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Remote Work Dynamics and Its Influence on U.S. Urbanization Patterns: A Review

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Abstract

This study explores the transformative impact of remote work dynamics on U.S. urbanization patterns, delving into how the shift towards telecommuting is reshaping urban and suburban landscapes. With the COVID-19 pandemic accelerating the adoption of remote work, this research aims to understand the subsequent changes in residential preferences, real estate dynamics, economic structures, and environmental sustainability. Employing a systematic literature review and content analysis as its methodology, the study synthesizes findings from peer-reviewed journals, government reports, and industry publications to offer a comprehensive overview of current trends and future projections. Key insights reveal a significant migration towards suburban and rural areas, driven by the desire for more spacious living conditions conducive to remote work. This shift is accompanied by a reevaluation of urban spaces, highlighting a decreased demand for traditional office buildings and an increased interest in flexible, mixed-use developments. Furthermore, the reduction in daily commuting associated with remote work presents notable environmental benefits, including lower carbon emissions and improved air quality. The study projects that the long-term impact of telecommuting will lead to further decentralization of the workforce, necessitating adaptive urban planning and policy frameworks. Strategic recommendations are provided for policymakers, businesses, and urban developers to support sustainable telecommuting practices. Areas for further research are identified, emphasizing the need for ongoing investigation into the social, economic, and environmental implications of remote work. This research contributes to the discourse on urban development, offering insights into the evolving relationship between work practices and urbanization in the era of telecommuting.

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1. Introduction

1.1. The shift towards remote work: A paradigm change in employment

The shift towards remote work represents a paradigm change in employment, fundamentally altering the traditional office-based work model and its associated lifestyle. This transformation, accelerated by the COVID-19 pandemic, has profound implications for urbanization, employment trends, and the social and technological infrastructure supporting telecommuting.

The transition to remote work is not merely a temporary adaptation but a permanent change that redefines the relationship between workspaces and workforce dynamics. The implications of this shift extend beyond the technological realm, impacting employment trends and quality of life for employees. Franco *et al.* (2023) ^[12] investigate the effects of remote work on employee well-being, comparing it to traditional work models. Their research, based on survey data, suggests that remote work offers a mixed bag of strengths, weaknesses, opportunities, and threats. While remote work can enhance work-life balance and reduce commute times, it also presents challenges such as isolation and the blurring of work-life boundaries. This nuanced view underscores the complexity of telecommuting's impact on the workforce and highlights the need for strategic management to harness its benefits while mitigating its drawbacks. Moreover, the transition to remote work signals a broader shift in labor markets and work-life balance dynamics. Vyas (2022) ^[34] discusses the "new normal" in the post-pandemic work environment, emphasizing the long-term adoption of hybrid and remote working models. This shift challenges traditional employment relationships, working hours, and the concept of work-life balance, suggesting a future where flexible work arrangements become the norm. Vyas (2022) ^[34] categorizes the trends in labor markets into acceleration, normalization, and remodeling, indicating a complex interplay of factors driving the evolution of work practices. The paradigm change towards remote work, therefore, is not just about where work is done but how it is conceptualized and executed. It reflects a broader societal and technological shift that impacts urbanization patterns, employment trends, and individual lifestyles. As organizations and employees navigate this transition, the role of policy, infrastructure, and management strategies becomes crucial in shaping sustainable telecommuting practices. The insights from Franco *et al.* (2023) ^[12], and Vyas (2022) ^[34] provide a comprehensive understanding of the multifaceted impact of remote work, offering a foundation for further exploration of its implications for urban and suburban development. In summary, the shift towards remote work represents a significant paradigm change in employment, driven by technological advancements and catalyzed by the COVID-19 pandemic. This transition challenges traditional notions of the workplace, necessitating a reevaluation of work-life balance, employment trends, and urbanization patterns. As this trend continues to evolve, it will be imperative for researchers, policymakers, and businesses to consider the complex implications of telecommuting on society and the economy.

1.2 Defining the Landscape: Telecommuting and its impact on urbanization

The landscape of urbanization is undergoing a significant transformation, influenced by the rise of telecommuting. This shift, catalyzed by technological advancements and accelerated by the COVID-19 pandemic, is reshaping the dynamics of city development and suburban growth. The impact of telecommuting on urbanization encompasses various dimensions, including economic, social, and environmental aspects. This section explores how telecommuting is defining the new landscape of urbanization, drawing on recent studies and analyses.

Telecommuting has emerged as a pivotal factor in urban and suburban development, challenging traditional models of

work and living spaces. Nazarenko (2020) ^[23] provides an economic analysis of the urbanization process, highlighting the interplay between urban growth and agricultural land use. The study underscores the necessity of balancing urban expansion with sustainable land use practices, a concern that telecommuting can address by reducing the need for physical office spaces and, consequently, the pressure on urban land resources. The decentralization of workspaces, facilitated by telecommuting, suggests a potential alleviation of urban sprawl, offering a pathway to more sustainable urban development.

The environmental implications of telecommuting are equally significant. Abdeljawad, Adedokun, and Nagy (2023) ^[1] examine the environmental impacts of urban sprawl, utilizing remote sensing indices to assess changes in land use and their consequences on the urban ecosystem. Their findings indicate that urban expansion, characterized by increased built-up areas and reduced green spaces, adversely affects the environment. Telecommuting, by diminishing the necessity for daily commutes and reducing the expansion of office infrastructure, can contribute to mitigating these environmental impacts. The reduction in vehicular emissions and the conservation of green spaces are among the environmental benefits associated with the widespread adoption of telecommuting.

