Recent Regional Development Strategies in Turkey and Smart Cities: The Case of the Southern Aegean Region (TR32)[1]

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Abstract

This article critically examines how the smart cities approach has been employed as a strategic tool in Turkey's recent regional development strategies. The paper explores the efficiency of development strategies prepared for Turkey's South Aegean Region (TR32) with a focus on smart city elements. These strategic elements include transportation, smart governance, energy efficiency, and digital transformation at the sub-regional level. The sub-regional plans prepared by the South Aegean Development Agency (GEKA) serve as a distinctive example of incorporating new technology-based urban and regional practices into regional development plans in Turkey. GEKA's smart city strategies, while addressing best practices, are criticized for a predominant focus on technological solutions, neglecting crucial human elements like sustainability and social inclusion. These strategies risk widening economic and social inequalities between urban and rural areas due to high costs and increased involvement of private sector companies, leading to an uneven distribution of projects. Critics argue that GEKA's plans lack transparency and public participation, prompting a call for a renewed debate on development agency strategies in Turkey. Furthermore, through a renewed emphasis on the integration of human-centric considerations and the cultivation of participatory governance mechanisms, GEKA's smart city strategies have the potential to facilitate sustainable and equitable development within the TR32 Region.

Keywords: development agencies; regional development; smart cities; Southern Aegean Region; Turkey.

Introduction

In the rapidly evolving landscape of urban and regional development, the concept of smart cities has gained prominence as a powerful driver of change, leveraging technology to tackle local challenges and enhance urban living standards. However, within the Turkish context, the integration of smart city strategies into regional development plans raises complex questions about their effectiveness and broader societal implications. This study aims to explore these issues, examining not only the technological aspects of smart cities but also their socio-economic and governance

1   This paper is partially based on an unpublished MSc thesis by Ezgi Karaçoban (2023) from the Department of Urban and Regional Planning at Pamukkale University. The thesis is entitled "Smart Cities and Regional Development: Rethinking TR32 Regional Development Strategies."

dimensions. The study evaluates the effectiveness of regional plans for Turkey's South Aegean Region (TR32) in aligning with the principles of smart cities. These plans outline explicit goals and strategies related to smart city initiatives over the past two decades.

Building upon the examination of smart city strategies within the Turkish context, it becomes evident that the integration of technological advancements is a pivotal aspect of regional development. In the pursuit of smart cities, not only is the efficiency of development plans crucial but also the alignment of these plans with broader societal considerations. Beyond the technological focus, this article probes the nuanced challenges and opportunities that arise in the execution of smart city strategies. It explores the necessity for a balanced approach that not only prioritizes technological solutions but also considers the human factor. Furthermore, the article addresses potential implications related to economic and social disparities that may arise from the implementation of smart city technologies. As we read through the next parts, the story will reveal more about how technology and various aspects of regional development are connected.

The development of smart city strategies within the TR32 Region, as exemplified by the sub-regional plans of GEKA, highlights their essential role as catalysts for regional development. By emphasizing principles of good governance, smart infrastructure, and digital transformation across different strategic levels, these plans create a strong technological framework for the region's developmental objectives. However, there are still challenges, especially in integrating human-centric aspects into smart city projects, addressing potential inequalities exacerbated by technology use, and fostering greater transparency and public participation in development planning. As this study elucidates, the successful implementation of smart city strategies in the TR32 Region requires not only the adaptation of best practices but also a nuanced understanding of local contexts and needs. By addressing these challenges and refining plans to align with principles of sustainability, social fairness, and equitable development, initiatives in the TR32 Region can leverage the transformative potential of smart city projects to foster lasting growth and innovation.

Methods

This study adopts a descriptive and critical approach to investigate the connection between smart city initiatives and regional development strategies in the TR32 Region. The descriptive nature aligns with the perspectives of interpretivism, acknowledging the value of subjective experiences and contextual understanding (Creswell & Poth 2018). Such rich descriptions lay an essential foundation for future analytical inquiries to build upon, serving as a precursor to theory-building and hypothesis testing, as asserted by Guba and Lincoln (1994). Moreover, the critical stance taken in this research enables examining existing policies and strategies, uncovering potential shortcomings or unintended consequences that may hinder the effective integration of smart city concepts into regional development efforts.

The article draws partially from an unpublished MSc thesis titled "Smart Cities and Regional Development: Rethinking TR32 Regional Development Strategies" (Karaçoban 2023). The descriptive and critical approach taken in the article is partly influenced by the discussion and conclusion sections of the mentioned master's thesis. However, the content of the article is not limited only to the scope of the master's thesis.

The methodology employed in this study involved a systematic approach to analysing and evaluating smart city strategies, with a specific focus on the plans developed by the South Aegean Development Agency (GEKA) for the TR32 Region. Several key steps were undertaken to gain insights into the nature, scope, and effectiveness of these strategies, as well as to compare them with national and international frameworks.

The information discussed and interpreted in the paper were collected from official documents, reports, and publications issued by GEKA, the Turkish government, and international organizations. This phase was crucial for getting detailed information about the particular strategies, priorities, and initiatives specified in GEKA's sub-regional plans for the TR32 Region. Below are sample sec-

toral and thematic research topics that constitute the informational infrastructure of the regional plans prepared by GEKA.

An important methodological issue regarding the South Aegean Development Agency plan reports used in this paper concerns the methods by which development agencies in Turkey acquire and generate data and information used to formulate plans and strategies. There are two important ways of obtaining data and information that constitute the content of regional and sub-regional plans prepared by development agencies in Turkey. The first is through preparatory meetings, workshops, commissions, and face-to-face interviews. The second involves sectoral and thematic development studies and reports prepared by central and local government institutions, as well as civil society organizations. The draft of the GEKA 2024-2028 Sub-Regional Plan for the Southern Aegean Region, which forms the basis for the descriptive and critical approach in this paper, was prepared through the same means of data and information gathering.

