# The Effect of E-Commerce in Reducing Intra-urban Trips and Carbon Monoxide Emission in District 5 of Tehran

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## Extended Abstract

## 1. Introduction

Tehran is one of the first and most important environmental challenges in the country's air quality due to geographical, climatic, and strategic conditions. Therefore, urban planners and policymakers need to take unified and integrated actions to get out of contaminated cities and harmful to citizens' health. Information and communication technology (ICT) and its tools such as E-commerce were introduced as a management solution to reduce intra-urban traffic, reduction in energy consumption, and air pollutants. E-commerce has been defined as doing any commercial affairs such as the purchase, sale of goods or services by tele-communication tools. E-commerce is derived from ICT and generally changes the purchase and distributing pattern. In the past decades, low land rates and widespread migration have increased congestion, increased traffic volume, and consequently increased air pollution and economic costs in District 5 of Tehran. Therefore, the effect of E-shopping on the amount of intra-urban trips and the carbon monoxide emission before and after the E-shopping application was investigated.

## 2. Review of the Literature

In the last two decades, urban planners have shifted to cyberspace to manage travel demand. In cyberspace, the meaning of place is reconstructed. In this space, looking at the city as the space of places changes the space of currents, which on the one hand makes the movement of the population and on the other hand the movement of information possible. In this space, urban planners try to play an important role in managing the travel demand by managing the movement of urban affairs by expressing concepts of electronic services such as E-banking, E-learning, E-health, E-commerce, etc. E-commerce is one of the most important parts in E-services. E-commerce plays a very important role in the economic growth of human societies and generally changes the pattern of buying and distributing goods between sellers and buyers. These services are provided online, and its goal is to provide high speed and performance services without the need for physical presence on site, while reducing economical costs, traffic, and consequently reducing traffic and pollution. The UK Department of Transportation (2003) has identified E-commerce as a soft policy to help the UK's transportation goals and policies to reduce traffic and energy consumption. Siikavirta, Punakivi, Kärkkäinen, and Linnanen (2002) concluded that the low share of this strategy in reducing greenhouse gases is due to share of ten percent of virtual stores in marketing. Koiwanit (2018) concluded that online shopping at Canadian grocery stores would

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reduce greenhouse gas emissions by 92.9 percent. Meshkini, Gholami, Moghaddam, and Rastegar (2011) concluded that the prosperity of electronic banking reduces the presence of citizens to the bank, the relative improvement of urban traffic and the reduction of costs in the city of Zanjan. Alavi, Fakhimjoo, and Parhizkar (2018) stated that there is a significant negative relationship between the use of E-government services and urban traffic. In other words, with the provision of E-government services and its increase, urban traffic has also decreased significantly.

## 3. Method

District 5 is one of 22 municipality districts that is located in the northwest of Tehran. Excessive urban trips for utilizing various urban services are known as one of the factors influencing the trip pattern and, consequently, the increase of air pollution and fuel consumption. Therefore, this study aimed to investigate the impact of E-commerce application on reducing intra-urban travel and reducing carbon monoxide emissions in district 5 of Tehran. At this stage, two scenarios are determined:

Scenario 1: Investigating the status of the pre-implementation of the E-shopping on intra-urban trips and carbon monoxide emissions.

Scenario 2: Investigating the status of the implementation of the E-shopping on intra-urban trips and carbon monoxide emissions.

For this purpose, it is necessary to estimate the level of readiness of samples to accept the change in the state of purchase from the traditional to the electronic, as well as the reduction in trip length by distributing the questionnaire. The structure of the questionnaire included introduction, general information, behavioral, trip demand, and perspective questions. The frequency and mean of data presented in the descriptive part, and the data were analyzed in SPSS software. In addition, other information such as vehicle type, trip length, and number of trips per month asked and analyzed. Then, it is necessary to estimate the amount of carbon monoxide emissions from the trip distances by vehicle to purchase the goods according to the IPCC equation. In addition, it is necessary to estimate the number of purchase orders, the amount of trip and trip distances by a carrier car in the second scenario.

