Final Report: Transportation Equity

Hui Wai Renata Lee (Group 1)

Northeastern University

ALY6980.70713: Capstone

Professor Hema Seshadri

3 December 2024

Introduction

Integrated Travel Office (ITRD) is a non-profit organization commenced operations in January 2024, which researches the viability of reintroducing passenger rail and inter-community busing along the Canamex corridor. Their goal is to signal to investors and the government that offering daily connecting communities services within each state and province will make a connecting neighbors long-distance corridor achievable. ITRD Research Team at the University of Toronto shared their project proposal, which outlines the objective of enhancing public transportation access for Alberta's rural and Indigenous communities. They will leverage Geographical Information Systems (GIS) spatial analysis methods to model and propose new transit routes based on identified underserved areas. This involves using network analysis, population density mapping, and route optimization algorithms to design efficient and accessible transit solutions. Given the team's strong expertise in GIS, which effectively covers key analytics components, I am focusing on literature reviews aimed at promoting transportation equity in rural areas to address the deliverables in Canvas.

Identifying economic development opportunities and gaps in rural community infrastructure

Li et al. (2019) explores the use of big data and social media to enhance public participation in traffic planning and management. The authors focus on leveraging text analysis of social media data to gather public opinions on transportation systems. They employ web crawler technology to collect traffic-related text from social platforms, followed by sentiment analysis and topic modeling using the Latent Dirichlet Allocation (LDA) model. The study uses the Nanjing Metro system as a case study, demonstrating the feasibility of this approach. The authors outline a process that includes data collection, preprocessing, classification, and modeling. They highlight the importance of public participation in transportation planning, noting that traditional methods often fall short in capturing the full spectrum of public opinion. By analyzing social media data, the study aims to provide a more

comprehensive understanding of public sentiment and identify key issues and areas for improvement. The results show that public opinions can be effectively mined to reveal temporal and spatial characteristics of transportation issues. Positive comments often focus on the convenience and quality of the metro system, while negative comments highlight operational failures and service disruptions. The study concludes with recommendations for improving metro operations, station safety, auxiliary facilities, and emergency handling based on the insights gained from social media data.

McKitrick et al. (2023) provides a comprehensive review of methods used in GIS to collect, analyze, and visualize location-based social media data (LBSMD). The authors highlight the potential of LBSMD due to its low cost, high availability, and extensive geographic coverage. The review is based on 222 articles and is structured around a typical GIS workflow: data collection, spatial analysis, and visualization. Regarding data collection, McKitrick et al. (2023) discusses the primary sources of LBSMD, such as Twitter, Flickr, and other social media platforms. It emphasizes the use of APIs for data collection, which allows for efficient and large-scale data gathering. The authors also address the challenges of data collection, including privacy concerns and the need for robust data filtering techniques. The review categorizes spatial analysis methods into spatio-temporal analysis, content analysis, and social network analysis. Spatio-temporal analysis involves examining the time and location of posts to detect patterns and events. Content analysis focuses on the textual or visual content of posts to derive additional insights. Social network analysis explores the interactions between users and the spread of information. McKitrick et al. (2023) highlights various visualization techniques, including point mapping, raster surfaces, thematic maps, and transmission diagrams. These methods help in effectively communicating the spatial patterns and trends identified through analysis. The authors conclude by discussing the limitations of LBSMD, such as data quality issues and the need for advanced computational resources. They also provide recommendations for future research, including the

integration of machine learning techniques and the development of more sophisticated data visualization tools.