Smart City Concept as a Regional Development Approach

The definition of smart cities revolves around the ubiquity of technological possibilities. Within modern urban environments, these possibilities are closely linked to the overall quality of life. According to certain scholars, strategies employed in smart cities involve the deployment of technological tools to address and resolve local issues. Beyond delivering various public advantages, these applications concurrently contribute to the enhancement of the urban quality of life (Meijer et al., 2016).

To systematically categorize academic contributions regarding the role of smart cities in regional development, it is essential to consider three key research questions: Can smart cities serve as tools for regional development? What challenges and opportunities are linked to the integration of smart city approaches into regional planning frameworks? Finally, what insights can be gained from successful smart city implementations worldwide, and how can these be applied to enhance the effectiveness of regional planning strategies?

Initially, several studies propose that smart cities can serve as a means for regional development by fostering sustainable urban growth, enhancing access to technology and innovation, and optimizing the allocation of resources and development policies. Smart cities serve as tools for the sustainable development of urban areas, with the assessment of their construction level holding significance for effective urban management and overall healthy development. The evaluation of smart city construction in China employs four subsystems and utilizes grey correlation analysis. This approach identifies general characteristics and level differences, offering valuable policy implications to enhance the smartness level in Chinese cities (Li et al., 2018). Smart cities and smart territories can optimize regional development by integrating transport infrastructures and sustainable land use, utilizing GIS (Geographic Information System) retrospective analysis (García-Ayllón & Miralles, 2015). Smart Cities can employ data analytics tools to identify the most visited regions and interconnections within an urban environment, potentially enhancing resource allocation to more effectively address the mobility needs of citizens (Buosi et al., 2018).

Smart cities play a crucial role in regional development by efficiently allocating regionally based public services, influencing the growth of cities (Drobne & Bogataj, 2015). Enhancing access to technology, fostering innovation, boosting local attractiveness, and addressing economic issues in Brazilian capitals can position smart cities as instrumental tools for regional development (Oliveira et al., 2021). Smart cities contribute to regional development by connecting technologies to people and utilizing knowledge as a strategic tool for the efficient and sustainable supply of goods and services. The sustainable development of smart cities is critically influenced by innovation, with identified research gaps and emerging trends highlighting a growing interest in this area (Camata et al. 2022).

The integration of social components such as participatory democracy and citizen engagement is a key aspect of smart city initiatives. These endeavours leverage information and communication

technologies to collect feedback from citizens and translate it into actionable insights that can inform decision-making and urban planning processes (Chong et al., 2018). Here, conceptualizing smart cities as "social machines" emphasizes the importance of socio-technical constructs and the integration of information technology to facilitate citizen interaction and participation. This perspective highlights the need to consider the social and technical dimensions in the development and implementation of smart city initiatives in order to enable meaningful engagement and participation from the community (Ahlers et al., 2016).

It is evident that contributions to the integration between the utilization of smart city projects as technological tools in regional development and the social aspects of these projects have begun to receive widespread recognition in academic literature. Here, an integrative framework for understanding smart cities includes critical factors such as management, technology, governance, policy, people, economy, infrastructure, and the natural environment (Chourabi et al., 2012). This holistic approach to smart city development emphasizes the importance of integrating hardware and software, as well as technology and human capital, in order to enhance the overall quality of life for residents.

Secondly, numerous studies propose that integrating smart city approaches into regional planning frameworks faces key challenges. These challenges encompass selecting evaluation methodologies, addressing authority requirements, overcoming infrastructural and organizational obstacles, poverty, inequality, cultural barriers, and achieving strategic objectives. On the other hand, opportunities arise in the form of improving well-being, reducing urbanization impacts, and enhancing mobility, activities, and governance.

Smart city development requires suitable evaluation methodologies, focusing on urban studies and measurement frameworks, to evidence urban value and outcomes (Caird & Hallett, 2019). The development of smart cities in Russia necessitates tackling organizational, financial, infrastructural, and technological challenges, with a particular emphasis on the digitization of city utilities, power engineering, construction, and public transport (Veselova et al., 2018). In the UK, smart cities encounter challenges in achieving strategic objectives, primarily stemming from deficient policy implementation and insufficient support from both the central government and corporate entities (O'Connor et al., 2016).

While the majority of smart city strategies prioritize enhancing efficiency and mobility, there is a comparatively lesser emphasis on equity and public participation. Local governments encounter a significant challenge in this regard, primarily related to limited data and tools (Wang et al., 2023). The transformation of smart cities necessitates innovation in approach, planning, operations, networking, and the management of urban enterprises, influenced by diverse factors and an integrative framework (Halepoto et al., 2015).

Developing countries encounter distinct challenges in implementing smart cities, such as integrating social, economic, and political needs and overcoming issues like poverty, inequality, and cultural barriers (Hamza, 2016). The examples provided here, where potential successes and challenges coexist, emphasize the importance of the local context in smart city implementations. Smart city initiatives in Central Asia demonstrate the potential to enhance living conditions, improve infrastructure efficiency, and promote environmental sustainability, all while addressing urban challenges such as traffic congestion and pollution (Irnazarov & Kayumova, 2017). The Smart Region Mobility Framework aims to modernize regional transportation networks by integrating intelligent transportation systems, enhancing social services infrastructure, identifying two cities in the Philippines as potential smart city candidates, and implementing data flow architecture (Billones et al., 2021). The objective of the ASEAN Smart Cities Network is to enhance the intelligence of cities and promote their development beyond provincial limitations. However, challenges such as varying infrastructure, integration issues, and the reconciliation of informal spaces may pose potential obstacles, potentially affecting its effectiveness and success (Kong & Woods 2021).

