsinki, Finland)	The city of Helsinki's capital has more than 500 underground shelters 30 meters deep that can contain 900,000 people, or one-third more than the entire population (Amadike, 2022).	(de la Cuetara, 2022)

PlanIT	Living PlanIT and Cisco will create	wave one development storagy 2.5 Image Identification Plant? Valley (2011 / 807
Vallov	a city in Paredes northern Portugal	
(Porto	a entry in f area es, normerin f ortugal,	and the second s
(FOILO, Deve des	on a 17 km plot. The city will	Country of the second second
Parades,	accommodate 225,000 people.	
Portugal)	Cisco, a manufacturer of networking	A CONTRACT OF A
	nardware, plans to build this smart	
	and sustainable city. The business	
	will collaborate with Living PlanIT,	
	a young company that specializes in	
	creating expansive sustainable	(Urenio.org, 18.07.2023)
	technology for cities and	
	construction projects.	
	This private, planned smart city	
	called "PlanIT Valley" (initially	
	scheduled for development from	
	2011 to 2015) is being built east of	
	Porto. The software business	
	"Living PlanIT" will use this model	
	city to demonstrate its "Urban	
	Operating System" (UOS) on a large	
	scale.	
	Living PlanIT intends to market the	
	modular UOS smart city platform to	
	additional planned smart cities in	
	China and India	
	The inhabitants will be mostly	
	researchers and staff members of	
	Living PlanIT's partner companies	
	and their affiliates. It is antisinated	
	to be completed in phases. The	
	profebricated blocks used to build	
	the gitu's foundation will have all of	
	the managemy amount infrastructures	
	the necessary smart infrastructures	
	aiready installed. In addition, the	
	city's neighborhoods and structures	
	will have plug-and-play polygonal	
	shapes enabling more resource-	
	effective use of available space.	
	The city will act as a living	
	laboratory for partner businesses, a	
	test site for their smart technologies,	
	an innovation hub, an incubator for	
	start-ups in the technology industry.	
	It will be a practical illustration of	
	how Living PlanIT will work with	
	its partners and real estate	
	developers to replicate its strategy in	
	other locations.	
	The Municipality of Paredes has	
	backed PlanIT Valley, and the	
1	Portuguese Government has	

	1 1 1 1 UD 1 4 C	
	recognized it as a "Project of	
	National Interest." However, due to	
	funding issues, the project has not	
G	yet started (Urenio.org, 18.07.2023).	
SmartCity	In Kalkara, Malta, a technological	
(Malta)	park called SmartCity is now being	
	built. Initially, it was planned to	
	develop the Ricasoli Industrial	
	Estate into an information	
	technology and media hub similar to	
	Dubai Media City and Dubai	
	Internet City. On September 10,	
	2007 the initiative started. At least	
	$\notin 2/5$ million was projected to be	(Archello, 22.07.2023)
	spent on the project. Although the	
	antire complex which many a sur-	
	of 260,000 aguara matara	
	scheduled to be finished in its	
	scheduled to be infished in its	
	22 07 2023 (Archeno,	
	When the Planning Authority stated	
	in June 2018 that it was looking into	
	master plan changes for the rezoning	
	of particular areas for residential	
	building it's probable that the	
	concept for an ICT village was	
	dropped and plans for a residential	
	area were substituted (Archello.	
	22.07.2023).	
	SmartCity Malta is situated along	
	the shoreline between Ricasoli Point	
	and Valletta's Grand Harbour and	
	offers a well-balanced combination	
	of office space, residential quarters,	
	hotel areas, and commercial spaces.	
	"Green" outdoor recreation areas	
	make up more than a third of the	
	facilities. In terms of sustainability	
	and environmental protection,	
	SmartCity satisfies all international	
	norms. It provides conducive	
	environments for work and play.	
	The Sunrise series, measuring 60 x	
	120 cm, has been selected for the	
	building facades within the	
	parameters of this policy (Archello, 2023)	
SmartCity	One of the first two initiatives in	
Kochi	SmartCity's plan to create a vast	
1x0cm	global network of knowledge-based	

(Kochi,	industry townships is SmartCity	
Kerala,	Kochi. This is a special economic	
India)	zone for information technology and	
	is located in Kochi, Kerala, India.	
	The Government of Kerala (16%	
	ownership) and Dubai Holding	SmartCity Kochi
	(84% ownership) formed a joint	201111
	(Kachi) Infrastructure Put I td. to	
	carry out the project A minimum of	
	8.8 million square feet will be built	
	as part of the 99.6 ha project, at least	
	6.21 million of which will be used	
	only for IT/ITES related services.	SmartCity Kochi
	Over 90,000 direct employments are	(SmartCity Kochi 17 07 2023)
	anticipated to be generated by the	(Sindicenty Room, 17107.2023)
	project.	
	included the 6.50,000 square foot	
	SCK-01 IT tower and supporting	
	infrastructure, was launched on 20	
	February 2016.	
	The SmartCity will be a home to	
	roughly 50 businesses, some of	
	which are Fortune 500 organizations	
	like Baker Hughes and Ernst &	
	roung and employ up to 5,000	
Amaravati	According to Norman Foster's	
(India)	architecture firm, the new city of	
()	Amaravati, which will be situated on	
	the banks of the River Krishna,	
	would be 217 square kilometers	
	large and one of the most	一 一 一 一 一 一 一 一 一 一 一 一 一 一 一 一 一 一 一
	environmentally triendly cities.	
	hroad government complex with	
	ribbon-like lakes and tree-lined	In State
	boulevards will run through the heart	Contraction of the second seco
	of the city. There are allusions to	
	both New York's Centrel Park and	
	Edwin Lutyen's ideas for Delhi in	
	the urban grid and the focal area of	
	With evolution paths, water taxis, and	
	routes for electric automobiles as	(Block, 2018)
	green transportation options. more	
	than 60% of this core region will be	
	covered in vegetation or water. To	
	promote walking, shaded streets and	
	plazas have been constructed.	