Rural and Indigenous communities often have unique cultural and natural attractions that can be leveraged for tourism development. Leveraging LBSMD can identify popular tourist destinations and travel patterns in rural areas. Geospatial data on public spaces can support tourism initiatives, which can be tailored based on activity patterns detected through GIS and social media data. By analyzing geotagged social media posts, ITRD can pinpoint locations that attract visitors and assess the infrastructure supporting tourism. Enhancing transportation to these areas can boost local economies by increasing tourist access and spending. Improved transit routes can facilitate easier travel to and from tourist sites, encouraging longer stays and repeat visits. Leveraging GIS-LBSMD integration provides strategic insights for local business planning by analyzing foot traffic and regional mobility trends. For example, understanding which locations within rural Alberta experience the highest activity could support business location decisions, potentially increasing local job opportunities. Social media data can also reveal the presence and popularity of local businesses in rural communities. By mapping these businesses and analyzing customer reviews and check-ins, ITRD can identify areas with high economic activity and potential for growth. Enhancing transportation access to these business hubs can increase customer footfall and support local entrepreneurs. These are very important opportunities identified to proceed the next step to community leaders for future planning decisions and local economic development initiatives.

The challenges in accessing precise spatial data due to privacy constraints significantly hinder efforts to address public transit needs in rural zones. Accurate data is essential for making informed, location-based recommendations for transit routes and other infrastructure. However, the limited availability of precise, geotagged data due to user privacy settings impacts the data's quality and relevance. Social media data offers a potential solution by capturing high-volume, user-generated

location-based information. Yet, inconsistencies in social media usage across rural areas lead to data gaps, as some populations are underrepresented online. This uneven distribution affects the accuracy and inclusivity of spatial analyses based solely on social media sources. A diversified data collection approach can mitigate these issues by integrating social media data with other GIS sources. Studies suggest using APIs to gather broad social media datasets, which can be narrowed by combining them with location data from platforms like Twitter or Flickr. Complementary data sources enhance representativeness and help form a more reliable basis for identifying true service needs, supporting data-driven decisions to address transportation inequities.

Leveraging data to predict impacts to share with community leaders for future planning decisions

Over the past two decades, China has experienced rapid growth in rural revitalization. Since the 1978 market-oriented reforms, China's economy has expanded swiftly, improving productivity and creating wealth, which has enabled significant investments in rural areas. The government has prioritized agricultural productivity, infrastructure development, and resource accessibility in rural regions. In 2017, China formally launched its Rural Revitalization Strategy to reduce the urban-rural divide and improve living standards in rural areas. This strategy includes efforts to boost rural economies, enhance healthcare, build infrastructure, and support ecological protection.

This focus on China forms the basis of my research. Xu et al. (2021) explores China’s shift from urban-centric development to a focus on rural revitalization. The authors discuss the "Strategic Plan of Rural Development" (2018-2022) as a significant pivot in policy aimed at achieving "Ecological Civilization" by 2050. This policy seeks to unify rural and urban standards of living while respecting rural lifestyles, aiming to prevent rural communities from collapsing under urban migration pressures. The authors identify five key socio-political drivers behind this strategy: ensuring food security, promoting culture and heritage, addressing overcapacity, emphasizing environmental protection, and eradicating

poverty. They argue that these drivers are crucial for China's long-term stability and global leadership aspirations. Xu et al. (2021) also outlines three main dilemmas in implementing the rural development plan: balancing central supervision with decentralized policy implementation, efficiently deploying limited resources, and managing competing narratives within policies. The authors suggest that involving rural community voices, adopting multiple forms of governance, and identifying and mitigating negative project impacts are essential steps to address these dilemmas. Xu et al. (2021) concludes by emphasizing the need for detailed implementation plans that consider the complexities and trade-offs in rural and urban governance, conservation and development, and monitoring and autonomy. The authors argue that China's rural development strategy could serve as a model for other countries facing similar challenges.