Lastly, several research findings indicate that the successful integration of smart city initiatives can contribute valuable insights to regional planning strategies. This involves amalgamating technological advancements with knowledge management, with a specific emphasis on city-centric solutions. A comprehensive approach is advocated, incorporating smart strategies at the district level. Additionally, the importance of citizen engagement and consideration of the local context is highlighted in achieving successful outcomes.

Technological advancements and a growing need for innovative urban solutions drive the development of smart city solutions. The demand for these solutions is fuelled by considerations related to urban futures and the knowledge and innovation economy (Angelidou, 2015). In the context of smart city development, an Information and Communication Technology (ICT)-enabled participatory planning framework is highlighted, advocating for a technology-driven approach that aligns smart features with urban functions and contextual considerations (Stratigea et al., 2015). The implementation of Smart-SUR (Smart and Sustainable Solution), which includes local engagement, strengthened institutions, careful project screening, and innovative regenerative funding, has the potential to promote inclusive, well-measured, and coordinated urban regeneration efforts while fostering local innovation (Huston et al., 2015).

Smart cities can enhance urban performance and wealth by considering the unique characteristics of each location and implementing geographically tailored policy measures (Kourtit & Nijkamp, 2012). A holistic planning approach can enhance the efficiency of a smart district across various aspects such as the economy, energy, mobility, community, and the environment when compared to a baseline scenario (Mattoni et al., 2019). An approach centred on smart city strategies could depoliticize discussions related to urban redevelopment and environmental management. This emphasizes the importance of repoliticizing Smart Cities debates and prioritizing citizens' involvement at the centre of urban debates (March & Ribera-Fumaz 2016).

In summary, the literature research above emphasizes the positive impact of smart cities on regional development while acknowledging challenges such as methodological complexities. Successful integration necessitates a tailored approach, as seen in various examples. The idea of "smart city regionalism" is highlighted as a promising strategy, balancing economic competitiveness and sustainability through innovation, collaboration, and citizen involvement. Overall, the section stresses the significance of utilizing smart city initiatives to provide valuable insights into regional planning, emphasizing the need to consider challenges and opportunities carefully.

South Aegean Region (TR32): Aydın-Muğla-Denizli

Before evaluating the smart city strategies in the South Aegean Region (TR32), it would be appropriate to provide information on the characteristics of this region.

Since the TR32 Region is part of the spatial statistical division of Turkey defined on a normative or administrative basis, it would be useful to start by providing information on Turkey's Nomenclature of Territorial Units for Statistics (NUTS) (see **Fig. 1**). In 2001, as part of Turkey's National Program for the Adoption of the EU Acquis and the Accession Partnership Document, the country defined its statistical regional units under the coordination of the State Planning Organization (SPO) and the Turkish Statistical Institute (TUIK). This classification, which came into force in 2002, divided Turkey into 12 NUTS-1 regions, 26 NUTS-2 regions, and provinces as NUTS-3 units. The NUTS classification has been adopted as the basis for implementing regional development policies, regional statistics, and the establishment of development agencies in Turkey. Specifically, the NUTS-2 level regions are considered an appropriate policy scale for national and regional analysis, as they form the basis for studies carried out in the EU candidacy process and determine the regions eligible for structural funds under the EU's convergence objective. Consequently, NUTS-2 sub-regions have been designated as the basic development planning unit for regional development policies in Turkey (The Republic of Turkey, the Ministry of Industry and Technology 2023).

Note: In the figure, thick lines represent NUTS-2 regions, while thin lines demonstrate the provincial (NUTS-3) borders in Turkey. The provinces including new industrial centers, termed as "Anatolian Tigers" are indicated by a factory sign.
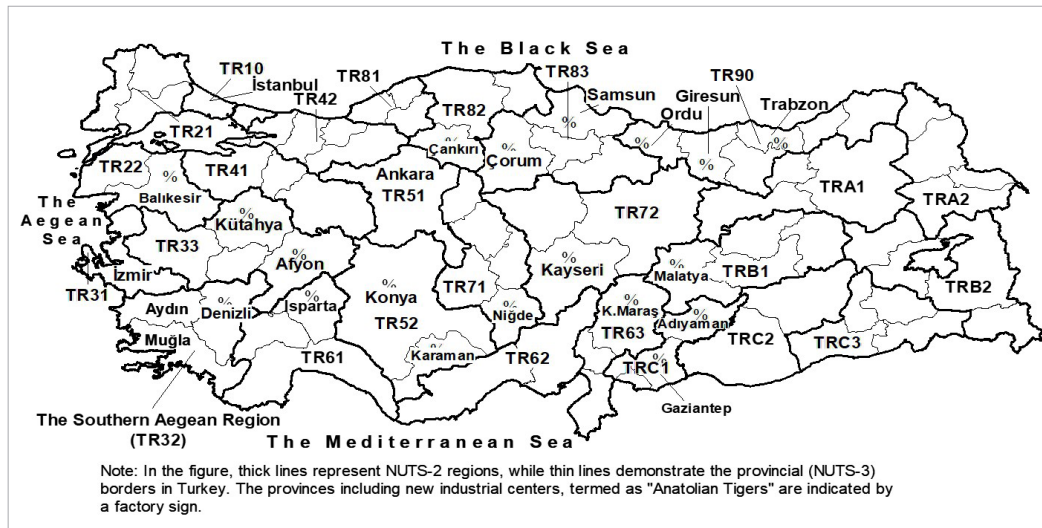
An important question here is whether the NUTS-2 level is an appropriate spatial policy level to assess the effectiveness of smart city strategies in Turkey. An appropriate answer to this question draws attention to the distinction between functional and normative regions in the case of the TR32 Region. Normative regions are primarily delineated based on administrative or political boundaries, often reflecting historical, cultural, or linguistic factors imposed by central authorities. In contrast, functional regions are defined by the actual interactions, interdependencies, and flows between different territories, shaped by economic, social, and transportation linkages (Prodromídis, 2006).