## 4. Results and Discussion

In this research, a sample size of 384 was determined according to Cochran's method with an error level of 5% and 95% confidence. Questionnaires were distributed randomly in the studied area. In addition, the Cronbach's alpha method was used to evaluate the reliability of questionnaire. The questionnaire had high reliability with overall alpha coefficient higher than 0.6. Results from demographic data show that 50.3% of the respondents are women and 49.7% are men. The results show that 40.9% of the sample is between 35 and 45 years of age. In addition, 67% of the statistical samples had a bachelor's or higher education degree that their level of awareness about the internet and computer programs with the average of 3.60 is higher than moderate. The results showed that from the viewpoint of citizens, their role in reducing the air pollution problems with a mean of 3.01 was average. In addition, they stated that their readiness level in order to reduce intra-urban trips was greater than moderate by a mean of 3.32. The results showed that the role of E-shopping from chain stores in reducing household and transportation costs was lower than the averages with 2.75 and 2.66, respectively. The results showed that the carbon monoxide emissions in the households of district 5 of Tehran which tend to E-shopping, is 41.3 tons per year in current purchasing situation. When the E-commerce program is implemented, the emission of carbon monoxide will reduce by 39.62 tons per year. In addition, the application of this strategy in total 22 districts of Tehran will reduce the 13.37% of shopping trips in Tehran, and decrease 871.64 tons of carbon monoxide contaminants per year for the all district of Tehran.

## 5. Conclusion

Result showed that young people with a higher education have a more positive tendency toward E-shopping, and the level of awareness, readiness and acceptance of new replacement systems in their purchases is very high. Citizens declared their role in

reducing the problems of air pollution was relative, which can be related to the public's view to the more effective role of government in reducing air pollution by providing infrastructure, economic, and cultural solutions. Citizens stated E-shopping from chain stores is an effective strategy to reduce intra-urban trips. They are ready to participate in reducing intra-urban trips to decrease the environmental impact on their urban community. The result showed that the role of E-shopping from chain stores in reducing household and transportation costs is less that the average which requires economic incentives to encourage citizen for E-shopping. The results showed that the application of this strategy would reduce 13.37 percent of shopping trips in Tehran, and reduce carbon monoxide emissions by 871.64 tons per year for all 22 districts of Tehran. The behavior of purchase cannot be changed at once. Nevertheless, experience has shown that providing a suitable and integrated model to meet the needs and demands of citizens by applying incentives such as easiness, economic benefits, and welfare encourages the citizens to improve the environmental situations.

**Keywords:** Air Pollution, E-shopping, Trip Demand, District 5 of Tehran, Carbon Monoxide

## References (In Persian)

1. Alavi, S. A., Fakhimjoo, S., & Parhizkar, A. (2018). تحلیـل نقش دفاتر خدمات الکترونیکی در کاهش سـفرهای درون‌شهری (مطالعه موردی: منطقه ۵ تهران) [Analysis of the role of e-service offices in reducing urban journeys (Case study: District 5, Tehran city)]. *Journal of Human Geography Research*, *50*(1), 93-108.
2. Ameli, S. R. (2005). دو فضـایی شـدن شـهر: شـهر مجازی ضرورت بنیادین برای کلان‌شهرهای ایران [Duality of city space: Virtual city as a necessity for the metropolis of Iran]. *Journal of Iranian Association for Culture & Communication Studies*, *1*(2-3), 117-134.
3. Barakpur, N., & Jahanseir, F. (2016). شـهروندی محیط‌زیسـتی و تحلیل رفتار شـهروندی در شـهر قزوین [Environmental citizenship and analysis of citizenship behavior in Qazvin city]. *Journal of Hoviatshahr*, *10*(28), 53-66.
4. Chitnis, M. (2005). برآورد کشـش قیمتی تقاضای بنزین با استفاده از مدل سری زمانی ساختاری و مفهوم روند ضمنی [Estimating gasoline demand price elasticity using structural time series model and Implicit Trend Concept]. *Journal of Economic Research*, *5*(3), 1-16.
5. Dehghanpoor, A., Mahmoudinia, M., & Rezaie, H. (2014). فناوری اطلاعات و ارتباطات و نقش آن در کاهش تقاضـای سفرهای درون‌شهری (مطالعه موردی: شهر یزد) [Information and communication technology and its role in reducing intra-urban travel demand (Case Study: Yazd city)]. *Journal of Geography and Urban Space Development*, *1*(2), 43-52.
6. Emamverdi, G. H., Haftlang, R., & Farahani, M. (2011). ارزیابی هزینه رفاهی ناشـی از افزایش قیمت حامل‌های انرژی (مطالعه موردی: کشـور ایران) [Evaluation of consumer's welfare costs due to rise of energy carriers prices (A case study of Iran)]. *Journal of Applied economics*, *2*(4), 25-42.
7. Gharbali Moghadam, Y., & Eghdami, P. (2002). بررسـی اثر افزایش قیمت بنزین بر مصـرف‌کننده [The effect of gasoline rising on consumers]. *Journal of Energy Economics*, *9*(44-45), 26-32.
8. Karbasi, A., Tehrani, S. M. (2006). کاربرد تجارت الکترونیک در بهینه‌سازی مصرف انرژی و کاهش آلودگی‌های زیسـت‌مـحیطی [The application of e-commerce to optimize energy consumption and reduce environmental pollution]. *Journal of Environmental Science and Technology*, *8*(1), 106-118.