Wang et al. (2016) explores the impact of transportation infrastructure investment on rural development in China. Using an autoregressive distributed lag (ARDL) model, the study quantifies the short- and long-term impacts of transportation infrastructure on rural development. The data, sourced from the World Development Indicators and China Bureau of Statistics, covers the period from 1980 to 2013. Findings indicate a positive correlation: a 1% increase in road infrastructure leads to an approximate 0.05% short-term increase in cereal yield and a 0.19% increase in the long run. For rural household income, a 1% increase in road infrastructure results in a 0.14% short-term income boost, though long-term effects are less statistically significant. Due to infrastructure's mixed public-good nature, Wang et al. (2016) suggests that it should be funded primarily by the government, complemented by private investment when feasible. Methods such as Build-Operate-Transfer (BOT) and Public-Private Partnerships (PPP) are suggested to attract private capital, particularly in cases of funding shortages. These models allow private entities to invest in, manage, and operate infrastructure projects under agreements that transfer ownership back to the government upon contract expiration. Wang et al. (2016) demonstrates that transportation infrastructure investments can significantly aid rural

development in China, helping to address rural-urban economic disparities. The findings and policy suggestions are positioned as relevant not only for China but potentially applicable to other developing regions seeking balanced growth through infrastructure.

The absence of rural revitalization can lead to various adverse impacts on rural and indigenous communities. Without targeted efforts to address these issues, rural areas may continue to suffer from neglect and decline. Through the implementation of the ITRD project, these negative impacts on rural and Indigenous communities can be mitigated. With a focus on environmental and cultural safeguards, the ITRD project holds the potential to establish a more inclusive and balanced approach to rural development. The shift from rural livelihoods to urban-centered development exacerbates economic disparities, with rural populations often earning significantly less than their urban counterparts. This divide leads to migration, leaving behind "empty-nest" communities, elderly populations, and deteriorated local economies. Inadequate roads prevent efficient transportation of goods, raising operational costs for farmers and businesses. As rural regions become isolated, the cost of essential goods rises, reducing disposable income for residents. Transport challenges also limit access to employment opportunities, further widening the income gap between rural and urban areas. The strategy to focus on rural development aims to bridge this gap, although it also risks creating dependencies on government support without sustainable economic structures. Rapid urbanization has led to the erosion of traditional rural lifestyles, with communities losing unique cultural practices tied to the land. Development policies that do not incorporate rural culture threaten to homogenize villages or replace heritage with urbanized standards. This undermines cultural diversity and disrupts community cohesion, making it harder for rural people to preserve their identities and values. Additionally, industrialization and infrastructure projects often lead to deforestation, pollution, and loss of biodiversity in rural areas. These conditions can harm the local environment and degrade agricultural land. Many projects aim for quick returns, ignoring long-term environmental consequences. For

example, dam constructions for urban electricity needs have forced rural resettlements, causing ecological harm. Sustainable rural development needs environmental safeguards to prevent these outcomes.

For any project aimed at improving rural infrastructure, recognizing the broader policy implications is crucial to achieving lasting success. By fostering transparency, sustainable funding mechanisms, and environmental safeguards, ITRD project can maximize its positive impact, bridging critical infrastructure gaps while supporting equitable and eco-friendly development. Policy implementation should be participatory, involving rural residents in decision-making. Local voices provide valuable insights that can help align infrastructure projects, such as transportation, with actual community needs, reducing the risk of policy failure. Policies should ensure that funding and resources reach areas in genuine need, with transparency in implementation. Governments should establish monitoring mechanisms to avoid resource mismanagement and ensure equitable support for infrastructure and transportation in rural regions. Additionally, policymakers should mandate environmental assessments for rural projects to anticipate potential impacts. This would help mitigate ecological damage and promote the sustainable development of rural areas by balancing growth objectives with ecological priorities. Regarding funding, Wang et al. (2016) recommends PPPs as a sustainable method to enhance rural transport infrastructure. Policy makers can facilitate these partnerships by creating clear regulations that secure private investments while ensuring that the government retains operational control. PPPs provide a financial solution to bridge infrastructure gaps, allowing rural projects to benefit from private-sector expertise and efficiency, essential for large-scale developments. Establishing infrastructure banks can address funding limitations by pooling public and private funds dedicated to rural transport projects. Such banks offer low-interest loans or guarantees, facilitating affordable infrastructure investment for underfunded areas. Policy makers can advocate for these banks to target rural-specific projects, ensuring equitable development and long-term financial

sustainability. To overcome infrastructure gaps, the government could offer tax benefits or subsidies to companies that invest in rural transport. Such incentives encourage targeted development where private capital may be hesitant to invest. This approach can attract industries to rural areas, promoting economic growth and enhancing access to essential services like healthcare and education.