	The 13 state districts will be represented by 13 plazas in this mixed-use sector. When the state borders between Andhra Pradesh and the recently constituted Telangana state were redrew, Amaravati was created.	
Maldives Floating City (Maldives)	By 2050, a large portion of the Maldives is projected to be uninhabitable due to rising sea levels brought on by climate change. The government of the nation has joined up with the architectural firm Waterstudio to create a floating metropolis that would begin to accommodate 20,000 people in a lagoon close to its capital as early as 2024. It will contain 5,000 low-rise floating dwellings and be erected on a series of hexagonal structures that rise with the water. The architects refer to it as "the world's first true floating island city". The Maldives government intends to give up to 20,000 locals and tourists the chance to relocate to the floating metropolis as early as 2024, with the islands forecast to become uninhabitable by 2100 owing to rising sea levels. It will be completed by the year 2027.	Image: constraint of the second sec
Busan Eco Delta Smart City (Busan, Gangseo-gu, South Korea)	In collaboration with Samoo and the technology company Oceanix, the Danish design firm BIG is creating a second prototype climate-resilient floating metropolis for the waters outside the South Korean city of Busan (Finney, 2022). The National Pilot Smart City was established in order to freely introduce and integrate Fourth Industrial Revolution-related technology to locations without development plans. Additionally, it is working toward the objective of presenting the leading model for a smart city of the future by developing a cutting-edge industrial ecosystem that can use original	(Smart City Korea, 2023).

	harding and date (Surgert City Varger	
	business models (Smart City Korea,	
	There is also another smart aity	
	Seiong	
Dogen City	The NEW OCEAN is an ocean	and the second second
(Janan)	business innovation that is supported	
(oupun)	by business academia and	
	government. The floating city of	CALL ST THE REAL
	Dogen, designed by N-ARK, is	
	dedicated to it. This has both social	
	and economic effects (e.g.,	
	development employing new	
	technologies and enterprises in	(Dogen City, 22.07.2023)
	addition to conventional shipping,	
	resources, and national security), for	
	example, responding to natural	
	disasters, enhancing the marine	
	environment, and housing climate	
	refugees. The diameter and	
	1.58 km and 4 km respectively. This	
	size is equivalent to the Japanese	
	idea of "1 ri. 1 hour." The city has	
	roughly 10.000 citizens and operates	
	on a city level, although it has the	
	livability of a small town (Dogen	
	City, 22.07.2023).	
City of	For the Japanese automaker Toyota,	
Future	the Danish architecture firm BIG is	THIS STAR
(Wowen	creating a "prototype city of the	
City)	future" with wooden structures and	
(Japan)	driverless cars close to Mount Fuji.	
	2,000 people will live in Woven	
	is a former auto factory. Here	
	robotics smart homes and	
	automobiles will be tested in a "real-	
	world environment" (Ravenscroft,	
	2020).	
	The Woven City combines the three	
	elements of a normal road-a	
	roadway optimized for automated	
	vehicles, a promenade for	
	micromobility, and a linear park for	(Ravenscroft, 2020).
	pedestrians—into a new urban	
	for how to redevelop existing cities	
	The block will be in groups and have	
	inner courtvards (Ravenscroft.	
	2020).	

Γ	Singapore	Singapore is an illustration of a	
	City	tuturistic city. The city-state has started a number of projects such as	
		the Smart Nation program, whose	
		objective is to build a city where	
		technology is employed to enhance	
		the lives of residents. The	
		vehicles and drones, as well as the	(Smart Nation Program, 22.03.2023).
		use of smart sensors and data	
		analytics to control the city's	
		transportation and energy systems,	n 🕳 i 🊔 🎟 n
		are some of the major components of Singapore's ambitious plans for its	
		future city.	
		The Smart Nation Program is	
		announced in 2014 and in 2017 the	(Structures Insider, 22.07.2023).
		government has announced \$2.4	
		entails using the market to buy	
		services from digital companies	
		rather than giving them funds.	
		Government websites like	
		Data.gov.sg provide open data to	
		The areas of focus include	
		preserving a secure yet open data	
		economy, supporting effective	
		aging, and enhancing public transit	
		amenities and public infrastructure	
		are gathered and analyzed through	
		the Smart Nation Sensor Platform	
		(SNSP) (ChannelNewsAsia, 2017).	
	Tianjin Eco-	The Eco-city site is in the Tianjin Dinhai Nau, Arag. 40 Irm from	
	City Project (China and	Tianiin's downtown and 150 km	
	Singapore)	from Beijing's downtown (Diehl	Tianjin Eco-city
		Metering, 21.07.2023). The Bohai	
		Bay Region is home to the Tianjin	
		Binhai New Area. The Bohai Bay Region is China's future growth	(Singapore Ministry of National
		engine. When choosing the location.	Development, 17.07.2023)
		the Chinese government considered	
		two factors: The lack of arable land	
		and a water deficit. It was ultimately	
		Tianiin Municipality because it was	
		on non-arable land with a water	
		scarcity and would serve as a	
L		convincing example of how	