9. Lotfi, S., Sholeh, M., Farmand, M., & Fattahi, K. (2016). تدوین معیارهای طراحی شهری برای محله‌های بدون کربن [Urban design criteria for zero-carbon neighborhoods]. *Journal of Naghshejahan*, *6*(1), 80-92.
10. Mesdaghinia, A., Yunesian, M., Naseri, S., Jafari, A., Moradi, A., Farahdoust, F, & Yaghobi, L. (2007). بررسی آگاهی ساکنین شهر تهران از آلودگی‌های زیست‌محیطی و عوارض بهداشتی مربوطه و تعیین منابع اطلاعاتی آنان [The knowledge of Tehran citizens on environmental pollutions, related health effects and their information sources City)]. *Journal of Yafte*, *9*(1), 3-13.
11. Meshkini, A., Gholami, M., Moghaddam, M., & Rastegar M. (2011). تأثیر بانکداری الکترونیک در کاهش سفرهای درون‌شهری (نمونه موردی: بخش مرکزی شهر زنجان) [The effect of electronic banking on reducing intra-urban trips (Case study: Central section of Zanjan city)]. *Journal of Regional Planning*, *1*(3), 17-28.
12. Mohrechi, K., & Abazari, A. (2015). *نقش دولت الکترونیکی در کاهش آلودگی هوا* [The role of E-government in reducing air pollution]. Paper presented at the *Second International Conference on Research in Science and Technology*, Istanbul, Turkey.
13. Mossammamy, S, Moradi, M., & Shah Bahrami, A. (2013). بررسی عامل مؤثر بر موفقیت تجارت الکترونیک از دیدگاه مدیریتی [A managerial examination of the successful parameters in the B2C business]. *Iranian Journal of Information and Communication Technology*, *5*(17-18), 57-72.
14. Safarzadeh, M., & Rasouli, A. (2014). مدیریت بهینه تراکم ترافیک با اخذ هوشمند عوارض از معابر درون‌شهری (منطقه مورد مطالعه: پل طبقاتی صدر) [Effective traffic congestion management using automatic toll collection on urban highways (Case study: Sadr multilevel highway)]. *Journal of Civil and Environmental Researches*, *1*(1), 39-48.
15. Statistics Center of Iran. (2018). *گزارش جمعیت منطقه ۵ تهران* [Population report of District 5 of Tehran]. Tehran, Iran: Statistics Center of Iran.
16. Tehran Air Quality Control Report. (2017). *گزارش کیفیت هوای تهران* [Tehran Air Quality report]. QM97/02/01(U)/1. Tehran, Iran: Tehran Air Quality Control Center.
17. Transportation and Traffic Deputy Municipality of Tehran. (2014). *گزارش حمل‌ونقل شهری تهران* [Tehran urban transport report]. Tehran, Iran: Transportation and traffic deputy Municipality of Tehran.