Offering support by providing equitable access to transportation-related information

China's approach has highlighted successful models for improving rural infrastructure and access, despite unique challenges. Building on this, I plan to expand my research to examine similar projects in Australia. Australia presents an especially valuable comparison to Canada due to several shared characteristics. Like Canada, Australia has sizable Indigenous and rural populations that often lack equitable access to essential digital infrastructure. This gap in access affects transportation planning by limiting the quality of information that communities receive, which in turn can hinder meaningful participation in planning processes. Australia's efforts to improve rural connectivity and involve communities in transportation planning may provide relevant lessons for Alberta's project, particularly in overcoming data access challenges.

Xia et al (2024) explores the impacts of limited public transportation options, sparse populations, and long distances on communities' access to essential services, jobs, and social activities in Australia. Vulnerable groups such as the elderly, disabled, and low-income individuals face heightened transportation disadvantages that exacerbate social isolation, economic hardship, and reduced quality of life. The authors propose that Mobility-as-a-Service (MaaS) solutions, which consolidate various public and private transport services into a unified digital platform, could help overcome these barriers. MaaS enables users to plan, book, and pay for transport services that fit their needs, potentially improving accessibility for those who are transport-disadvantaged. Through community focus groups in New South Wales towns, Xia et al (2024) identifies common transportation barriers including high travel

costs, inadequate frequency and coverage of services, and a lack of reliable transportation information. Specific challenges faced by older adults, such as difficulties in accessing bus stops and the limited availability of accessible vehicles, are also addressed. Xia et al (2024) concludes with policy recommendations to support MaaS implementation in rural areas, focusing on infrastructure improvements, enhanced awareness of transport options, and flexible, inclusive transport solutions. These policies could enable MaaS to address not only logistical barriers but also the broader social needs of rural residents, helping them access essential services and participate more fully in economic and community life.

Spandonide (2017) addresses the unique transportation challenges faced by Aboriginal and Torres Strait Islander communities in remote areas of Australia. The author emphasizes the disproportionate impact on Indigenous Australians, who often face limited access to transportation due to vast distances, poor infrastructure, high costs, and socioeconomic disadvantage. Spandonide (2017) introduces a framework that links transportation access with well-being. In remote contexts, transport is not only about mobility but is essential for accessing health, education, and other services. Additionally, the paper highlights that mobility in these regions is often tied to cultural practices, community connections, and environmental factors, where the act of traveling—often termed “going out bush”—fulfills social, cultural, and spiritual needs. The study also reports that due to high travel costs and poor accessibility, Indigenous people face social isolation and have limited economic opportunities. Key initiatives and recommendations for improving transportation access include community-based car-sharing models, eco-friendly vehicles, road maintenance projects, and improved public transportation services. Infrastructure developments, such as one-lane roads and solar-powered transportation, are also discussed as means to enhance accessibility and sustainability. Spandonide (2017) also advocates for policies that recognize cultural values and support Indigenous mobility needs, suggesting that transportation policy in remote Australia should incorporate Indigenous community needs, including

communication, governance, and sustainable practices. The study emphasizes a need for a culturally adapted transportation framework that integrates sustainable practices to reduce emissions and promote resilience in these communities. The findings indicate that transportation options in remote Australia require a comprehensive approach that addresses economic, social, and environmental sustainability to foster well-being and reduce socio-economic inequities.

