**Transport Economics**
URBP (620) 4 credits
Instructor: Ahmed M. El-Geneidy
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Meeting: Monday, 11:35 a.m. to 1:55 p.m.
Office Hours: Monday 9:30 am to 10:30 am or by
appointment

Due to COVID-19 situation and restrictions that might be imposed on some students due to travel or any health-related situation that prevents you from attending the class in person, I will be posting a zoom link every week which I will login to at the beginning of each class so those students can follow the class remotely. I will do my best to maintain this policy, but it is not guaranteed that the zoom link will work every week.

## Course Description

This course presents the economic and financial aspects of urban transport policies and planning. The course introduces students to impact assessment techniques for major transport projects and policies. In addition, it discusses political debates around transport finance, highlighting winners and losers under various financing policies.

## Course Objective

The readings, lectures, case studies, class discussions, and assignments are designed so that, by the end of this course, students will be able to:

1. Think critically about transportation economics,

2. Evaluate economic policies that affects the transportation system,

3. Apply basic econometric methods to the analysis of transportation data,

4. Understand the institutional and political barriers associated with transportation pricing and financing,

5. Actively discuss and debate contested transportation economic issues,

6. Have a solid understanding of transportation issues from the perspectives of engineering, planning, economics and other disciplines. As well as how all these fields are related,

7. Be familiar with the goals and assumptions that underlie debates about transportation finance and policy, and

8. Identify detailed elements of the transportation economics sub-field that may be appropriate for future thesis/project work.

## Course Structure
The course is organized around one-week lecture/class discussions.

### *Assignment and Evaluation Methods*

| Assignment | Description | Weighting |
|---|---|---|
| Reflections & Participation | Each student should submit one paragraphs (250 words max) discussing the assigned readings of the week on my courses | 15 |
| Weekly Question | Starting from week 5, each student will be assigned to help respond to **one of series of weekly questions** on different policy topics, using case studies to support answers. | 20 |
| Assignment #1 | Cost calculation of the capital and operating cost of a new Light Rail Line. | 10 |
| Midterm | Covering the first 5 lectures | 5 |
| Assignment #2 | A one-page memo arguing for or against one of the following two questions:<br>1. Should public transport be free?<br>2. Should e-bikes be subsidized? | 15 |
| Assignment #3 | A surprise assignment to solve at home in 3 hours (You will write a memo of 2 pages on the assigned topic.) | 15 |
| Assignment #4 | Students may choose one of two options:<br><br>(1) Choose a planned transport project from the assigned list and write a policy brief 2 to 4 pages to build a business case for or against this project. Each student will give a 10 minutes presentation in class.<br>(2) After consultation with Prof. El-Geneidy, the student will prepare a 10 pages regarding an element of his or her transport-related thesis or SRP. | 20 |

In fairness to all students, no late assignments will be accepted (Read: this means "0" points will be assigned for work turned in after the deadline). The *only* exception is for documented family and/or medical emergencies. It is in your best interest to please respect this edict.

## Lectures and Discussion
Discussion Component: The lecture component of this course consists of discussions of the readings and providing examples from real world related to the discussed topic from outside

sources and criticizing them based on the readings. Therefore you should have **READ THE MATERIAL BEFORE CLASS** and be ready for the discussion. Students are expected to come to class ready to be active participants in the discussion.  If you get behind, always do the readings for the next class first. You need to read carefully for the argument or main facts, but you do not need to memorize every detail. One or two students will be answering the question of the week details mentioned below.

## Videos on the fundamentals of microeconomics

To make better use of class time, videos on the fundamentals of microeconomics from Khan Academy have been compiled in two Youtube playlists for students to watch and learn on their own time prior to the third and fourth lectures. The links are provided along with the weekly readings. There are about 3.5 hours of videos in the first playlist and the around 5 hours in the second playlist.