## References (In English)

1. Arentze, T. A., Oppewal, H., & Timmermans, H. J. (2005). A multipurpose shopping trip model to assess retail agglomeration effects. *Journal of Marketing Research*, *42*(1), 109-115.
2. Auf der Landwehr, M., Trott, M., & Viebahn, C. (2019). *E-grocery in terms of sustainability–simulating the environmental impact of grocery shopping for an urban area in Hanover*. Retrieved 11 December 2019, from http://www.asim-fachtagung-spl.de/asim2019/papers/09_Proof_126.pdf
3. Azmi, D. I., Karim, H. A., & Ahmad, P. (2013). Comparative study of neighborhood walkability to community facilities between two precincts in Putrajaya. *Procedia-Social and Behavioral Sciences*, *105*, 513-524.
4. Bidad, F. (2017). *Main factors in online shopping behavior in Iran*, (Unpublished master's thesis). Centria of Applied Sciences University, Finland.
5. Boussauw, K., Neutens, T., & Witlox, F. (2012). Relationship between spatial proximity and travel-to-work distance: the effect of the compact city. *Regional studies*, *46*(6), 687-706.

6. Calabrese, D., Kalantari, K, Santucci, F. M., & Stanghellini, S. (2008). *Environmental policies and strategic communication in Iran*. Washington, DC: World Bank Working Paper.
7. Cervero, R., & Duncan, M. (2006). Which reduces vehicle travel more: Jobs-housing balance or retail-housing mixing?. *Journal of the American planning association*, *72*(4), 475-490.
8. Chen, Y. H., Hsu, I. C., & Lin, C. C. (2010). Website attributes that increase consumer purchase intention: A conjoint analysis. *Business research*, *63*(9-10), 1007-1014.
9. Chong, A. Y., Chan, F. T., & Ooi, K. B. (2012). Predicting consumer decisions to adopt mobile commerce: Cross country empirical examination between China and Malaysia. *Decision Support Systems*, *53*(1), 34-43.
10. Chow, G. C. (2008). China's energy and environmental problems and policies. *Asia-Pacific Journal of Accounting and Economics*, *15*(1), 57-70.
11. Dan, C. (2014). Electronic commerce: State-of-the-art. *American Journal of Intelligent Systems*, *4*(4), 135-141.
12. Dargay, J. M., & Hanly, M. (2003). The impact of land use patterns on travel behavior. Paper presented at Conference of European Transport. Strasbourg, France.
13. Demirdogmez, M. (2015). Development and impact of E-commerce in Turkey. *The Russian Academic Journal*, *31*(1), 141-147.
14. Dhar, S., Jain, N., & Mandloi, D. (2015). Information technology in today's era: E-governance, E-learning, E-commerce, E-health. Paper presented at Conference on Information Technology, Bhubaneswar, India.
15. Dillon, T. W., & Reif, H. L. (2004). Factors information consumers E-commerce commodity purchases. *Information Technology and Performance*, *22*(2), 18-21.
16. Gurjar, B. R., Aardenne, J. A., Lelieveld, J., & Mohan, M. (2004). Emission estimates and trends (1990–2000) for megacity Delhi and implications. *Atmospheric Environment*, *38*(33), 5663-5681.
17. Heger, M., & Sarraf, M. (2018). *Air pollution in Tehran: Health costs, sources, and policies*. Washington, DC: World Bank Group.
18. Hinz, O., Hann, I. H., & Spann, M. (2011). Price discrimination in e-commerce? An examination of dynamic pricing in name-your-own price markets. *Management Information Systems*, *35*(1), 81-98.
19. Houghton, J. W. (2010). *ICT and the environment in developing countries: A review of opportunities and developments. In What kind of information society? Governance, virtuality, surveillance, sustainability, resilience.* Berlin: Springer.
20. Joewono, T. B., Tarigan, A. K., & Rizki, M. (2019). Segmentation, classification, and determinants of in-store shopping activity and travel behaviour in the digitalisation era: The context of a developing country. *Sustainability*, *11*(6), 1591-1614.
21. Koiwanit, J. (2018). Energy efficiency and environmental impact analysis in grocery store market in Canada. *Journal of GEOMATE*, *15*(49), 30-36.
22. Leung, D. Y. (2015). Outdoor-indoor air pollution in urban environment: challenges and opportunity. *Frontiers in Environmental Science*, *2*, 69-76.
23. Li, X., Song, J., Lin, T., Dixon, J., Zhang, G., & Ye, H. (2016). Urbanization and health in China, thinking at the national, local and individual levels. *Environmental Health*, *15*(1), 113-123.
24. Litman, T. (2017). *Evaluating accessibility for transport planning*. Victoria: Victoria Transport Policy Institute.
25. Min, Z., & Chen, C. (2016). Reassessing informal migration and urbanization in China. In Z. Yongnian., Z. Litao., & S. Y. Tong (Eds.), *China's great urbanization* (pp. 78-98). London: Routledge.
26. Nair, K. S. (2017). Impact of E-commerce on global business and opportunities: A conceptual study. *Advanced Engineering and Management Research*, *2*(2), 324-336.