In the case of the TR32 region, there are elements that suggest both normative and functional characteristics at play. On the normative side, Turkey's unitary state characteristics emphasize the importance of normative units within the public administration system. Within the province system, adapted from France's public administration system and known in Turkey as the "Inclusive Governorate System," provinces are the basic public administration units in statistical and administrative terms. The boundaries of the TR32 region align with the administrative provinces of Aydın, Muğla, and Denizli, indicating that its delineation was influenced by the existing political-administrative division based on this public administration system. This normative aspect is further reinforced by the fact that the NUTS classification system was adopted in Turkey as part of its efforts to align with European Union standards and prepare for potential EU accession, highlighting the role of central authorities in shaping regional boundaries.

The TR32 Aydın-Muğla-Denizli sub-region can also be considered a functional region due to the functional and complementary production relations within it. The TR32 region exhibits strong functional linkages and complementarities in its production system, suggesting it can be viewed as a functional region in addition to its normative delineation based on administrative boundaries. Several factors contribute to the functional nature of this region. Firstly, the industrial sector is spatially distributed across 11 organized industrial zones spanning the constituent provinces. This implies functional interdependencies in production activities, supply chains, and labour mobility within the region. Moreover, the export-oriented manufacturing sector has maintained a trade surplus, necessitating functional connections among industrial centres and integration into global trade networks. The region's industries display diverse specializations like textiles, machinery, food products etc., indicating complementarities and potential for inter-industry linkages within TR32. The agricultural sector and its integration with food processing activities also suggest functional production relationships internally in the TR32 Region. Crucially, increasing international competitiveness by enhancing production capacity and integrating into global value

chains is a strategic priority, which requires strong intra-regional coordination across economic activities .In conclusion, the presence of this industrial network, complementary specializations, agricultural-processing linkages, and the strategic focus on integrating into global value chains highlight the functional interdependencies within TR32's production system (South Aegean Development Agency 2023). Therefore, in addition to being a normatively delineated NUTS 2 region, TR32 Aydın-Muğla-Denizli can also be considered a functional region based on these production-related functional relations and complementarities.

The population of the TR32 Region in 2023 is 3,287,520 people (Turkish Statistical Institute 2024). The area of the sub-region is 33,213 km². As a natural consequence of Turkey's province-based NUTS classification, the population and surface area values presented here are the sum of the data of Aydın, Muğla, and Denizli provinces (NUT-3 units) that make up the TR32 sub-region. The TR32 Region, like all other NUTS-2 regions in Turkey, encompasses both urban and rural areas. With the enactment of "Law No. 5216 on Metropolitan Municipalities" in Turkey in 2004, commonly known as the "Compass Law," the administrative and operational jurisdiction of Metropolitan Municipalities was expanded to cover the entire province (The Republic of Turkey, the Prime Ministry General Directorate of Legislation Development and Publication 2004). Accordingly, Aydın, Muğla, and Denizli provinces, which constitute the TR32 Region, are also considered metropolitan municipalities. This legislation has artificially redefined metropolitan areas in Turkey, which ideally should be defined based on functional criteria, into normative regions. According to this law, enacted with political considerations for local elections, all provinces in Turkey with metropolitan municipalities (30 provinces), along with their rural and urban areas, were relabelled and delineated as urban areas.

An important question here is: what makes TR32 Aydın-Muğla-Denizli Region special in terms of examining the relationship between regional development and smart cities? To shed light on possible answers to this question, Fig. 1 shows the NUTS-2 regions in Turkey and the new industrial centres (Anatolian Tigers) at the NUTS-3 level. The term "Anatolian Tigers" is used to describe a group of cities and their economic hinterlands that have developed in the manufacturing industry in Turkey since the 1980s (Erman, 2013). Denizli province and its central city play a very important role among these new industrial centres, with a thriving textile industry, machinery and metalworking, food processing, ceramics and glass, mining and quarrying, furniture and woodworking, and renewable energy sub-sectors. Other province and central city in the region, Muğla's main sectors include tourism, agriculture, fishing, marble and mining, ceramics, textiles, and furniture production. Aydın's main sectors consist of agriculture, food processing, textiles, mining, tourism, renewable energy, and machinery and metalworking industries. The provinces of Aydın, Muğla, and Denizli, along with their central cities, are ideal examples for examining the relationship between regional development and smart cities due to their stated sectoral characteristics.