Several support mechanisms to assist rural and Indigenous communities, emphasizing the importance of accessible, affordable, and integrated transportation options are outlined. Xia et al. (2024) advocates for Integrated Mobility Services (IMS), particularly Integrated Mobility Services Integrated Mobility Services (MaaS), to improve transportation accessibility for underserved communities. Through a single digital platform, MaaS enables users to access multiple transport modes, such as buses, trains, on-demand services, and taxis. IMS streamlines the planning, booking, and payment processes, making it easier for individuals to access transportation services that meet their specific needs. To address the unique challenges in rural areas, the paper suggests the establishment of community-based transport services tailored to local needs. These programs could include on-demand services, shuttle buses, or volunteer driver programs, which provide flexible and low-cost transport options. Community-based services allow rural residents, particularly the elderly and those with disabilities, to access essential services like healthcare and groceries. The paper identifies cost as a significant barrier for rural residents. To support Indigenous and rural communities, it proposes flexible payment options, such as subscription-based or pay-as-you-go models, along with subsidies or financial support for low-income residents. Flexible options, like community car-sharing programs or bookable car services, provide cost-effective alternatives that increase access without a substantial financial burden. Spandonide (2017) advocates car-sharing initiatives that are practical solutions to the limited vehicle access in remote Indigenous communities. These models leverage community resources by allowing individuals to share vehicles, reducing the cost burden of vehicle ownership. In remote

Australia, car-sharing is essential as most residents cannot afford private vehicles due to high maintenance costs and the rapid wear associated with challenging travel conditions. Lift-sharing further increases vehicle occupancy, reducing travel expenses and minimizing environmental impacts. The development of single-lane roads, solar-powered roads, and community-led maintenance projects is another significant support discussed in the paper. Poor road infrastructure in remote regions exacerbates transportation challenges by increasing travel times and vehicle wear. Improved infrastructure supports more reliable travel, promoting both physical and economic accessibility. The use of local labor in maintenance projects empowers communities, creating economic opportunities and ensuring that the infrastructure meets local needs. The paper advocates for enhanced public transportation services and the provision of discounted ticketing options to improve affordability. Frequent door-to-door services and community-specific public transport routes are proposed to accommodate the unique needs of remote Indigenous communities. Subsidized ticketing systems, such as those directly debited from social assistance programs, make transport more affordable and accessible. Each support mechanism aims to reduce the social and economic isolation experienced by transport-disadvantaged individuals in rural areas. By integrating transportation options, tailoring services to community needs, and enhancing affordability, these supports foster greater inclusion and improve access to essential services for Indigenous and rural communities.

For the ITRD Project, additional considerations from the paper could enhance the effectiveness of support strategies for Indigenous and rural communities. While IMS platforms can increase access, the digital nature of MaaS can be a barrier for some, especially in rural communities with limited internet connectivity or low digital literacy. ITRD should consider both digital and offline options, such as phone-based services or local kiosks, to ensure all community members can access and benefit from integrated mobility services. The papers underscore the importance of involving local communities in the planning and decision-making processes to ensure services are culturally sensitive and effectively

meet residents' needs. This community-centered approach can foster trust and encourage the use of IMS in Indigenous areas. Environmental sustainability is also a pertinent consideration for Alberta's ITRD Project. The adoption of eco-friendly transportation, such as hybrid or electric vehicles, could address environmental impact concerns and align with Indigenous communities' focus on environmental stewardship. Sustainable practices, like developing solar-powered charging stations or incentivizing active transport modes for short-distance travel, can reduce emissions and promote a healthier environment. By integrating these considerations, the ITRD Project can create a transportation system that is not only accessible and affordable but also respectful of Indigenous values and environmentally sustainable.

Key success & failure factors of global initiatives promoting transportation equity in rural areas

Kaiser et al. (2022) reviews the impacts, implications, and interventions of rural transportation infrastructure primarily in low- and middle-income countries (LMICs). It highlights rural transport's critical role in sustainable development, connecting various aspects of socioeconomic growth like economic development, agriculture, healthcare, education, and environmental protection. Rural transport infrastructure is associated with multiple Sustainable Development Goals (SDGs), with rural roads and bridges enhancing market access, increasing agricultural productivity, supporting non-agricultural income opportunities, and improving access to health and education. Despite its potential, investment often skews toward urban projects due to the economic growth focus.