Moreover, the social dimensions of telecommuting and its influence on urbanization patterns are profound. Makhrova and Nefedova (2022) explore the phenomenon of migration reversal during the COVID-19 pandemic, observing a trend towards sub-urbanization and de-urbanization as individuals and families seek refuge from densely populated urban centers. This movement is facilitated by the flexibility of telecommuting, which allows people to live further from their workplaces without compromising their professional responsibilities. The implications for urbanization are substantial, as this trend could lead to a redistribution of population densities, with potential benefits for alleviating urban congestion and enhancing the quality of life in suburban and rural areas.

Telecommuting, therefore, stands at the intersection of economic efficiency, environmental sustainability, and social well-being. Its impact on urbanization is multifaceted, offering opportunities to rethink the organization of work and living spaces in a manner that promotes balanced development. The transition towards telecommuting necessitates a reevaluation of urban planning and policy-making to accommodate the changing dynamics of work and mobility. As cities and suburbs adapt to the increasing prevalence of telecommuting, the potential for creating more sustainable, livable, and resilient communities becomes evident.

In essence, telecommuting is redefining the landscape of urbanization, challenging conventional paradigms of city development and suburban growth. The insights from Nazarenko (2020) ^[23], Abdeljawad, Adedokun, and Nagy (2023) ^[1], and Makhrova and Nefedova (2022) ^[18] illuminate the complex interrelations between telecommuting and urbanization processes. As the trend towards telecommuting continues to evolve, its implications for urban and suburban development warrant careful consideration and strategic planning to harness its potential benefits while addressing its challenges. The role of telecommuting in shaping the future of urbanization is a testament to the transformative power of technology and innovation in reimagining the spaces where

we live and work.

1.3 Aim and objectives of the study

The primary aim of this study is to investigate the impact of remote work dynamics on U.S. urbanization patterns, focusing on how the increasing prevalence of telecommuting influences urban and suburban development, environmental sustainability, economic structures, and social equity.

The objectives of the study are;

- To investigate how telecommuting trends might reshape urban and suburban growth.
- To analyze the impact of remote work on urbanization.
- To project future urban and suburban development trends.

1.4 Significance of the study

The significance of the study encompasses a broad spectrum of societal, economic, and environmental implications, marking it as a pivotal piece of research with far-reaching consequences. At its core, this study delves into the transformative impact of remote work on the fabric of urban and suburban development, offering critical insights that can guide city planners, policymakers, and developers in reshaping infrastructure investments, zoning laws, and urban planning strategies to better accommodate emerging living and working patterns.

Beyond the realm of urban development, the research plays a crucial role in the environmental sustainability discourse. By examining the potential reduction in commuting and its associated decrease in carbon emissions and pollutants, the study contributes valuable data to efforts aimed at combating climate change and promoting greener, more sustainable cities. This aspect of the research is particularly significant as it aligns with global objectives to reduce environmental footprints and enhance the quality of urban life.

Economically, the shift towards remote work heralded by the pandemic has profound implications for real estate market dynamics, the distribution of economic activities, and the overall economic health of urban and suburban areas. This study provides a nuanced understanding of these economic shifts, enabling businesses, investors, and government entities to make informed decisions that align with the evolving economic landscape.

Social equity and accessibility emerge as critical themes in the study, highlighting the disparities in remote work accessibility across different demographics and regions. By shedding light on the digital divide and its impact on employment opportunities, the research underscores the need for policies that ensure equitable access to remote work, thereby fostering a more inclusive workforce.

Furthermore, the study offers a foundational perspective on future workforce and workplace trends, equipping employers, employees, and labor market analysts with the insights needed to navigate the changing work environment. From organizational culture and employee well-being to productivity and workforce management, the implications of remote work are vast and varied, necessitating a strategic approach to harness its benefits while mitigating potential drawbacks.

The development of policy and regulatory frameworks that support sustainable telecommuting practices is another significant outcome of this research. Identifying the benefits and challenges associated with remote work, the study aids in the formulation of policies that promote flexibility,

environmental responsibility, economic growth, and social equity.

Lastly, the research underscores the necessity for innovation in urban planning and design to reflect the rise of remote work. It encourages the exploration of new living space models, transportation networks, and public services that are attuned to the changing dynamics of work, thereby fostering urban environments that are resilient, sustainable, and conducive to the well-being of their inhabitants.

In essence, the study on "Remote Work Dynamics and its Influence on U.S. Urbanization Patterns" is a comprehensive exploration of how remote work is reshaping American cities and suburbs. Its findings are instrumental for a wide array of stakeholders, offering a roadmap for navigating the complexities presented by the shift towards more flexible work arrangements and laying the groundwork for a future where urban and suburban environments thrive in harmony with the evolving nature of work.

2. Methodology

The methodology for the study on "Remote Work Dynamics and its Influence on U.S. Urbanization Patterns" employs a systematic literature review combined with content analysis to explore the multifaceted impacts of telecommuting on urban and suburban development. This approach ensures a comprehensive and structured examination of existing research, facilitating the identification of key themes, trends, and gaps in the literature.

2.1 Data Sources

The primary data sources for this study include academic journals, conference proceedings, government reports, and reputable industry publications. Key databases such as PubMed, Scopus, Web of Science, and Google Scholar serve as the main repositories for sourcing literature. These databases are chosen for their extensive coverage of interdisciplinary research relevant to urban planning, environmental studies, economics, and remote work dynamics.