The development agencies in Turkey, based on the spatial statistical classification defined above, were established according to Law No. 5449 in 2006. By 2010, a total of 26 development agencies were set up, covering all 81 provinces in Turkey (The Republic of Turkey, the Ministry of Industry and Technology 2024). In Turkey, NUTS (Nomenclature of Territorial Units for Statistics) 2 regions constitute the geographical jurisdiction of development agencies. Fig. 2 shows a sample of 26 regional development agencies operating in NUTS-2 regions in Turkey. Development agencies in Turkey aim to accelerate regional development sustainably, reduce development disparities, and foster cooperation between the public, private, and non-governmental sectors. Their primary tasks include creating regional development strategies, identifying and utilizing regional resources, enhancing economic and social growth, and promoting competitiveness (The Republic of Turkey, the Ministry of Industry and Technology 2024). In Turkey, recent regional and sub-regional plans prepared by development agencies within the framework of such organizational tasks and
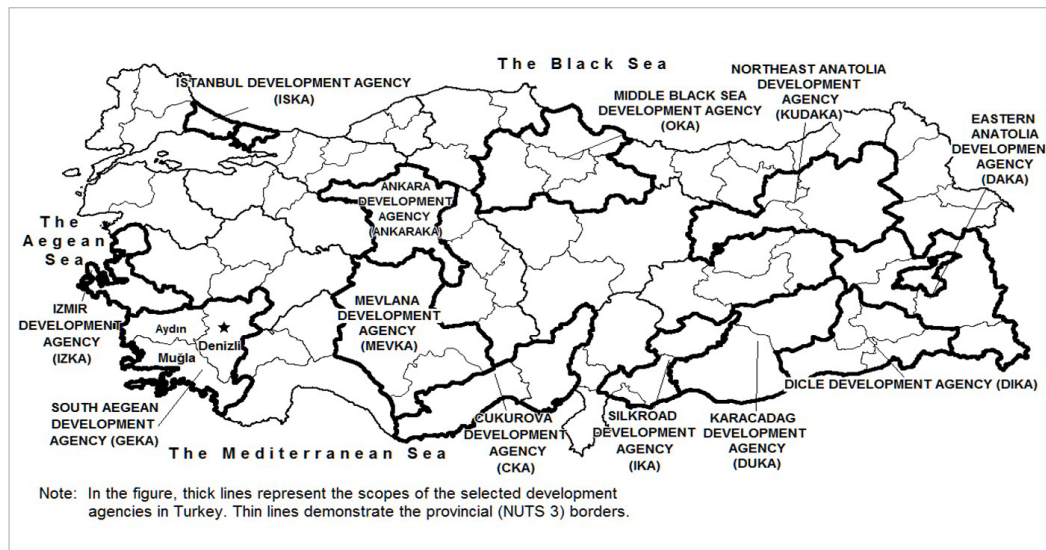
responsibilities have begun to show traces of a development approach in a technological framework. This approach emphasizes current concepts such as smart cities. The sub-regional plans prepared by the South Aegean Development Agency (GEKA) are a typical example of these technology-oriented regional development strategies.

The regional development plans prepared by the GEKA over the past two decades constitute regional development documents tailored for the TR32 Region, which encompasses the provinces of Aydın, Denizli, and Muğla. These plans, grounded in the contemporary spatial-economic analysis of the TR32 Region, delineate regional potentials, priorities, and developmental objectives. Moreover, they advocate for policies and strategies in alignment with the identified objectives.

Within the framework of the GEKA 2010-2013 Sub-Regional Plan, the concept of smart cities emerges as a key strategic focus. This plan directs attention towards the digital transformation of cities within the region, accentuating the importance of smart, sustainable, and innovative urban strategies. Notably, it advocates for the enhancement of information and communication technologies infrastructure in the cities of the region, the augmentation of e-government applications, and the implementation of pioneering projects, including smart transportation systems. Table 1 lists the general policies and strategies of the GEKA 2010-2013 Sub-Regional Plan that are relevant to smart cities. These policies and strategies demonstrate a focus on innovation, technological advancement, and sustainability, all of which are essential elements for smart city development and technological progress (South Aegean Development Agency [GEKA] 2011).

The policies and strategies outlined in Table 1, which are associated with the overall approach of the GEKA 2010-2013 sub-regional plan on smart cities, can be subject to critical analysis. The primary issue with the smart city development strategies of development agencies operating in the 26 statistical sub-regions of Turkey is crucial for GEKA's initial sub-regional plan: the tendency to separate technological strategies, solutions, and tools from the socio-economic and socio-cultural context of development.

The emphasis on conducting R&D and innovation studies, along with the establishment of regional strategies and joint R&D laboratories, demonstrates a commitment to technological advancement. However, without addressing the human-centric aspect, such as integrating sustainability and social inclusion, these initiatives may fall short in meeting the diverse needs of the population. Additionally, while increasing labour force participation through vocational training is laudable,

Smart Cities Approach for TR32 Regional Development Strategies

General Policies	Strategies
Conducting R&D and Innovation Studies for Sectors	_ Creation of innovation awareness in the region, _ Development of university-industry cooperation, _ Establishment and development of joint R&D laboratories, _ Establishment of regional R&D and innovation strategies, _ Increasing the effectiveness of Pamukkale Technopolis in regional industry.
Strengthening the Infrastructure of Sectors	_ Improvement of energy, transportation, and environmental infrastructure of industrial enterprises, _ Improvement of informatics infrastructure in sectors, _ Renewal of machinery park and technological equipment of industrial enterprises.
Increasing Labour Force Participation by Improving Employment Opportunities	_ Diversification of non-agricultural investment opportunities and provision of vocational training, _ Necessary infrastructure arrangements to make city life easier for the disabled, _ Vocational training and employment opportunities for the disabled, _ Vocational training and internship studies in cooperation with industry, _ Vocational training organized according to sectoral needs.
Inventory of Renewable Energy Potential and Investment Feasibility Studies	_ Establishment and strengthening of R&D centres in universities for renewable energy research, _ Popularization of renewable energy sources in daily life, _ Support for renewable energy machinery and equipment production, _ Sustainable wastewater and waste management.

there's a risk that the focus on sector-specific training may not adequately prepare individuals for the evolving demands of a smart city economy, thus potentially perpetuating inequalities.

The inventory of renewable energy potential and investment feasibility studies highlights a progressive approach to sustainable development. Yet, without addressing the potential economic disparities in accessing renewable energy technologies, such as support for renewable energy machinery and equipment production, there's a risk that only certain segments of the population will benefit. Moreover, while sustainable waste water and waste management are essential for environmental well-being, without considering the social implications, such as ensuring access to these services for all communities, the plan may unintentionally exacerbate existing inequalities.