Kaiser et al. (2022) discusses strategies for rural transport development, such as constructing and maintaining roads, implementing intermediate modes of transport (IMTs), and employing technology innovations. Effective governance, which includes localizing policies, planning, and integrating rural transport with other development sectors, is crucial. Kaiser et al. (2022) also emphasizes barriers to equitable rural transport benefits, notably for the rural poor, who often lack

resources to capitalize on improved infrastructure. The importance of pro-poor strategies and inclusive governance structures is noted, alongside calls for improved data collection and infrastructure maintenance.

Projects in the paper of Kaiser et al. (2022) reflect similar goals to ITRD Project, including improving accessibility for underserved areas, integrating sustainable transit options, and targeting equity. The emphasis on the interconnectedness of rural transportation with various sectors provides valuable insights for ITRD Project. The emphasis on linking transport to socioeconomic outcomes is relevant, especially in tailoring infrastructure to reduce rural isolation and support Indigenous communities in Alberta. Governance practices promoting localized policy adaptations also align with ITRD project's objectives to engage local stakeholders effectively.

Kaiser et al. (2022) prioritizes market access, healthcare, gender inclusivity, cost management, and educational support tend to experience greater success in LMICs. By focusing on these areas, rural transportation infrastructure becomes an essential driver of sustainable development and social equality.

1. **Improved Market Access and Economic Growth.** A significant success factor for rural transportation infrastructure projects in LMICs is their ability to boost economic growth by enhancing access to markets. Improved roads and transportation systems allow rural farmers to transport goods efficiently, expanding their market reach and increasing their income.

2. **Enhanced Healthcare Accessibility.** Another critical factor for the success of these projects is the improved access to healthcare. Transportation infrastructure reduces travel time to medical facilities, allowing rural populations, especially women and children, to receive timely medical attention.

3. **Gender-Inclusive Infrastructure Planning.** Integrating gender-sensitive approaches into rural

transport projects has proven successful in increasing women's access to economic and social resources. Gender-focused design considers the unique mobility patterns and safety concerns of women and girls, creating a more inclusive infrastructure.

4. **Reduction in Transportation Costs and Enhanced Productivity.** Successful rural infrastructure projects often focus on lowering transportation costs, which directly benefits local economies by reducing the cost of moving goods and services. Reduced transport costs contribute to lower production expenses for local businesses, fostering economic development.

5. **Support for Educational Access and Attendance.** Access to education is a fundamental success factor for rural transportation projects. By decreasing the distance and time required for students to reach schools, these projects increase enrollment and attendance rates, directly supporting educational outcomes.

The failure of rural transportation projects in low- and middle-income countries hinge on several key factors, both external and internal. The following is a summary of five primary success factors in the paper of Kaiser et al. (2022).

1. **Insufficient Funding and Maintenance.** Insufficient and inconsistent funding is a major failure factor for rural transportation projects. Without adequate financial resources, projects may be delayed, scaled back, or abandoned altogether. This can result in incomplete infrastructure that fails to meet the needs of the community.

2. **Political and Governance Challenges.** Political interference can significantly undermine the effectiveness of rural transportation projects. When project priorities and resource allocations are driven by political motivations rather than actual community needs, the resulting infrastructure may not address the most critical issues.

3. **Inadequate Data.** Effective planning and implementation of rural transportation projects require accurate and comprehensive data. Inadequate data collection and management can lead to poor decision-making and prioritization. Without reliable data on current infrastructure conditions, traffic patterns, and community needs, it is challenging to design projects that effectively address the most pressing issues.

4. **Failure to Address Socioeconomic Disparities.** Another common failure factor is the oversight of socioeconomic inequalities, where projects benefit wealthier households disproportionately. Projects that do not specifically target poor and vulnerable populations may inadvertently widen income gaps and limit equitable access. Failing to implement pro-poor strategies can reduce the effectiveness of infrastructure in uplifting disadvantaged communities.