2.2 Search Strategy

The search strategy involves the use of specific keywords and phrases related to remote work and urbanization patterns, including "telecommuting," "remote work," "urbanization," "urban development," "suburban growth," and "environmental impact." Boolean operators (AND, OR) are utilized to combine these terms and refine the search. The strategy also includes a temporal filter to focus on studies published after 2010, ensuring the relevance and timeliness of the data in the context of recent advancements in remote work technologies and practices.

2.3 Inclusion and exclusion criteria for relevant literature

The inclusion and exclusion criteria for relevant literature in the study on "Remote Work Dynamics and its Influence on U.S. Urbanization Patterns" are designed to ensure a focused and relevant selection of sources that contribute directly to the understanding of how telecommuting impacts urban and suburban development within the United States. The criteria delineate the boundaries of the literature review, guiding the selection process to include studies that specifically address the intersection of remote work practices and urbanization trends. This encompasses research that provides empirical data, case studies, or theoretical analyses pertinent to the U.S.

context, ensuring that the findings are applicable and insightful for the study's objectives. To capture the most relevant and contemporary insights, the review prioritizes articles published in peer-reviewed journals or by reputable organizations, reflecting a commitment to academic rigor and credibility.

Conversely, the exclusion criteria serve to filter out literature that does not directly contribute to the core themes of the study. This includes studies that, while perhaps tangentially related to remote work or urbanization, do not explore the specific dynamics of how telecommuting influences urban and suburban growth patterns. Literature focusing exclusively on contexts outside the United States is also excluded unless it offers insights or findings that are demonstrably applicable to the U.S. scenario. Additionally, to maintain a high standard of evidence and argumentation, opinion pieces, editorials, and non-peer-reviewed articles are omitted from the review process. This careful delineation of inclusion and exclusion criteria ensures that the literature review is both comprehensive and sharply focused on the study's aim, providing a robust foundation for analyzing the impact of remote work on urbanization patterns.

2.4 Selection Criteria

The selection process involves a two-stage screening. Initially, titles and abstracts are reviewed to assess their relevance based on the inclusion and exclusion criteria. Subsequently, full texts of potentially relevant articles are examined in detail. The selection criteria further emphasize the methodological rigor, the relevance of findings to the study's aim, and the contribution of the research to understanding the impact of remote work on urbanization patterns.

2.5 Data Analysis

Data analysis employs content analysis to systematically categorize and interpret the findings from the selected literature. This involves coding the data into thematic categories related to the study's objectives, such as changes in residential preferences, economic impacts, environmental considerations, and policy implications. Qualitative insights, including expert opinions and theoretical discussions, are synthesized to provide a comprehensive understanding of the study's subject matter. The analysis aims to distill key insights, identify consensus and divergences in the literature, and highlight areas for future research.

This methodological framework ensures a thorough and systematic review of the literature on remote work and its influence on U.S. urbanization patterns, providing a solid foundation for the study's findings and recommendations.

3. Literature Review

3.1 Conceptualizing remote work: Definitions and dimensions

The conceptualization of remote work, particularly in the wake of the COVID-19 pandemic, has become a critical area of study as organizations and employees worldwide adapt to new modes of working. This section delves into the definitions and dimensions of remote work, drawing on recent scholarly contributions to clarify the concept and its implications for the future of work.

Remote work, often used interchangeably with terms such as telework, distributed work, and virtual work, encompasses a range of practices that allow employees to complete their

work tasks outside of traditional office environments. Henry, le Roux, and Parry (2021) ^[13] address the conceptual ambiguity surrounding remote work by proposing an integrated framework that distinguishes between virtuality and distributedness as two key dimensions. Their framework elucidates how these dimensions interact to define specific work settings, offering a nuanced understanding of remote work practices. According to their analysis, factors such as the interdependence of tasks, the nature of work, the technological environment, and temporal distance play pivotal roles in shaping organizational policies towards remote work. This conceptual clarity aids both managers in formulating distributed work policies and researchers in investigating the phenomenon more precisely.

Sakurai (2021) ^[27] explores the impact of remote work on occupational safety and health, acknowledging the challenges and opportunities presented by the transition to new working models. The paper emphasizes the need for research and practice in occupational safety to adapt to the realities of remote work, including the implementation of preventive measures to protect workers' health in a distributed work environment. Sakurai (2021) ^[27] work underscores the significance of telework as a subject of research, particularly in light of the ongoing global pandemic and the anticipated recurrence of similar public health crises. In synthesizing these perspectives, it becomes evident that remote work encompasses a complex array of practices influenced by technological, legal, and health-related considerations. The definitions and dimensions of remote work articulated by the authors provide a foundation for understanding the multifaceted nature of telecommuting. As organizations continue to navigate the post-pandemic landscape, the insights offered by these scholars will be instrumental in shaping the future of work. The evolving conceptualization of remote work not only reflects changes in the technological and regulatory environment but also signals a broader shift towards more flexible, distributed forms of employment that prioritize the well-being and safety of the workforce.

3.2 Variations in remote work practices: From fully remote to hybrid models

The evolution of remote work practices, particularly the shift from fully remote to hybrid models, has been a significant development in the contemporary work landscape. This transition, accelerated by the COVID-19 pandemic, has introduced a new paradigm in how organizations and employees navigate the balance between office-based and remote work. This section explores the variations in remote work practices, drawing insights from recent studies to understand the implications of these changes on job conditions, employee attitudes, and organizational strategies. Fan and Moen (2023) provide a comprehensive analysis of the disparities in job conditions associated with remote, hybrid, and traditional working arrangements. Their study, based on a nationally representative survey, reveals that ongoing remote and transition to hybrid work models lead to significant reductions in psychological job demands, particularly among older employees. However, the return to office work poses challenges for Black and Hispanic women, who experience a decrease in decision latitude and schedule control. This research underscores the nuanced effects of remote and hybrid work on different demographic groups, highlighting the need for organizations to consider these

disparities in their work policies.