In summary, while the policies and strategies outlined in the GEKA 2010-2013 Sub-Regional Plan demonstrate a commitment to technological development and sustainability, they may overlook crucial aspects such as social inclusion, equitable access to resources, and transparent decision-making processes. A more comprehensive approach that integrates these considerations into smart city initiatives is necessary to ensure that the benefits of technological advancement are shared equitably among all residents.

The 2014-2023 Sub-Region Plan, prepared by GEKA for the Southern Aegean Region, does not contain a specific section devoted to evaluating the achievement of the general policies and strategies related to smart cities, which were included in the First Plan (2010-2013). However, in the "Annex-3: Evaluation of the 2010-2013 Regional Plan" section of the Second Plan (South Aegean Development Agency 2014, pp. 152-154), a general assessment can be made regarding the progress achieved and the targets that could not be reached in terms of sectoral-technological development and innovation capacity, as outlined in the initial plan. This general assessment may offer insights into the effectiveness of the strategies aimed at smart cities for the TR32 Region, as outlined in the initial plan.

The 2010-2013 South Aegean Regional Plan established ambitious targets across five developmental axes: Branding and Innovation, Sectoral Competitiveness, Healthy and Livable Environment, Social Development and Cultural Growth, and Strengthened Infrastructure and Disaster Management. While progress was achieved in certain areas such as the expansion of organic farming, enhancement of tourism infrastructure, establishment of renewable energy research centres, and improvement of educational indicators, the plan fell short of several numerical targets related to firm counts in organized industrial zones, hospital bed ratios, and women's employment rates. Notable accomplishments included the inauguration of the region's first private R&D centre, growth in the number of technology firms at Pamukkale University's Technopark, and enhancements in environmental infrastructure, such as wastewater treatment ratios. However, long-term strategies such as clustering policies and logistics centre projects remained in the planning stages. The multi-sectoral economic landscape facilitated tailored grant programs to address issues in key industries such as agriculture, food processing, textiles, tourism, and manufacturing. While branding initiatives promoted local products, the approval for geographical indications was still pending as of 2013. Overall, the region showcased socioeconomic developments that surpassed expectations but encountered challenges in fully achieving certain targets, with some weaknesses in implementation timelines for complex initiatives requiring extensive coordination among stakeholders. Continuing these efforts while transparently monitoring progress would reinforce the adaptation of subsequent regional plans to realize the overarching vision of establishing the Aegean region as an internationally recognized, innovative brand (South Aegean Development Agency 2014, pp. 152-154).

The GEKA 2014-2023 Sub-Regional Plan delineates specific objectives and policies pertaining to smart city strategies (see **Table 2**). Significantly, the plan highlights the centrality of smart city initiatives geared towards fostering sustainable urban development within the sub-region. These initiatives encompass a comprehensive approach, addressing the renewal of existing urban infrastructures to enhance their efficiency and sustainability, the promotion of energy efficiency, the development of waste management, and recycling systems, the improvement of transportation networks and the widespread adoption of digital technologies in both urban and rural areas. Furthermore, the strategic framework encompasses measures aimed at bolstering the competitiveness of small and medium-sized enterprises (SMEs) within the sub-region. It extends support for innovation, research and development (R&D) endeavours, facilitates sectoral transformation, and advocates for the expanded utilization of information and communication technologies (South Aegean Development Agency [GEKA] 2014).

General Policies	Strategies
Creating an Effective Labour Market with a Qualified Labour Force	_ Establishment of a cooperation platform for improving vocational education, _ Alignment of vocational education with industry needs and standards.
Ensuring Industrial Sector Transformation with High Innovation, Technology, Design, and Branding Capacity	_ Establishment of an R&D and textile design centre, _ Increasing competitiveness in the textile sector with a clustering approach.
Developing and Expanding Social Services for Disadvantaged Groups and Increasing Their Participation in Economic and Social Life	_ Improving and expanding social services for disadvantaged groups, _ Increasing participation of disadvantaged groups in economic and social life.
Creating an Agricultural Sector that Produces Information and Quality-Oriented, Highly Organized, Productive, and Marketing Capacity	_ Ensuring the production of innovative and high-quality agricultural and food products that are sustainable and based on information technologies, _ Establishment of an organized greenhouse zone to enable the use of geothermal energy in greenhouse cultivation.

Table 2

Selected policies and strategies of the GEKA 2014-2023 sub-regional plan for smart cities

Source: Adapted from South Aegean Development Agency (GEKA) 2014

In comparison to GEKA's initial sub-regional plan, there are fewer policies and strategic topics directly addressing smart cities and technological advancement in the second plan. However, the second plan's development axes and support programs demonstrate a shift towards a more innovation-focused development approach. It can be said that the issues related to the use of smart cities and technological solutions for development in GEKA's first sub-regional plan, alongside problems concerning social inclusion and social justice, as well as deficiencies in organizational structure, persist in the second sub-regional plan The GEKA 2014-2023 Sub-Regional Plan primarily focuses on technological solutions for smart city development but overlooks the importance of human-centric aspects.

Additionally, the strategies in the second plan might worsen economic and social disparities in the region. While measures to enhance vocational education and competitiveness are vital, the high costs of smart city technologies could lead to unequal distribution between urban and rural areas. Involvement of private sector entities could exacerbate these gaps, highlighting the necessity for strategies ensuring fair access to smart city projects and resources throughout the region.

Moreover, concerns arise about the perceived privatized and isolated approach in GEKA's plans, raising questions about public involvement and transparency. While the second plan addresses social services and agriculture, there's a need for greater transparency and public engagement in decision-making regarding smart city development. Consulting all stakeholders and implementing mechanisms for public supervision can help address these concerns.

To sum up, although the policies and strategies in the 2014-2023 Sub-Regional Plans demonstrate a commitment to technological advancement and economic growth, they lack consideration for human-centric aspects, mitigating economic and social disparities, and ensuring public participation and transparency. A more comprehensive and inclusive approach is essential to tackle these issues and ensure equitable and sustainable smart city development in the region.