27. Ningrum, W. (2018). Urban heat island towards urban climate. Paper presented at *IOP Conference Series: Earth and Environmental Science.* Bandung, Indonesia.
28. Oyedepo, S. O. (2012). Energy and sustainable development in Nigeria: the way forward. *Energy, Sustainability and Society*, *2*(1), 1-17.
29. Polzin, S. E. (2004). *The relationship between landuse, urban form and vehicle miles of travel: The state of knowledge and implications for transportation planning.* Florida: Florida Department of Transportation Report.
30. Punnet, J., Kritika, J., & Pushpendra, K. J. (2016). Electronic-commerce and its global impact. *Innovare Journal of Engineering and Technology*, *4*(3), 1-6.
31. Ramachandra, T., & Shwetmala, V. (2009). Emissions from India's transport sector: Statewise synthesis. *Atmospheric Environment*, *43*(34), 5510-5517.
32. Reijnders, L., & Hoogeveen, M. J. (2001). Energy effects associated with E-commerce: A case-study concerning online sales of personal computers in Netherlands. *Journal of Environmental Management*, *62*(3), 317-321.
33. Sanaul, H., & Mondal, M. (2019). The implications of population growth and climate change on sustainable development in Bangladesh. *Jàmbá: Journal of Disaster Risk Studies, 11*(1), 1-10.
34. Satterthwaite, D. (2009). The implications of population growth and urbanization for climate change. *Environment and Urbanization, 21*(2), 545-567.
35. Shahnoori, P. (2018). Environmental impact of online banking: Positive externalities on fuel consumption and greenhouse gas emission. *Journal of Computer Science and Network Security*, *18*(1), 207-210.
36. Siikavirta, H., Punakivi, M., Kärkkäinen, M., & Linnanen, L. (2002). Effects of E-commerce on greenhouse gas emissions: A case study of grocery home delivery in Finland. *Industrial Ecology*, *6*(2), 83-97.
37. Sloman, L., Cairns, S., & Goodwin, P. B. (Eds). (2003). *The influence of soft factor interventions on travel demand: Summary report*. London: Department for Transport.
38. Tehrani, S. M., Karbassi, A. Monavvari, S. M., & Mirbagheri, S. A. (2009). Prediction of energy consumption and urban air pollution reduction in e-shopping adoption. *Food, Agriculture and Environment*, *7*(3-4), 898-903.
39. Wang, J., Zhang, J., Jiang, H., & Lu, Y. (2015). API-based assessment on urban air environment bearing capability in China. *Frontiers of Environmental Science and Engineering*, *9*(6), 1049-1055.
40. World Economic Forum and Accenture (WEFA). (2009). *Supply chain decarbonization: The role of logistics and transport in reducing supply chain carbon emissions*. Geneva: World Economic Forum and Accenture.
41. Zhao, J., Xiao, L., Tang, L., Shi, L., Su, X., Wang, H., ... & Shao, G. (2014). Effects of spatial form on urban commute for major cities in China. *Journal of Sustainable Development and World Ecology, 21*(4), 361-368.

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