Balabanova and Molchanova (2022) focus on the IT sector, examining employee workloads and socio-psychological well-being under remote and hybrid employment conditions. Their findings indicate that while the hybrid model increases workloads compared to fully remote work, it paradoxically remains the preferred option among employees. This preference is attributed to organizational and managerial factors that shape employee attitudes towards remote work. The study suggests that the character of work tasks and the employee's position within the organizational communication network are critical determinants of their response to remote work. Furthermore, the quality of organizational communications is identified as a key factor in both social well-being and performance assessment in remote working environments.

Kemell and Saarikallio (2023) explore hybrid work practices and strategies in software engineering, offering insights into the experiences of software developers. Their research highlights the factors influencing work mode choices and the complementary roles of remote and on-site work in software engineering. The study identifies challenges associated with hybrid work, such as social isolation in fully remote settings and the perception of on-site days as unrewarding when offices are largely empty. These findings emphasize the importance of addressing the unique challenges of hybrid work to optimize the benefits of both remote and on-site work modes.

In synthesizing these perspectives, it becomes evident that the shift towards hybrid work models presents both opportunities and challenges. The studies by these authors collectively highlight the complex dynamics of remote and hybrid work practices. Organizations must navigate these dynamics carefully, considering the diverse impacts on employee well-being, job conditions, and organizational performance. As the future of work continues to evolve, understanding the variations in remote work practices from fully remote to hybrid models will be crucial for developing effective work policies that accommodate the needs of a diverse workforce.

3.3 Milestones in telecommuting and their impact on work cultures

The evolution of telecommuting has marked significant milestones in the transformation of work cultures, reshaping the dynamics of organizational effectiveness, employee productivity, and the very essence of workplace environments. Agba *et al.* (2022) ^[2] provide a multi-perspective analysis on the revolution of telecommuting and remote work, questioning the effectiveness and productivity of working from home. Their research presents a brief history of teleworking, exploring various remote working platforms and the performance of teleworkers. The study highlights the factors affecting the performance of remote workers and concludes with recommendations for optimizing remote work practices. This analysis underscores the transition from traditional office settings to remote work environments, emphasizing the need for organizations to adapt to these changes to maintain and enhance worker productivity and effectiveness.

Khan and Lopez (2023) ^[16] investigate the impact of hybrid work culture on organizational effectiveness, focusing on the IT sector. Their cross-sectional survey of top-level managers reveals that remote workers are perceived to be more productive than their on-site counterparts. Additionally, the

study finds a positive association between employee engagement and both remote and hybrid work arrangements, suggesting that these flexible work models contribute beneficially to employee engagement. This research highlights the growing popularity of remote and hybrid work models and their potential advantages for organizational growth and development, signaling a shift in organizational culture towards more flexible and motivated workforces.

Barjaktarović (2023) ^[6] explores the transformation of organizational culture in a digital and hybrid work environment. The paper discusses the key elements of digital organizational culture and the characteristics of the digital workplace, including the impact of new forms of work such as hybrid work, telecommuting, and remote work. The study emphasizes the necessity for traditional organizational cultures, conceived in the analogue age, to evolve and adapt to the needs of the modern digital and hybrid work environment. This transformation is crucial for fostering a collaborative work environment, creativity, and innovation, leading to permanent business improvement through a unique digital strategy.

The insights from Agba *et al.* (2022) ^[2], Khan and Lopez (2023) ^[16], and Barjaktarović (2023) ^[6] collectively illustrate the significant milestones in the evolution of telecommuting and their impact on work cultures. The shift towards remote and hybrid work models has not only redefined workplace dynamics but also prompted organizations to reconsider their cultural practices to accommodate the changing nature of work. As telecommuting continues to shape the future of work, understanding its influence on organizational culture and employee productivity remains essential for navigating the challenges and opportunities presented by this evolving work paradigm.

3.4 Innovations facilitating remote work: Technological advances and policy shifts

The landscape of remote work has been significantly reshaped by innovations in technology and shifts in policy, marking a pivotal transition in the way work is conducted across the globe. This evolution, accelerated by the COVID-19 pandemic, has not only facilitated the widespread adoption of telecommuting but has also raised important questions about the future of work, employee well-being, and organizational culture.

Semenova, Ozdamirova, and Zyryanova (2023) ^[30] delve into the transformative impact of automation, artificial intelligence (AI), and information technology (IT) on the future of work. Their analysis highlights the dual nature of technological advancements: while they offer significant benefits by enabling remote working and fostering collaboration, they also pose challenges, including the potential displacement of jobs and the need for reskilling. The authors emphasize the critical role of IT in supporting remote work, underscoring the importance of ethical considerations and the need for strategies to ensure an inclusive and sustainable future of work. This research underscores the necessity for businesses, policymakers, and individuals to adapt to a rapidly changing landscape, where technology plays a central role in defining work practices.