Meixi Lake Master Plan (Changsha, China)	sustainable urbanization could be accomplished despite significant environmental hurdles. The location was primarily made up of saltpans, desolate land, and unclean water bodies before the Eco-city was built, including a 2.6 km ² wastewater pond (Singapore Ministry of National Development, 17.07.2023). As part of a new push to create "sustainable" surroundings, China commissioned a number of new projects that were designed to be ecologically friendly and low- carbon dependent. Meixi Lake is one of these. According to KPF's description of the project, "Water serves as the main design component and the master plan's focal point	
	and the master plan's local point. The "central park" of the city is a 40- hectare lake that offers area for gardening, transit, and cultural activities. There are eight community clusters, each housing 10,000 people, connected by a network of radial canals. Boats are frequently used for transportation, which lessens the need for cars and pollution (Phantom urbanism, 17.07.2023). The city plan's radial design enables a transportation system that can lower potential pollution and energy use. Urban agriculture, distributed energy sources, and gray and black water collection systems are further sustainable tactics. This comprehensive design includes garden integration, pedestrian planning, cluster zoning, and advanced environmental engineering (Deng & Cheshmehzangi, 2018). Although the project is generally seen as being in the development phase, it has received a great deal of domestic and international criticism for its protracted development period, patchy construction, and excessive budgeting. The district's essential infrastructure is still	(Phantom urbanism, 17.07.2023)

	lacking due to the high technological demands of the eco-friendly design, even though many of the residential structures are done. The Chinese government has continued to promote the project and awarded the city the "2014 Prize for Chinese eco- living".	
Chengdu	The Sichuan province's capital	
Future City	boasts a car-free masterplan created	
(Scihuan,	by the Dutch architecture firm	
China)	OMA, which the company claims	
	defies traditional urban planning	
	paradigms that are driven by road	
	networks or maximizing gross floor	
	area. Chengdu Future City, which	
	will span a 4.6 square kilometer plot,	
	will instead emphasize the terrain's	AB ET
	rolling topography, with six distinct	
	zones created to fit in with the	
	surrounding nature.	
	Within each zone, all buildings will	
	be within ten minutes of walking	AN A MARKET
	distance, and the city will be	
	connected to the rest of Chengdu by	(Crook, 2021).
	a "smart mobility network" that uses	(01001, 2021).
	automated cars (Crook, 2021).	
A mixed-use	The project is designed by the	
community	Guallart Architects. Greenhouses	
(Xiong'an,	will provide protection for all	
China)	buildings and allow them to grow	
	food for daily consumption as well	
	as produce electricity from their	
	stanted roots. Utilizing 3D printers	
	and rapid prototyping tools, small	
	bottom floor will archie the	
	manufacturing of daily items. The	
	structure has an internal matchalia	In the later of the
	system that produces energy	
	recycles water food and materials	
	in order to support a distributed form	Carlo and a state of the second
	of urban management	and the second se
	or arban management.	and the second
		(Archdaily (b), 16.07.2023)

Xiong'an	In the Chinese province of Hebei, is	
(Xiongan)	the state-level new region known as	
New Area	Xiong'an. The region, which opened	and one of the second s
(Hebei,	in April 2017, is 50 kilometers east	AND
China)	of the center of Baoding and 100	
·····,	kilometers southwest of Beijing. It is	A REAL PROPERTY AND A
	a development centre for the	MANY MEL STATE
	Beijing-Tianiin-Hebei (Jingiinii)	CONTRACTOR ELLER
	economic triangle. In addition to	(The Economist, 16.07.2023)
	offices of several state-owned	ASTER CALL
	corporations. government	and the second sec
	organizations, and research and	
	development institutions are	
	anticipated to relocate here, along	
	with other "non-core" services	
	formerly performed in the Chinese	A state of the state of the
	capital. The city is expected to start	
	construction in 2035. It is announced	
	as a green, ultra-modern annexe to	(Global construction review,
	Beijing. 40 construction projects	16.07.2023)
	with a total value of \$6.2bn were	
	begun (Global construction review,	
	16.07.2023).	
Electing City	Architecture studio AT Design	
FIDALING CILV	ATCHIECTURE STUDIO AT DESIGN	
(China)	Office developed a concept for an	
(China)	Office developed a concept for an ocean metropolis. It is a 10-square-	
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(China)	Office developed a concept for an ocean metropolis. It is a 10-square- kilometre floating island. The project provided a chance to create a brand-new urban core with residential, commercial, and cultural amenities and to advance the development of an energy-efficient, self-sufficient, zero-carbon city." The "Floating City," consists of a sequence of prefabricated hexagonal modules that enables a water-based city infrastructure, including a floating hotel and entertainment complex and a network of yachts and submarines for transportation. Along with farms, hatcheries, and trash collection facilities, recreational green spaces would be situated both above and below the water's surface, enabling the town to grow its own food and dispose of	Frearson, 2014

Net City by Tencent (China)	Tencent, a Chinese online company, will construct a 320-acre city in China as a work-life campus for its employees. Offices, homes, schools, retail, open areas, and rooftops covered in grass will all be present in Net City. One of the newest digital companies to venture into master- planned communities is Tencent (Canales, 2020).	
Shanghai Lingang (China)	Shanghai Lingang occupies a 315 km ² area and is situated in Shanghai's southeast. In 2002, the Shanghai city government formally began the development. A significant portion of Lingang's urban area was reclaimed from the sea, unlike many other new towns that were constructed in Shanghai throughout the 2000s (such as the "one city, nine towns" initiatives). The industrial zone, which has a 240.99 km ² size, and the primary residential town, which has a 67.76 km ² area, are the two main land uses in the Lingang area. The final masterplan was chosen through a competition, just like previous significant metropolitan developments in China. The masterplan idea created by the German firm GMP Architects, which envisioned Lingang as a drop of water entering the sea and causing ripples, won the competition. This idea is represented in the circular layout of the new town and the 2.5 km wide artificial lake known as "Dishui." The main town of Lingang is organized into five circular zones, reflecting Howard's garden city design ideals. The new town's lake serves as its focal point, and the lakefront neighborhood offers shopping and entertainment options like supermarkets and water sports. The first ring neighborhood serves a range of needs, including residential, commercial, and office space.	(Urban-China.org, 2023)