5. **Neglect of Environmental and Climate Considerations.** Failure to consider environmental impacts and climate resilience in the planning and implementation of rural transportation projects can lead to significant long-term issues. Infrastructure that is not designed to withstand extreme weather conditions and climate change impacts may suffer from frequent damage and require costly repairs.

Conclusion

The ITRD project can leverage insights from these literature reviews to develop a transportation system that effectively meets the needs of Alberta's rural and Indigenous communities. By prioritizing access to essential services such as healthcare, education, and markets, the ITRD project can directly enhance local economic resilience and social welfare while addressing unique regional challenges.

Integrating social media data with GIS workflows presents a promising method for understanding and addressing rural transit needs. Leveraging big data and social media not only enhances public participation but also provides a more comprehensive understanding of transit demands and challenges, particularly in underserved regions. By focusing on location-based data and

employing sentiment and topic modeling, the ITRD project can identify high-need areas, informing policy decisions and resource allocation to optimize rural transit networks.

The project can draw valuable lessons from China's rural development strategies to mitigate potential adverse impacts on Alberta's rural and Indigenous communities. Promoting partnerships, such as public-private collaborations, could secure additional funding for rural transportation while maintaining government oversight to ensure long-term community benefits. Incorporating environmental safeguards and cultural preservation measures will help build trust with community leaders, demonstrating the ITRD project's commitment to sustainable and respectful development.

Drawing from cases in Australia, consolidating multiple transportation modes into a single, user-friendly platform could significantly improve access to essential services, reduce isolation, and promote social inclusion. The ITRD project should prioritize infrastructure improvements, culturally sensitive service design, and flexible payment models. Additionally, ensuring both digital and non-digital access to the platform will help bridge the information and technology gap for rural and Indigenous residents.

Overall, the ITRD project can benefit from these recommendations, adopting user-centered policy frameworks and sustainable transport solutions to foster a more equitable transportation system that addresses the specific needs of Alberta's rural and Indigenous communities.

Reference

Li, D., Zhang, Y., & Li, C. (2019). Mining public opinion on transportation systems based on social media data. *Sustainability*, *11*(15), 4016. https://doi.org/10.3390/su11154016

McKitrick, M. K., Schuurman, N., & Crooks, V. A. (2023). Collecting, analyzing, and visualizing location-based social media data: review of methods in GIS-social media analysis. *GeoJournal*, *88*(1), 1035–1057. https://doi.org/10.1007/s10708-022-10584-w

Xu, H., Pittock, J., & Daniell, K. A. (2021). China: A new trajectory prioritizing rural rather than urban development? *Land*, *10*(5), 514. https://doi.org/10.3390/land10050514

Wang, Z., & Sun, S. (2016). Transportation infrastructure and rural development in China. *China Agricultural Economic Review*, *8*(3), 516–525. https://doi.org/10.1108/caer-09-2015-0115

Haoning Xia, John D Nelsonb, Corinne Mulleyc, David A Hensherd, Chinh Hoe and Camila Balbontinf (2024). Addressing transport disadvantages in regional and rural areas through integrated mobility services. Institute of Transport and Logistics Studies. https://ses.library.usyd.edu.au/bitstream/handle/2123/32362/ITLS_WP_24_08.pdf?sequence=1&isAllowed=y

Bruno Spandonide. (2017). Sustainable Remote Australian Transport for Living on Country and Going Out Bush. International Journal of Rural Law and Policy, Article ID 4941. https://epress.lib.uts.edu.au/journals/index.php/ijrlp/article/view/4941/6081

Kaiser, N., & Barstow, C. K. (2022). Rural Transportation Infrastructure in Low- and Middle-Income Countries: A Review of Impacts, Implications, and Interventions. *Sustainability*, *14*(4), 2149. https://doi.org/10.3390/su14042149