Johnson (2020) ^[14] provides a broader perspective on "The Future of Work," examining the converging forces of technological advances, demographic shifts, and globalization. The study discusses how the COVID-19 pandemic has accelerated trends such as remote work and

expanded the role of employers as a social safety net. Johnson's analysis suggests that the pandemic has not only fast-tracked the adoption of remote work but has also highlighted the potential for creating value and meaning for all stakeholders through the co-creation of a preferred future. This research points to the need for job redesign and shifts in business operations to accommodate the changing nature of work, driven by digitalization and the Fourth Industrial Revolution.

Johnson *et al.* (2020) ^[15] further explore the implications of these changes for well-being in the workplace. Their work, "Knowing Well, Being Well," emphasizes the importance of understanding the impact of work on well-being, particularly in the context of remote and hybrid work models. The authors argue that the digitalization of work and the adoption of flexible work arrangements can contribute positively to employee well-being, provided that organizations are mindful of the challenges and opportunities presented by these new work models. This study highlights the importance of fostering a supportive organizational culture that values well-being and adaptability in the face of technological and policy shifts.

In synthesizing the insights from Semenova, Ozdamirova, and Zyryanova (2023) ^[30], Johnson (2020) ^[14], and Johnson *et al.* (2020) ^[15], it becomes evident that the innovations facilitating remote work are reshaping the future of employment. Technological advances in AI, automation, and IT have enabled the widespread adoption of telecommuting, offering new opportunities for collaboration and productivity. However, these changes also necessitate a reevaluation of work practices, organizational cultures, and policies to ensure that the transition to remote work is beneficial for all stakeholders. As the landscape of work continues to evolve, the interplay between technology, policy, and human factors will be crucial in shaping a future that maximizes the potential of remote work while addressing its challenges.

3.5 Future trajectories in remote work adoption

The trajectory of remote work adoption is being significantly shaped by technological innovations and policy regulatory changes, heralding a new era in the organization of work. This evolution, accelerated by the global pandemic, has prompted a reevaluation of traditional work models and the exploration of future possibilities.

Eckhardt and Zimmerling (2023) ^[10] explore the concept of digital futures in the making, focusing on the theoretical and ethnographic understanding of digital processes that influence work and its future. Their research highlights the role of technological design, imagination, and the future of work, particularly in the context of service platforms and the health industry. The study underscores the importance of moral experience and materiality in innovation contexts, revealing how sociotechnical change through innovation impacts people's meaning and purpose in their work. This analysis provides insights into the evolving digital landscape of work, emphasizing the need for organizations to navigate these changes thoughtfully to maintain a sense of purpose and engagement among employees.

Kvasha (2022) ^[17] discusses the significance of foresight research as a strategic planning component, particularly in the context of science, technology, and innovation (STI). The paper outlines the structure of STI roadmaps and the role of foresight research in developing a vision for the future of

work. By identifying long-term prospects for science, technology, innovation, and investment in STI, foresight research offers a framework for decision-making and policy development. This approach enables organizations and policymakers to anticipate changes in the labor market, including the emergence of new roles and the need for reskilling, thereby facilitating a more proactive and strategic response to the evolving work environment.

Mussinelli (2021) ^[21] reflects on the multifactorial crisis induced by the pandemic and its implications for the future of work, particularly in terms of remote working and education. The editorial discusses how the crisis has accelerated existing dynamics, leading to significant transformations in work practices and the built environment. Mussinelli (2021) ^[21] sees opportunities in these changes, including the potential for more sustainable, intelligent, and ethical cities and territories, as well as the role of architects in designing them. This perspective highlights the broader societal and environmental implications of the shift towards remote work, suggesting that the current crisis could serve as a catalyst for more profound changes in how work is organized and performed.

In synthesizing the insights from these studies, it becomes evident that the future trajectories of remote work are being shaped by a complex interplay of technological innovations, policy regulatory changes, and broader societal shifts. As organizations and policymakers navigate this landscape, the focus will increasingly be on creating work environments that are not only technologically advanced and policy-compliant but also meaningful and sustainable. The evolution of remote work practices presents both challenges and opportunities, requiring a thoughtful approach to ensure that the future of work is inclusive, adaptable, and responsive to the needs of a diverse workforce.

3.5.1 Technological innovations and their potential

The future of remote work is being shaped by a series of technological innovations that promise to redefine the boundaries of telecommuting, enhancing its feasibility, productivity, and overall appeal. Makori and Mauti (2023) ^[19] delve into the evolving landscape of telecommuting practices and trends in the digital transformation era. Their research highlights the critical role of trending digital innovations such as the Internet of Things (IoT), enterprise mobility, cloud solutions, and blockchain in advancing telecommuting. These technologies not only facilitate seamless remote work but also open and expand economies and business opportunities globally. The study emphasizes the importance of robust technological infrastructure, effective management, communication, and cultural trust as top strategies for sustaining telecommuting programs. In the post-COVID-19 world, where telecommuting has become fundamental and mandatory, the insights provided by Makori and Mauti (2023) ^[19] underscore the significant gains to be had by leaders, organizations, professionals, and communities from embracing these practices.

McVeigh-Schultz and Isbister (2021) ^[20] explore the future of remote work through the lens of virtual reality (VR) meetings, proposing a "beyond being there" approach. Their research envisions a future where VR technology not only replicates but enhances the experience of in-person meetings, addressing challenges such as social presence and engagement. By leveraging the immersive and interactive capabilities of VR, remote meetings could surpass traditional

face-to-face interactions in certain aspects, offering new possibilities for collaboration and communication. This study points to the potential of VR and other immersive technologies to significantly impact the future of remote work, making it more engaging and effective.