Liyve Forest City (China)	Lingang was expected to have 800,000 residents, and 200,000 people are students (Urban- China.org, 2023). Cities like Shenzhen and others are approaching 60 million inhabitants. For its part, Shijiazhuang has a dismal record: It is the Chinese city with the greatest level of air pollution. a few days a year with a veil of pollution and smoke. A new metropolis with 100,000 residents will be called "The Forest metropolis" in Shijiazhuang. A modern city that can serve as an example of sustainable development in a big nation where 14 million farmers move to the cities every year. The city occupies a land of occupies a land of 225 hectares. Forest City Shijiazhuang© (FCS) is the prototype of a new generation of small, compact and green cities, composed by dozens of tall and middle size buildings – the so called "VerticalForests"– all surrounded by the leaves of trees (ranging from 3-9 meters in hight), shrubs and flowering plants. Every VF grafts the equivalent of thousands of 20.000 square meters (2 ha) of a real forest. The city is designed by Stefano Boeri Architetti (Boeri, 2023)	With the second secon
Liuzhou Forest City (Liuzhou, China)	Stefano Boeri Architetti's Chinese Forest City is a city totally covered with plants and trees, including all of the buildings—offices, homes, hotels, hospitals, and schools. After construction is finished, the new city will have a population of 30,000, absorb almost 10,000 tons of CO2 and 57 tons of pollutants annually, and produce almost 900 tons of oxygen. In a region that spans 175 hectares along the Liujiang river, north of Liuzhou in the mountainous region of Guangxi, in the southern part of China, Liuzhou Forest City will be developed. A quick train line	

	utilized by electric automobiles will connect the new green metropolis to Liuzhou, and it will have two schools, a variety of residential regions, and commercial and leisure places. A total of 40,000 trees and about 1 million plants from more than 100 species will be found in	(Archilovers, 2023)
	Liuzhou Forest City (Archilovers,	
Nusantara (Kalimantan, Indonesia)	2023). The City of Nusantara will become the capital of Indonesia on August 17, 2024, which also happens to be Indonesian Independence Day. In other words, Jakarta, which has served as the nation's capital since the country's independence in 1945, will be replaced by Nusantara. The location of the site is in the province of East Kalimantan, which lies on Borneo's east coast. The city is anticipated to cover an area of 2,560 km ² (990 sq mi), and it would be encircled by forested hills, a bay, and a forest. In July 2022, land clearing and access road construction started the construction process. The first stage, also referred to as the "Government Central Area" (Köybaşı, 2022; Wikipedia, 2023a; Yıldız, 2022). The city is designed for sustainability and protecting its surrounding Kalimantan forests, targeting 80% of mobility to be supported by public transport, cycling, or walking and drawing all of its energy from renewable sources and allocating 10% of its area to	(Escap, 2023) (Escap, 2023)
	Wikipedia, 2023a).	
i-City (Malaysia)	The i-City represents a flexible development created using a modular planning approach. This approach combines system modularity and radial planning to establish a sustainable environment that adheres to leading global green standards like BREAM and LEED. The primary goal of the i-City is to establish a green community that	

	stands out for its clear and innovative approach, aiming to enhance the quality of life and equality on a global scale. The central design challenge lies in avoiding the unsustainable architectural elements commonly found in contemporary mixed developments, which is achieved by incorporating the "floating garden" concept. This concept introduces park-like features and landscaping throughout the project, both horizontally and vertically. The implementation involves incorporating tiered green terraces, elevated communal green spaces, recreational platforms, sky bridges within the development. The project is defined by interconnected courtyards, water gardens, and sky gardens, which serve as its central theme, symbolizing its identity and future (IDS, 2023). The i-City introduces a fresh perspective on green principles, integrating ecological entertainment and workspace concepts. It goes beyond ecologically sustainable design (ESD) principles, emphasizing a holistic integration of green elements and aesthetics (IDS,	(Wikipedia, 2023b)
The Wave (Malaysia)	The objective of the design of city within a city concept Project is to establish a peaceful oasis within the urban landscape, achieved through careful and strategic zoning. This approach aims to mitigate the challenges commonly encountered by developed cities while also introducing a fresh layout to the existing area. The organic shapes of the buildings draw inspiration from a blend of modern and cutting-edge architecture, resulting in distinctive sculptural structures (IDS, 2023). The zoning of various structures has been meticulously planned to offer picturesque vistas while preventing any intrusion into neighboring units.	

	The elevated undulating platform, positioned 20 meters above street level, serves a dual purpose. It not only establishes a fresh ground level, concealing the older cityscape beneath it, but also provides a sanctuary away from pollution, traffic, and carbon monoxide. A notable aspect of this design is the	(IDS, 2023)
	significant integration of natural elements (IDS, 2023). Prominent within the design are expansive elevated gardens and play areas that span the skyline, serving as a central motif symbolizing the project and its forward-looking vision. The inclusion of lush areas, an array of landscaped spaces, and park gardens serves as pressive	
	community resources. Additionally, the revival of the river holds paramount significance for the city. The river's course will meander through the site, inviting a stunning array of aquatic wildlife. This design offers a fresh and artistic perspective on the interplay between land and water, seamlessly blending architecture and landscape architecture (IDS 2023)	
BiodiverCi (Malaysia)	ity In BIG's vision, BiodiverCity, three man-made islands will be erected off the coast of Penang Island in Malaysia and connected by an automated transportation system. In partnership with Ramboll, Hijjas, and the Penang State Government, BIG is creating the massive land reclamation project, which will	
	 cover 1821 hectares. Each island will have mixed-use neighborhoods, 4.6 kilometers of public beaches, 242 hectares of parks, and a coastline that is 25 kilometers long. The islands will be designed to resemble lilypads. The Project is expected to sustain economic and cultural growth of Penang Island while protecting its coastal zones and natural habitats. 	