The GEKA 2024-2028 Sub-Regional Plan is still in the draft stage. Consequently, the monitoring and evaluation report section regarding the accomplishment of the general policies and strategies outlined in the second plan (2014-2023) has not yet been included in the draft plan. Nevertheless, it is feasible to reference the regional plan preparation process and studies initiated during the second plan period, which have contributed to the formulation of the GEKA 2024-2028 plan.

The draft of the GEKA 2024-2028 Sub-Regional Plan for the Southern Aegean Region has been developed in alignment with principles of participation, complementarity, local and spatial focus, and consideration of global trends. The planning process began in 2016 with sectoral and thematic analyses.

From 2016-2022, various studies were conducted such as sectoral commissions, surveys, inventories, and research reports to provide inputs for the new regional plan. The overall planning process involved seven main stages: stakeholder analysis, sectoral/thematic analyses, data compilation and soliciting institutional views, current situation analysis, workshops and in-person meetings, determining the vision/priorities/targets/measures, and coordination with national strategies. Key elements included analysing the region's socioeconomic trends, priority intervention areas, and strategic objectives while ensuring effective resource utilization aligned with national/local policies. Stakeholder participation was emphasized through workshops held in the region's provinces to discuss draft measures within the strategic areas identified through the analyses (South Aegean Development Agency 2023, pp. 5-9).

In light of the lack of formal feedback and performance evaluation concerning the realization of smart city strategies and policies within the second GEKA plan period (2014-2023), the examination of smart city strategies in GEKA's Third Plan (2024-2028) will be conducted autonomously, detached from past assessments. Naturally, this evaluation cannot provide definitive information about the plan's approach to smart cities and technological development. Nevertheless, the draft plan can be considered an important strategic document for understanding the technological perspective towards development efforts in the TR32 Region in general terms.

Table 3 shows the priorities, targets, projects, and measures outlined in the GEKA 2024-2028 Draft Sub-Regional Plan for smart cities and technological development. As with the assessment of the

Table 3

Selected targets and measures in the draft GEKA 2024-2028 sub-regional plan for smart cities
Source: Adapted from South Aegean Development Agency (GEKA) 2023: 53-95.

Priorities, Targets, Projects and Measures	
Strategic Priority 1: Increasing International Competitiveness	
Targets and Projects	Measures
Target 1: Integration into global value chains will be ensured.	_ Investments in internet of things, robotic applications, simulation, artificial intelligence, digital twin, big data, and additive manufacturing technologies in the manufacturing industry will be encouraged. _ Human resource capacity for the effective use of digital technologies in the manufacturing industry will be strengthened. _ Software and equipment production for smart agricultural practices will be supported, and smart agricultural practices based on digitalization and artificial intelligence will be expanded in the region. _ In the livestock sector, the use of technologies that monitor and optimize parameters such as feed, disease, climate, and lighting will be encouraged.
Projects	_ Smart Farm Management System Project _ *Ortaca* Software Village Project _ Artificial Intelligence and Game Development Incubation Centre Project _ Nanotechnology Research and Application Centre Project
Target 2: Institutionalization and productivity-oriented transformation will be ensured in traditional production areas.	_ Digital competencies will be increased in producer organizations. _ Research and development activities for the agricultural sector will be supported and product storage and processing facilities will be encouraged. _ Investments for the development of irrigation infrastructure and water saving will be expanded.
Strategic Priority 2: Increasing Tourism Mobility in the Region	
Targets and Projects	Measures
Target 1: Service quality in tourism will be enhanced.	_ Digital applications such as 3D animations, mobile applications, metaverse technology, and virtual reality will be popularized in the promotion of tourism products and destinations. _ Innovative solutions for traffic problems in tourism-intensive districts will be popularized. _ Tourism enterprises will be encouraged to invest in technologies such as artificial intelligence, internet of things, and blockchain. _ The use of augmented reality and virtual reality technologies in the promotion of ruins will be expanded. _ Integration of health and aesthetic treatment services into tourism will be increased.
Projects	_ Ancient Cities Revitalized with Virtual Reality Project
Strategic Priority 3: Ensuring Green Transformation in Production and Living Areas	
Targets and Projects	Measures
Target 2: Natural habitats will be protected.	
Projects	_ Marine Pollution Management with Smart Buoys Project _ Transformation of *Dalyan* Sightseeing Boats into Environmentally Friendly Solar Boats Project
Strategic Priority 4: Reducing Social Risks and Facilitating Access to Urban Services	
Targets and Projects	Measures
Target 1: The impact of social risks will be reduced.	_ Access to education services will be strengthened by integrating digital technologies into education. _ Digital literacy and online access capacity to public services will be increased.
Target 2: Urban services and physical infrastructure will be strengthened.	_ Smart city applications and technology enterprises for the development of these applications will be supported. _ Differences between settlements in terms of internet access and usage will be reduced.
Projects	_ South Aegean Smart Cities Project
Target 3: Resilience to disasters will be increased.	_ Analysis and planning studies for disaster risk reduction will be expanded. _ Realization of critical investments for disaster risk reduction will be ensured. _ Efficiency of response capacity to disasters and emergencies will be increased.

previous two sub-regional plans, a selective strategic review is conducted here. The table outlines the selected targets and measures proposed in the draft GEKA 2024-2028 sub-regional plan for smart cities, focusing on various strategic priorities within the Southern Aegean Region. Under the strategic priority of "Increasing International Competitiveness", targets include integration into global value chains, with measures such as encouraging investments in digital technologies for manufacturing and smart agricultural practices. Projects like the "Smart Farm Management System" and "Artificial Intelligence and Game Development Incubation Centre" aim to achieve these targets. Additionally, efforts to enhance tourism mobility in the region prioritize service quality improvement through digital applications and innovative solutions for traffic management, exemplified by projects like the "Ancient Cities Revitalized with Virtual Reality Project". Another priority, "Ensuring Green Transformation in Production and Living Areas", emphasizes protecting natural habitats through projects like "Marine Pollution Management with Smart Buoys". Lastly, the priority of "Reducing Social Risks and Facilitating Access to Urban Services" aims to strengthen urban services and physical infrastructure, increase digital literacy, and enhance resilience to disasters through various targeted measures and projects like the "South Aegean Smart Cities Project".