In synthesizing the insights from these authors, it becomes evident that technological innovations hold immense potential in shaping the future of remote work. From digital platforms that facilitate telecommuting to immersive technologies that enhance remote interactions, the trajectory of remote work is poised for significant transformation. As organizations and workers navigate this evolving landscape, the adoption and integration of these innovations will be crucial in realizing the full potential of telecommuting. The future of remote work, therefore, lies not just in the technology itself but in our ability to harness it effectively, overcoming organizational barriers and fostering a culture of innovation and adaptability.

3.5.2 Policy and regulatory changes shaping telecommuting

The COVID-19 pandemic has acted as a catalyst for profound changes in the global workforce, accelerating the adoption of telecommuting and necessitating a reevaluation of policy and regulatory frameworks to adapt to this new reality. Poór *et al.* (2023) investigate the impact of the COVID-19 pandemic on workload and the adoption of home office practices in several European countries. Their study highlights the immediate measures taken by governments to address the challenges posed by the pandemic, including protecting jobs and providing financial support to businesses and households experiencing sharp drops in income. The research underscores the significant increase in telecommuting as an innovation attributed to the pandemic's impact, which has become an accepted form of work in sectors previously resistant to its adoption. This study points to the necessity for HR policy adjustments to accommodate the increased frequency of remote work, suggesting that policy and regulatory frameworks need to evolve to support this shift towards more flexible work arrangements.

Babacan (2022) ^[5] delves into the regional and rural workforce transitions for post-COVID-19 resilience, emphasizing the amplified impacts of the pandemic on social and economic vulnerabilities, labor market structures, and pre-existing inequities. The paper calls for a more in-depth understanding of the fragmentation impacts of work, changing employer arrangements, and workers' conditions across different locales. Babacan (2022) ^[5] analysis suggests that addressing future policy and regulatory challenges for the future of work requires a comprehensive approach that considers the diverse strengths and needs of regional and rural economies. This perspective highlights the role of policy in facilitating workforce transitions and building resilience in the face of global crises.

Tanatova *et al.* (2021) ^[32] provide a sociological assessment of the implications of the first wave of COVID-19 for small businesses, focusing on the transition to remote work and its challenges. The study reveals how small businesses have been forced to adapt to the pandemic by changing their usual work formats, transforming traditional business processes, and switching to remote customer service. The findings indicate that despite current problems, there is a restrained degree of optimism among small business leaders about the future. The crisis has highlighted the weakest points in their

businesses, prompting a reevaluation of inefficient business processes and an increased reliance on telecommuting. This research underscores the importance of policy and regulatory support in enabling small businesses to navigate the transition to remote work effectively.

In synthesizing the insights from the studies, it becomes evident that policy and regulatory changes are crucial in shaping the future of telecommuting. As the pandemic accelerates the shift towards remote work, governments and organizations must adapt their policies and regulations to support this transition, ensuring that the workforce is resilient, flexible, and prepared for the challenges and opportunities of the post-COVID-19 world. The evolution of telecommuting practices necessitates a collaborative effort among policymakers, businesses, and workers to create an enabling environment that fosters innovation, equity, and sustainability in the future of work.

4. Discussion of Findings

4.1 The influence of remote work on urbanization patterns

The influence of remote work on urbanization patterns is a multifaceted phenomenon that has been accelerated by the COVID-19 pandemic, reshaping residential preferences and real estate dynamics across urban and suburban landscapes. Chekmarev *et al.* (2021) ^[9] explore the stimulus provided by the COVID-19 pandemic for the sustainable development of rural areas and labor markets. Their research highlights the pandemic's role in exacerbating the challenges of maintaining urban sustainability while offering a fresh perspective on the feasibility of developing rural areas. The study suggests that the pandemic has prompted authorities, businesses, and the population to recognize the benefits of rural development, including the potential for telecommuting to facilitate this process. The findings indicate that to sustain positive trends, significant investments in the infrastructure of rural areas are necessary, alongside legislative efforts to support the rights and obligations of freelancers. This research underscores the pandemic's impact on shifting residential preferences towards rural and suburban areas, driven by the increased feasibility of remote work.

In synthesizing the insights from the study, it becomes evident that the rise of remote work is significantly influencing urbanization patterns. The pandemic has accelerated a reevaluation of living spaces, with a noticeable shift towards suburban and rural areas. This transition is supported by developments in transit-oriented urban planning and the transformation of housing preferences, indicating a broader trend towards more sustainable and livable communities. As remote work continues to shape residential and work practices, the implications for urban and suburban development are profound, necessitating adaptive policy and planning strategies to accommodate these evolving trends.

4.1.1 Economic Impacts: From city centers to suburbs

The economic impacts of telecommuting on city centers and suburbs are profound and multifaceted, reflecting shifts in residential preferences, real estate dynamics, and urban development patterns. The study by Siani and Najafi (2021) ^[31] provides an insightful analysis of the socio-economic effects of metropolitan growth on suburban villages, focusing on the case of Mehrabad village near Tehran. The research highlights how technological advancements and changing work patterns, including telecommuting, have influenced

rural settlements around urban centers. The findings indicate that while there are opportunities for economic development and increased attention to suburban and rural areas, there are also challenges, including shifts in employment and income sources away from traditional agriculture and towards service-oriented sectors. This transition underscores the complex economic impacts of urban expansion and telecommuting on suburban and rural communities, necessitating adaptive strategies to balance growth with sustainability.