	Bamboo, timber and green concrete will be used (Crook, 2020). The island districts will all rely on regional water supplies, renewable energy sources, and waste management to support their respective populations of 15,000 to 18,000 people. In order to eliminate cars from BiodiverCity, a network of autonomous water, air, and land- based transportation will connect them, giving bikes and pedestrians priority. A network of ecological "buffers," or corridors that span between 50 and 100 meters and are used as parks and natural reserves to maintain biodiversity, will be built around the buildings and districts. The Project is family-focused, green, and smart. People will accomodate in a human-made ecosystem. A 200-hectare digital park that will serve as the island's hub and enable residents and visitors to "explore the world of technology, robotics, and wirtuel reality" will be built there	<image/> <image/> <image/>
New Songdo City Project (Songdo International Business District, Incheon, SouthKorea)	This smart city and business center project built on 600 ha (1,500 acres) of reclaimed land along Incheon's waterfront, 30 km (19 mi) southwest of Seoul (Henry, 2011). It is designed as a "smart city" to create a sustainable, livable environment. Some of the key features of city plans include the use of smart sensors and data analytics to manage the city's transportation and energy systems, as well as the development of autonomous vehicles and a high- speed fiber optic network. With walkable streets, 40% of which are green, and an urban density that encourages a bustling street life, it is a city that welcomes pedestrians. The heart of the city's intricate urban fabric is braided with a new 100-acre recreational park. Sea canals network is powered by wind	Kew Songdo City, 17.07.2023)
	turbines. The Songdo Program includes ten million square feet of public space, five million square feet of retail, 45 million square feet of commercial space, 30 million square feet of residential space, and five million square feet of hotel amenities. Additional attractions include university campuses, a top- notch hospital, a museum, and an international K–12 school (Archdaily (a), 17.07.2023).	Image: Henry, 2011)
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Nurkent (Kazakhstan)	Nurkent is currently being built in the Panfilov District of Kazakhstan's Almaty Region. It is expected to be completed by 2035 and have a 100,000-person population. The village is situated close to one of Kazakhstan's two railway crossings at the Chinese city of Khorgos, which marks the country's border with China. Kazakhstan planned to set aside 11.3 billion tenge to build the infrastructure of a new town called Nurkent. It was reported that the town's construction was seen as crucial to the resettling of workers of the free economic zone "Khorgos — Eastern Gate," the largest transportation and logistics hub on the planet. In January 2015, a dry port that is a part of the Khorgos — Eastern Gate free economic zone started to function. The Chinese state-owned logistics and shipping services provider COSCO acquired a 49 % ownership stake in the property on which the town was being developed from scratch in the summer of 2017.	(Silk Road Briefing, 2023)

Diamniadio Lake City (Senegal)	The village reportedly has roughly 1,200 residents as of the end of 2017 (Wikipedia, 2023). Nurkent border city resembles Pruitt İgoe settlement in he USA. Although stated as a future city, it has modernist architectural style. Diamniadio Lake City is a government approved futuristic township based in Diamniadio. The township is conceptualized to ease the residential and commercial clutter in the capital of Dakar, which is currently the home to a quarter of the country's 14 million people. According to Semer Group, despite the project's architectural design resembling that of Akon City. These two are in no way connected. The project will cover a surface area of 1644 hectares and is expected to cost \$2 billion. The Project will house 350.000 people. The Project covers residential neighborhoods and commercial sectors that can house hotels, shopping malls, the Abdou Diouf International Conference Center, the Dakar Arena for sporting events, research facilities, an exposition center, government agencies, academic institutions, and other entertainment venues. It is a LEED-certified project called The Diamniadio Lake City. According to the agreement of understanding with the Sanegleon	
	According to the agreement of understanding with the Senegalese government, the new city will be built over a period of ten years. The city will have a number of centres for finance, transportation, and	
	education.	
Eko Atlantic	Un victoria Island, which is next to	
(Nigoria)	Lagos, Nigeria, a brand-new coastal	
(Inigeria)	developed It serves as a hub for	A A A A A A A A A A A A A A A A A A A
	investors looking to profit from the	
	rich development boom caused by	23
	high demand as well as a point of	
	entry into the continent's rising markets. Before the project was	(Punch, 2022)

	conceived, the area of land that is now Eko Atlantic City was Lagos Bar Beach, a beach on the Atlantic Ocean's shoreline of Lagos, located on Victoria Island. The area of Eko Atlantic is expected to be the same size as Manhattan's skyscraper district, and it will be built on 10 million square meters of land that has been reclaimed from the sea and is surrounded by an 8.5-km sea wall (Punch, 2022).	
Sidewalk Labs (Toronto, Ontario Canada) (Cancelled)	At Quayside, a waterfront neighborhood, Sidewalk Labs proposed the abandoned Sidewalk Toronto urban development project. Waterfront Toronto first started this project in 2017 by putting out a request for proposals (RFP). The bid was won by Sidewalk Labs, a Google subsidiary (formerly owned by Alphabet Inc.). The Master Innovation Development Plan (MIDP), which was developed in 2019, intended to imaginatively change Toronto's neglected eastern downtown waterfront through talks with more than 21,000 residents. The objective of Sidewalk Toronto was to employ technology to create a smart urban zone that improves the quality of life for its residents while also acting as a testing ground for emerging technical and urban design initiatives. The proposed community's extensive data collection sparked privacy issues that resulted in condemnation of the high-tech idea. The project was canceled on May 7, 2020, due to concerns about the economy brought on by the COVID-19 pandemic's unpredictability.	Gidewalklabs, 16.07.2023)