The strategic priorities outlined in the draft GEKA 2024-2028 sub-regional plan for smart cities reflect a strong emphasis on technological advancement and innovation, particularly in enhancing international competitiveness, tourism mobility, green transformation, and urban services. Initiatives such as investments in digital technologies, promotion of smart agricultural practices, and the integration of advanced digital applications in tourism promotion highlight a clear commitment to leveraging technology for economic growth and sustainability. However, the draft plan appears to prioritize technological solutions without adequately addressing the potential social consequences and compatibility with existing socio-cultural structures. Moreover, the increasing reliance on private sector involvement in technological projects raises concerns about potential inequalities in development outcomes. Furthermore, there are several challenges related to governance and centralized administration, particularly in ensuring equitable access to and the implementation of technological advancements across different regions.

Here, it's essential for the draft plan to also consider social impacts, governance issues, and the necessity for inclusive development in order to achieve its goals effectively. In the process of transforming the draft plan into the final plan, the socially-oriented, participatory, transparent, and balanced approach to technological development, concerning the relationship between the public and private sectors highlighted in this paper, is important.

Discussion

The smart city strategies outlined in the sub-regional plans by the South Aegean Development Agency (GEKA) emphasize their crucial role as catalysts for regional development within the TR32 Region. The consistent focus on principles of good governance, smart infrastructure, and digital transformation across various strategic levels establishes a robust technological framework to guide the region's overarching development goals. However, the effective realization of the TR32 Region's smart city vision depends on the successful adaptation of region-specific best practices and the seamless execution of related sub-projects, encompassing both urban and rural areas.

In light of the descriptive and critical assessments made above regarding the use of the smart city concept as a regional development tool and strategic direction in the general policies and strategies of GEKA's regional plans, the following concise conclusions and evaluations can be derived:

1. The smart city strategies outlined in GEKA's sub-regional plans demonstrate a strong emphasis on technological solutions and infrastructure development, aligning with national priorities in Turkey. However, there appears to be a lack of comprehensive consideration for integrating human-centric aspects such as sustainability, cultural diversity, social inclusion, and social justice into these technological frameworks (Tables 1, 2, 3).

2. The increasing reliance on private sector involvement in implementing smart city projects, coupled with the high costs associated with these technologies, raises concerns about potential economic and social inequalities arising from an uneven distribution of projects across urban and rural areas within the TR32 Region (**Tables 2, 3**).

3. While GEKA's strategies acknowledge the importance of aspects like energy efficiency, sustainable transportation, and digital transformation, the lack of a holistic approach that balances technological advancement with effective governance, public participation, and transparency could hinder the successful implementation and long-term sustainability of these initiatives (**Tables 1, 2, 3**).

4. One of the most significant criticisms to be raised regarding the technological development and innovation-oriented strategic content of the three GEKA regional plans is the absence of a comprehensive section dedicated to smart cities in these plan reports. Findings, strategies, and analytical policies regarding the relationship between smart cities and regional development are dispersed across various strategic headings in these plans.

In summary, the descriptive and critical evaluation presented suggests that while GEKA's sub-regional plans align with national priorities in promoting technological development and smart city initiatives, there is a need to broaden the scope of these strategies to incorporate human-centric considerations, address potential inequalities, enhance governance and public participation, and adapt best practices from various levels to the local context of the TR32 Region.

Conclusions

This study emphasizes the significant impact of smart city strategies on regional development, focusing on the case of South Aegean Development Agency sub-regional plans. Addressing smart city aspects such as good governance, smart infrastructure, and digital transformation across various strategic levels can establish a technological foundation for development strategies in the TR32 Region. However, for the successful implementation of the smart city strategy in the TR32 Region, practical considerations must be highlighted. Best practices, aligned with the core principles of the comparative strategies discussed in this paper, should be adapted to the local context and reinforced by sub-projects tailored to the specific needs and intricacies of the region. In doing so, a more contextually nuanced and effective approach to smart city development can be achieved, fostering sustainable growth and innovation within the TR32 Region.

In addition to addressing best practices for the effective implementation of potential smart city projects in the region, there are several issues with how GEKA approaches smart city strategies in their regional plans. Firstly, they tend to focus primarily on technological solutions, neglecting important human aspects. Smart city strategies should not only involve implementing technology but also integrating sustainability, cultural diversity, social inclusion, and social justice into technological frameworks. Secondly, these strategies may worsen economic and social inequalities among urban and rural areas due to the high costs associated with smart city technologies and the growing involvement of private sector companies, leading to an unequal distribution of projects. Lastly, critics argue that GEKA's plans exhibit a privatized and sheltered approach, prompting a need for a new debate on public participation and transparency in development agency plans and strategies in Turkey.

The examination of smart city strategies, exemplified by the TR32 Region case study, reveals the nuanced complexities involved. While technological advancements offer substantial potential for sustainable growth and innovation, their effective application requires a holistic approach that transcends mere technological solutions. It is crucial to align these initiatives with core human values, societal needs, and ethical considerations. Embracing an inclusive paradigm that balances technological advancement with sustainability, social equity, cultural preservation, and participatory governance enables regional development strategies to fully leverage the transformative capacity of smart cities.

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