Nasreddine (2021) ^[22] addresses the impact of urban sprawl on the identity and economic fabric of suburbs and rural areas. The study examines how the expansion of cities towards their outskirts, driven in part by changing work and living preferences facilitated by telecommuting, leads to increased real estate prices, environmental degradation, and the displacement of original inhabitants. This phenomenon not only alters the physical landscape but also reshapes the economic dynamics of affected areas, highlighting the need for comprehensive planning and sustainable development strategies to mitigate the adverse effects of urban sprawl.

Broitman and Koomen (2020) ^[8] explore the phenomenon of urban densification, particularly in Dutch city centers, challenging the conventional wisdom that urban growth inevitably leads to sprawl. Their research suggests that the attractiveness of urban cores, bolstered by amenities and historical monuments, can lead to a steepening of urban density gradients, contrary to the flattening expected from telecommuting trends. This densification reflects a preference for urban living that coexists with the rise of telecommuting, indicating a nuanced economic impact where both urban cores and suburban areas can thrive under different dynamics.

These studies collectively highlight the diverse economic impacts of telecommuting on urban and suburban development. While telecommuting facilitates a redistribution of population and economic activities towards suburban and rural areas, it also coexists with a renewed interest in urban living, driven by the amenities and lifestyle options that city centers offer. The challenge for policymakers and urban planners is to navigate these trends, ensuring that economic growth and development are sustainable, equitable, and responsive to the changing preferences and needs of the population. As telecommuting continues to shape the future of work, its economic implications for urban and suburban areas will remain a critical area of study and action.

4.1.2 Environmental Considerations: Reduced commuting and carbon footprints

The transition to remote work has ushered in a significant shift in commuting patterns, with profound implications for environmental sustainability. The shift towards remote work has led to a notable decrease in daily commuting, resulting in a significant reduction in carbon emissions. Sánchez-Barroso *et al.* (2021) ^[28] analyze the impact of urban mobility on the carbon footprint in healthcare centers in Extremadura, Spain, revealing that changes in commuting patterns can lead to substantial environmental benefits. The study underscores the importance of rethinking urban mobility to enhance sustainability, suggesting that the adoption of remote work can play a crucial role in reducing greenhouse gas emissions associated with transportation (Sánchez-Barroso, González-Domínguez, & García-Sanz-Calcedo, 2021) ^[28, 28].

The environmental impact of remote work extends beyond commuting patterns. Nidhi (2023) ^[24] discusses the implementation of sustainable practices in clinical research, highlighting the potential for remote work to reduce the carbon footprint of clinical trials. By minimizing the need for physical travel and leveraging digital technologies, clinical research can become more environmentally responsible, contributing to the reduction of greenhouse gas emissions across sectors (Nidhi, 2023) ^[24].

The environmental benefits of remote work are further elucidated by Berkovic, Omerhodžić, and Džananović (2023) ^[7], who propose a methodological framework for comparing the emission footprints of virtual remote work and travel by autonomous electric vehicles to the workplace. Their research suggests that remote work, facilitated by information and communication technologies, offers significant opportunities to reduce emissions in the realm of physical mobility. The study highlights the potential for digital teleworking services to serve as a more environmentally friendly alternative to even the most sustainable forms of physical transportation (Berkovic, Omerhodžić, & Džananović, 2023) ^[7].

The environmental considerations of reduced commuting due to remote work are multifaceted, encompassing not only the direct reduction in carbon emissions from transportation but also the broader implications for sustainable practices across various sectors. As the world continues to grapple with the challenges of climate change, the transition to remote work presents a valuable opportunity to rethink commuting patterns and embrace more sustainable lifestyles. The findings from recent studies underscore the potential for remote work to contribute to environmental sustainability, highlighting the need for continued research and policy development in this area.

4.1.3 Future urban and suburban landscapes: Predictions and possibilities

The evolution of urban and suburban landscapes in the coming decades is poised to reflect significant shifts in land use and land cover (LULC), driven by factors such as technological advancements, population growth, and changing work patterns, including the rise of remote work. Vinayak *et al.* (2021) ^[33] provide a comprehensive study on the future LULC changes in Mumbai, India, utilizing remote sensing data and a multilayer perceptron neural network-based Markov chain model. Their research predicts a substantial increase in urban areas by 2050, with a notable expansion over suburban regions. This study underscores the critical need for sustainable urban planning to accommodate the anticipated growth, highlighting the importance of integrating remote work trends into development strategies to mitigate potential negative impacts on infrastructure and the environment.

Otuoze *et al.* (2020) ^[25] examine the dynamics of urban growth and its impact on transport infrastructure space in Kano, Nigeria. Through the application of cellular automata-Markov (CA-Markov) modeling techniques, their predictive analysis reveals significant expansion of transport and built-up areas, emphasizing the challenges and opportunities presented by rapid urbanization in developing countries. The findings suggest that remote work could play a pivotal role in alleviating pressure on transport infrastructure by reducing the need for daily commuting, thereby contributing to more sustainable urban growth.

Selmy *et al.* (2023) ^[29] focus on the arid region of Sohag Governorate, Egypt, to detect, analyze, and predict LULC changes using Landsat images and GIS techniques. Their study highlights the expansion of built-up areas at the expense of agricultural lands, pointing to ongoing urbanization trends. The research emphasizes the necessity of incorporating remote work considerations into land-use planning to ensure ecological management and sustainable development in response to changing LULC dynamics.

The studies reviewed herein illustrate the complex interplay between urbanization, technological advancements, and remote work trends in shaping future urban and suburban landscapes. As cities and suburbs adapt to these evolving dynamics, the integration of predictive modeling and sustainable planning practices will be crucial in navigating the challenges and leveraging the opportunities presented by the anticipated changes. The role of remote work in influencing these trends underscores the need for flexible, forward-thinking approaches to urban and suburban development in the post-pandemic world.