Telosa (USA)	This city is expected to be the most sustainable city in the world. It will house five million people in a 40 years' time. Telosa to be built on community-owned land just like Ebenezer Howard's Garden City. The density will be 33 people per acre. The city will have diverse housing options and accessinle to all. On Telosa's website, a picture of BIG's Dortheavej Residence in Copenhagen was used as an example. The center would be a huge viewing tower called Equitism, encircled by a string of blocky high- rises. The building can share and distribute whatever it produces by an aeroponic farm, a photovoltaic roof, and raised water storage.	Ravenscroft, 2021)
Innovation Park (USA)	The project is desgned by Ehrlich Yanai Rhee Chaney Architects and Tom Wiscombe Architecture. Blockchain-powered smart city development plans for a sizable portion of Nevada's desert have been made public by cryptocurrency millionaire Jeffrey Berns. After reportedly paying \$170 million (£130 million) for the land, Berns, who amassed a fortune selling cryptocurrencies last year, aims to develop the 67,000-acre (27,113-hectare) piece in the state's northern region. His company, Blockchains, which is an incubator that helps projects and enterprises using blockchain technology, already has its offices at the location known as Innovation Park, which is close to hubs of big tech giants like Google, Apple, Switch, and Tesla. A "new kind of business and residential community" will be the city (Gibson, 2018).	Gibson, 2018)

Aequorea, the floating city (Rio de Janeiro, Brazil)	"Aequorea," is designed by Vincent Callebaut, a Belgian architect. The town is an underwater village. It is a self-sufficient, non-polluting eco- village (Floating Ecopolis) modeled after bioluminescent jellyfish, with nearly everything located beneath the sea's surface. These underwater jellyfish constructions were built with 3D architecture printers with algoplast in Rio de Janeiro. The designer offered a hypothetical letter written by a 15-year-old boy named Océane on Christmas Eve in the year 2065 to describe how this Atlantis-esque community of jellyfish Archibiotic architecture came to be. He is a teen aquanaut who was born underwater in 2050 in Aequorea, a Brazilian underwater farm off the coast of Rio de Janeiro (Arch20 (a), 17.07.2023).	
NUTOPIA	Nutopia was created as an imaginary conceptual country by the famous musician John Lennon and his wife Yoko Ono (Ryan et al., 2006). This idea emerged with a press statement and document named "Nutopian Embassy," which Lennon and Ono referred to in 1973. The picture is an AI visualization of the concept.	
		(Castro, 2023)

Table 2. Futuristic Cities

Amphibia (Singapore Strait)	Amphibia is designed by Vincent Callebautarcitectures as a floating village in Singapore. This village is suitable for sea level rise.	(Archiseeker, 2023)
PANGEOS (Saudi Arabia)	Future floating city is called Pangeos. The concept first surfaced in 2009. Pierpaolo Lazzarini, the architect, imagined a giant yacht construction that could house an entire city. The length is 550 meters (1800 feet), and the width is 610 meters (2000 feet). Pangeos is currently only an idea and a fully sustainable virtual reality estate. The Pangeos accommodates up to 60,000 visitors in the middle of the ocean. The turtle shaped structure includes hotels, malls, parks, ship and airplane ports, and other public spaces. If realized, the vessel will be the biggest floating construction ever constructed (Pangeos Yacht, 2023). The terayacht takes its name from Pangea, the supercontinent that existed millions of years ago during the late Paleozoic and early Mesozoic eras. The word "Terayatch" is a name given to ships even larger than super, mega, and giga yachts (Lunapark, 29.07.2023).	Pangeos Yacht, 2023)

	T	
Rural Towers	A visualization of a contrast design in the middle of the nature. A skyscraper instead of a large sprawling city is proposed. This is an urban lifestyle in rural environment. The tower is thought to be self sufficient and ecological. Blockchain fractional ownership is proposed (Garner, 2023).	(Garner, 2023)
The Pearl	The 2018 motion picture "Skyscraper" includes this structure as a key location. Dwayne Johnson is the movie's leading man. If The Pearl were to ever be built, it would be the tallest structure in the world at 1,066 meters. The enormous structure is called "a marvel of contemporary engineering and architecture." The Pearl and the Dragon, an old folktale, served as inspiration. The Pearl, a structure in Hong Kong, China, has surpassed all previous records for height. The tower took 7 years to build, from the ground floor's office space to the 95th floor's residential space. Retail, dining, and movie theaters are located on the lower floors. Jade Park is situated on floors 100 to 130.	(Fando 01.08.2023)

EtheraSkies	EtheraSkies is the enchanting balloon architecture. The White Light Balloon Architecture floats gracefully above the skies. Its lifelike perspective, intricate design, and cinematic appeal combine to provide an epic photograph that perfectly conveys the ethereal atmosphere. It is a breath-taking architectural beauty that you will never forget.	(MAA Studio, 2023)
City in the sky	The project is designed by Nordic Office Architects. Exclusive mixed used development is situated in Abu Dhabi.	(Archiseeker, 2023) (visualized by
Rural hillside pods	Rural hillside pods designed by Will Garne (@wg.xyz).	(@pictown.co)

City in the	This megacity is planned as a	
Sky	metropolitan area with 10 million	
	people. Numerous megacities can be	
	found in science fiction, but in my	
	opinion, only a visual medium can	
	Tsystan Toshkov proves that the sky	
	is not the limit of imagination as he	
	ventures above it, investigating	
	novel ideas, and building a futuristic	(Arch20 (b), 22.07.2023)
	city in the sky. Tsvetan recently	
	released a complex design for a	
	futuristic metropolis that holds	
	promise for the future. The	
	still in the planning stages and	
	located far above any familiar	
	skyscrapers, depicts a long-	
	cherished sustainable vision with	
	soaring perspectives of a	
	frictionless, shiny, and clean city.	
	The concept of a tranquil paradise	
	suspended above a heavily	
	can escape the daily grind of noise	
	smog, and grime, is known as a "city	
	in the sky." The Lotus flower served	
	as the inspiration for the concept	
	because it is recognized for its	
	ability to emerge pure and clear from	
Slay City	Sky City Have is a profoundly	
Hava	intimate tale about the battle to	A CAT
	overcome hardship and achieve	
	redemption. It is a tv series. It also	The second second
	touches on more general issues like	SKY CITY HAYA
	climate change, social inequity, and	
	now the choices we make today will determine the world in which we	RA PHIL PHIL
	will live tomorrow	A Company and
		In particular and the
		(Sky City Haya, 22.07.2023)
WAKANDA	Wakanda is a marvel. The city is	
	proposed in the movie Black	
	Panther. The fictional country of	
	the Marvel Universe is the most	THE REAL PROPERTY IN
	world years beyond the rest of	Mart in WW
	the world in technological	
	learning. It is expected to be a	
	model for our future cities	

(Pinterest, architecturaldigest. com). Wakanda's architecture comes in many shapes, sizes, and materials, unlike other cities that are crammed with futuristic glass and steel structures that stretch into and over the clouds.