4.2 Reshaping urban and suburban growth: How telecommuting trends might influence the coming decades

The reshaping of urban and suburban growth under the influence of telecommuting trends presents a complex interplay between technological advancements, societal shifts, and policy adaptations. Fox (2016) ^[11] delves into the potential impact of driverless technology on urban density, drawing parallels with historical shifts in urban development. The advent of self-driving vehicles, expected to be widespread within the next several decades, could significantly reduce congestion, air pollution, and fatalities while freeing up productive time. However, these benefits might also challenge traditional motivations for sprawl reduction by making distant suburban and rural areas more accessible and attractive for living and working. Fox argues that without proactive urban planning that integrates new technologies with sustainable development goals, the potential for increased sprawl and its ecological consequences could undermine efforts to promote density and reduce carbon footprints. This research highlights the need for cities to adapt their planning strategies to accommodate technological changes without compromising on sustainability.

Alonso Ferreira (2021) ^[3] examines the urban policy changes in São Paulo, focusing on the politics of incremental progressivism. The study provides insights into how governments and governance structures respond to urban challenges, including those posed by shifting work patterns. The gentrification process, initially intended to revive neighborhoods, has often led to the displacement of existing residents, altering the urban space and cityscape. This transformation has profound implications for income inequality, suburbanization, racial and ethnic segregation, and social stratification. Alonso Ferreira's analysis suggests that telecommuting trends, by potentially reducing the need for centralized office spaces, could further influence these urban dynamics, necessitating thoughtful policy responses to ensure equitable and sustainable urban development.

Danial (2019) explores the recent and future trends of population growth, internal migration, and urbanization in Malaysia, providing a framework to understand similar processes in other developing countries. The study highlights

the transition from rural-urban to urban-urban migration, driven by economic opportunities and enhanced connectivity. As telecommuting becomes more prevalent, such trends could accelerate, leading to a reevaluation of urban planning and development strategies. Danial's research underscores the importance of considering differential urbanization theory in planning for future urban and suburban growth, suggesting that telecommuting could play a significant role in shaping the spatial distribution of populations and economic activities.

In synthesizing the insights from Fox (2016) ^[11], Alonso Ferreira (2021) ^[3], and Danial (2019), it becomes evident that telecommuting trends have the potential to significantly reshape urban and suburban growth patterns. The integration of new technologies, such as driverless vehicles, with urban planning and policy-making, will be crucial in navigating these changes. As cities and suburbs adapt to the evolving landscape of work and living, the challenge will be to leverage these trends to promote sustainable, equitable, and livable communities. The coming decades will likely witness a continued transformation of urban and suburban areas, influenced by telecommuting trends, technological innovations, and policy adaptations, underscoring the need for proactive and inclusive urban planning strategies.

5. Conclusions

The study has provided comprehensive insights into the evolving landscape of work and its implications for urban and suburban development. Through a detailed examination of current trends, predictive analyses, and strategic considerations, this research offers a nuanced understanding of the interplay between remote work and urbanization, setting the stage for informed decision-making and future investigations.

The transition towards remote work, accelerated by the COVID-19 pandemic, has emerged as a significant driver of change in urban and suburban landscapes. Key insights from the study reveal a shift in residential preferences towards suburban and rural areas, driven by the desire for more spacious living environments conducive to telecommuting. This shift is accompanied by a reevaluation of urban spaces, with decreased demand for traditional office buildings and increased interest in flexible, mixed-use developments that cater to a more mobile workforce. Environmental considerations have also come to the forefront, with the reduction in daily commuting offering potential benefits in terms of lower carbon emissions and improved air quality.

Looking ahead, the long-term impact of telecommuting on urban and suburban areas is expected to be profound. The study projects continued growth in remote work, leading to further decentralization of the workforce and diversification of residential and commercial real estate markets. Urban centers may see a transformation into more livable, green spaces with a focus on community and connectivity, while suburban areas are likely to experience growth in local economies and infrastructure development tailored to the needs of remote workers. These changes underscore the need for adaptive urban planning and policy frameworks that can accommodate the evolving demands of a digitally connected society.

To navigate the challenges and opportunities presented by the rise of remote work, the study offers several strategic recommendations. Policymakers are encouraged to invest in digital infrastructure and public services that support

telecommuting, while also implementing zoning and land-use policies that promote sustainable development and community well-being. Businesses should embrace flexible work arrangements and invest in technology that facilitates collaboration and productivity outside traditional office settings. Urban developers are advised to focus on creating mixed-use, adaptable spaces that can serve the varied needs of a remote workforce, including residential, commercial, and recreational uses.

The study identifies several areas for further research, highlighting the need for ongoing investigation into the implications of remote work for society, the economy, and the environment. Future research should explore the long-term effects of telecommuting on workforce diversity and inclusion, the impact of remote work on public transportation systems, and the potential for telecommuting to contribute to climate change mitigation efforts. Additionally, studies examining the psychological and social aspects of remote work, including its effects on work-life balance and community engagement, would provide valuable insights into how to maximize the benefits of this evolving work model.

Lastly, the study underscores the transformative potential of remote work to reshape urban and suburban landscapes, offering a roadmap for navigating this transition towards more flexible, sustainable, and inclusive ways of living and working. By embracing strategic planning and policy-making, society can harness the benefits of telecommuting while addressing its challenges, paving the way for a future that accommodates the diverse needs and aspirations of all citizens.

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