(Pinterest, Architecturaldigest.com, 2023)

4. General Evaluation

As technology advances, cities around the world are embracing the future by constructing innovative, futuristic, smart, and sustainable cities or city sections. Architectural project-based and fragmented planning approaches are supporting this development discussed as future cities. The cities of the future are an unexplored field in the discipline of urban planning.

In this chapter, some of the most well-known future city examples around the world have been analyzed, and their features, goals, and challenges have been presented. Most of the projects are real estate-oriented architectural projects. Smart cities are in their early stages, and developing fully operational and sustainable smart cities still presents considerable challenges. While these cities offer new opportunities, they also face difficulties in achieving their vision. Addressing these challenges will be crucial in realizing the capability of these cities to create sustainable, equitable, efficient, and livable urban environments.

AI and digital advancements, along with innovations, are additional factors required to develop smart city technology for the creation of future cities. These technologies have influenced the transformation of existing traditional cities and their environments. This is mainly exercised in developed capitalist countries, China or Gulf countries. AI-assisted design of future cities holds the potential to revolutionize urban planning and design, enabling the optimization of resource utilization. While great progress has been achieved in developing smart city technology, the analysis shows that major hurdles remain in achieving a functional and sustainable smart city. Ethical and transparency concerns and the need for human oversight must also be noted.

These cities that are integrated into people's lives are controlling and monitoring individuals. In other words, cities that embrace digitalization and integrate smart technologies using AI are limiting the privacy of city inhabitants. However, cities can utilize AI to enhance the efficiency and intelligence of urban environments by striking a balance between AI and human monitoring.

Smart city technologies provide opportunities to tackle poverty by improving access to services and resources for low-income communities. To guarantee fair and equal access to and involvement in the creation of smart city initiatives, a number of challenges must be overcomed. Determining the digital divide, designing initiatives with an equity lens, and ensuring data privacy and security are crucial for realizing the potential to alleviate poverty. Ensuring the security and privacy of data is essential to prevent data misuse and protect the rights of low-income communities.

There is the risk of exacerbating social inequalities. Smart technologies may benefit the affluent and exclude marginalized groups, particularly those who lack access to technology or digital literacy. Some of these cities encounter obstacles in ensuring equitable access to their services and resources. Cities must ensure that they provide equal access to smart city services to all residents, regardless of their socioeconomic status.

Cities face significant challenges in achieving their future visions. One of the most significant challenges is the cost of building and maintaining these cities. Many of these projects require substantial investment and ongoing funding to sustain their innovative features. Implementing proposals that can solve all the problems of a city or city-scale interventions is not feasible for all cities due to their current scale and costly nature. This is why, the majority of proposals for future cities are driven by the wealth of Gulf countries, which is mainly sourced from relatively strong investments in fossil fuels and alternative energy.

While economically advanced countries have initiated individual projects, numerous challenges have been identified in their implementation, often leading to project delays or incomplete constructions. It must be kept in mind that the eco-friendly designs have high technological demands. As a result, it is evident that not all future cities can seamlessly transition into smart and sustainable entities within the intended timeframe, and new cities might struggle to replicate such advancements.

It has been determined that in most of the examined examples, the city or city section integrates with the architectural structure. While these proposals involve specific land use decisions and order, and despite the use of high-quality building materials, there is a lack of a city which has developed over time, the city life, and urban relations. These designs feature artificial and digitized living spaces. Aesthetics have taken a back seat to functionality in these designs. The production of virtual spaces by non-professionals can also be a contributing factor to the change in perception and deviation from aesthetics.

The prime example of urban life being standardized into static spaces is Neom's "The Line" Project. This project envisions the creation of an elongated single structure spanning kilometers, consisting of subdivided spaces adorned with oases. Both nature and humans find themselves confined within the constraints of this colossal construction. As these constructed spaces lack dynamism, they are likely to have adverse effects on human psychology over time, causing a yearning for the dynamic variability found in traditional cities.

Despite maintaining a high environmental quality within the structure, its lifespan is anticipated to be limited due to the environmental impacts on its walls and the expansive Teflon-like surfaces resulting from its architectural design. The detrimental effects on natural life caused by the structure are also unavoidable.

Another impact of futuristic urban proposals will be on the city identity that shapes the individual's identity. With a focus on real estate-oriented architectural projects, standard identities will be presented to people from the outset, without giving them the chance to develop or transform these identities on spaces. As a result, individuals with different perspectives and perceptions of identity may not emerge or merge, making it difficult to create new urban proposals.

Therefore, the presence of the word "city" in the names of future city and futuristic city projects does not automatically make them an actual city or urban area. It must be noted that futuristic cities are also future cities. Most of these projects are typically thematic, sectoral, and specific to certain land uses, specialized urban sections, or self-sufficient digital, and planned living spaces. In other words, the concept of a city or urban section is trapped within the architectural structure or designed as a combination of sculptural structures and systems, aiming to create standardized spaces and city dwellers. As a result, the concept of the city, city center, zoning, rural are losing their known meanings or becoming blurred.

At this point, the need for a separate conceptual definition of future cities based on their differences from sustainable cities becomes a controversial issue. Future cities are conceptualized differently from sustainable cities. Sustainable cities are urban areas based on the long-term principles of environmental, social, and economic sustainability. Such cities aim to use natural resources effectively and efficiently, leaving minimal impact on the environment, while balancing the needs of the society to enhance social welfare and leaving sufficient resources to future generations.

On the other hand, future cities are urban areas where technology, digitalization, and advanced technologies are integrated into. These cities optimize urban services using technologies such as smart infrastructure, data analytics, and artificial intelligence, making urban life more efficient and effective. Therefore, future cities encompass not only sustainability, but also aspects related to technology and innovation.

The distinction between the concepts of "future city" and "sustainable city" can be unclear and lead to debates in some cases. Some future city projects can focus on both sustainability principles and advanced technologies. Hence, each project can be conceptualized differently based on its unique characteristics and priorities. Therefore, it is essential to clearly define the differences between future cities and sustainable cities

and better understand the relationship and distinctions between these two concepts. It is considered that the strengthening of architectural projectbased service production and these developments mutually reinforce each other.

Another consequence of these proposals is the replacement of the concept of the "countryside" with that of "nature." The distinctions between city, countryside, rural areas, and villages are losing their significance. The need for rural area planning is diminishing. In most futuristic projects, the connection with the countryside is severed, and there are no suggestions for incorporating rural settlements on the scale of future city plans. Any projects intended for rural areas take on an architectural nature. Additionally, the term "village" is employed to describe isolated or scattered, unrelated building units, resulting in contrasts of scale and form. It remains unclear why these structures or buildings, lacking urban relationships, are proposed in the midst of nature as megastructures. There is a high likelihood that these architectural spaces and structures, devoid of urban connections and vitality, could give rise to stagnant urban forms reminiscent of abandoned malls.

This differentiation of conceptual content can be attributed to ignorance, low quality of architectural and planning education, and disrupted social relationships, lifestyle, and culture.

There is a misconception of categorizing every future city as a futuristic city. Futuristic cities involve a higher level of imagination and most are virtual. There are technically and technologically challenging to implement due to their complex and advanced features, as well as their significant investment requirements.

The concept of futuristic smart cities can become controversial, if its content is not clearly defined. Without a clear definition and understanding of what creates a future smart city, there can be varied interpretations and debates surrounding the concept. Clarity in defining the features and characteristics of futuristic smart cities is crucial for a more accurate and meaningful discussion and implementation of such projects as in the case of future cities and smart cities.

Today, the majority of the world's cities are defined by their complexity, poverty, and lack of identity. Despite the existence of various projects with the word "city" in their names, offering different content and scale as solutions to urbanization problems, the presence of current traditional cities, urbanization tendencies, and city life will continue worldwide. The cities of today will either maintain their traditional structure and relationships or evolve into a combination of tradition and futurism in the future. The level of achievement is considered a separate topic for further study. It is believed that today's cities will continue to exist in the future until a severe climatic change or a war or heavy impacts of global warming occur.

After the Industrial Revolution, the first significant urban intervention aimed at addressing the issues of cities occurred in Paris in 1853 under the direction of Baron Georges-Eugène Hausmann. This marked the inception of urban developments initially observed as "Cité" in France, "Mietskaserne" in Germany, and "Tenements" and "workers' dwellings" in England. These early interventions subsequently evolved into widely accepted and implemented large-scale modernist concepts fostered by movements such as Bauhaus, CIAM, Team X, and Archigram, which have played a role in shaping today's global urban landscape.

Upon scrutinizing the examples in this study, it becomes apparent that Le Corbusier's revolutionary modernist ideas form the bedrock of many future urban proposals. Notably, no proposal fundamentally divergent from these earlier concepts has yet emerged. The line project resembles Rem Koolhaas's Generic City (See: Böck, 2015).

The proposals for future cities can be perceived as digitally evolved renditions of modernist ideas, yet they have not achieved the same widespread global adoption as their modernist predecessors.

In human settlements, there will always be architectural solutions for both interior and exterior spaces, as well as holistic or fragmentary design approaches and proposals seeking a better living environment in the city. Future cities, whether they are smart, sustainable, or futuristic, should not be viewed merely as individual architectural projects. Instead, they should allow urban planners to create urban relationships and should include proposals that can be implemented in stages and phases.

Despite all the efforts and projects, the feasibility of creating fully functional and sustainable smart cities remains uncertain. The current state of future city developments indicates that significant progress has been made. To create a truly intelligent and sustainable urban environment, much work remains. Expecting all cities to be smart at the same level sustainable seems utopian for today.

A number of obstacles must be overcome before a fully operational and sustainable smart city can be realized. As AI continues to evolve, it is critical that cities and communities explore its potential to create more sustainable and livable urban environments.

While claiming that all future cities where people will live are futuristic cities may not be realistic at present, it is argued that viable strategies and policies for human settlements cannot be formed without knowledge of existing future city proposals.

Inhabitants, city authorities and urban planners must work to address these challenges and ensure that they create smart cities that are sustainable, equitable, and beneficial for all residents. With careful planning and implementation, the future of cities can be transformed by these innovative technologies. A major challenge in the field, nevertheless, is how long the cities and urban areas these innovative projects have produced will last, be maintained and cared for, or provide resilience and sustainability.

The future of cities can only accommodate no more than 100 million residents. Consequently, the proposals for future cities raise a significant question: As urban planners, how will we address the needs of the remaining cities?

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Offering a profound exploration of architectural sciences, this book provides readers with a thorough understanding of the latest methodologies, innovative strategies, and contemporary city and regional planning trends. With a focus on sustainable development, smart cities, and integrating technology into urban spaces, this book is an indispensable resource for architects, urban planners, and anyone interested in the future of cities and regions. It combines theoretical knowledge with practical applications, making it an essential guide for professionals and students who seek to shape the built environments of tomorrow.