*Main Readings*
Levinson, D. (2015) Transportation Economics, Wiki Book. **Available online at**
    https://en.wikibooks.org/wiki/Transportation_Economics
Kockelman, K., Chen, D., Larsen, K., and Nichols, B. (2013). The Economics of Transportation
    Systems: A reference for Practitioners. The University of Texas. **Available from
    amazon.com and from** http://www.utexas.edu/research/ctr/pdf_reports/0_6628_P1.pdf
Gomez-Ibenez, J., Tye, W., & Winston, C. editors (1999). Essays in transportation economics
    and policy. Washington DC USA: Brookings Institution Press. **Available in E-Book
    through McGill Library.**


*Additional assigned readings*
Button, K. (2010). Transport economics. Cheltenham UK: Edward Elgar; 3rd edition. **2 chapters
    Available at the McGill Library.**
Button, K. & Reggiani A. editors (2011). Transportation and economic development.
    Northampton, MA: Edward Elgar Publishing. **Available in E-Book through McGill
    Library.**


*Readings Reflections*
Every week each student is required to submit a reflection (one paragraph on MyCourses) on the assigned readings of the week (250 characters max). Reading reflections are due no later than Sunday at 12 p.m. These reflections should represent your thoughts about the readings and the take-home lesson. You need to be critical in your thoughts and ideas presented in this one paragraph. During the term, three reflections will be selected randomly from the submitted ones and evaluated. Students will be assigned the higher mark of two of the three reflections. The reflections are only required for the assigned readings during the week. **One or two** questions or thoughts can be added below the 250 words, some of these questions or thoughts will be discussed during the lecture on Monday.

*If you miss a class, you are required to write a minimum of 2-page summary of the readings and submit to the instructor prior to the next lecture. Failing to do so will lead to a 10% deduction of your final grade in the attendance and participation grade for every summary you did not submit*

## Lectures

|   |   | **Topic Discussed** | **Weekly Question** |
|---|---|---|---|
| 1 | 13/9/2021 | Introduction to Transport Economics | No question |
| 2 | 20/9/2021 | Transport and the Economy | No case study |
| 3 | 27/9/2021 | Basics of microeconomics Part I: Demand, supply, and elasticity<br>Demand, supply, and elasticity in transport<br>**Distribution of Assignment 1** | Demand for shared e-scooters, who is using them? |
| 4 | 4/10/2021 | Basics of microeconomics Part II: Consumer and producer surplus, profit and costs, competition and monopoly<br>Costs and benefits of transport services | HOT lanes, who benefits from them the most? |
| 5 | 14/10/2021 (Thursday) | No lecture | |
| 6 | 18/10/2021 | Value of Time and consumer utility<br><br>**Assignment 1 due** | How to set the price for congestion charging? |
| 7 | 25/10/2021 | Pricing of transport services<br><br>**Midterm** | Should there be free parking? |
| 8 | 1/11/2021 | Regulations and competition in transport | Is privatizing public transport a valid option? |
| 9 | 8/11/2021 | Movement and location<br>**Assignment 2 due** | Tolling car bridges, for how long and why? |
| 10 | 15/11/2021 | Investment and financing, and revenues of transport | Financing transit from road pricing, is it fair? |
| 11 | 22/11/2021 | Freight logistics<br>**Assignment 3 (Sunday afternoon 28/11/2021)** | What is the future of short-distance delivery vehicles? |
| 12 | 29/11/2021 | Transport project evaluation, forecasting, and positive externalities | Can Uber replace public transport? What will be the cost? |
| 13 | 6/12/2021 | Economic impact analysis and negative externalities | Presentations of Assignment 4 |
| 14 | 13/12/2021 | **Assignment 4 due** | |

*Current Debates in Transport*

Each week one of the students will lead a discussion on an article, a book, or a video that she or he read during the last week. This can be an article from City Lab. The student will summarize the article and then as a class we will have discussions for 25 minutes on that article, students are not expected to do formal presentations, students can bring up the article and if it is a short one we can all read in class then discuss, if it is long the student can first summarize. Each student should sign up for one week to do so. These efforts will be counted towards the participation marks. The discussion will concentrate on the economic and ethical aspects of the transport issue being discussed.

## Weekly Question and Case Studies:

Each week, from **27/9/2021** through **29/11/2021,** two or three students will answer the "question of the week" described in the table of contents. The answer should rely on case studies from around the world. Students are expected to prepare a joint PowerPoint presentation based on the question and each student should be responsible for at least one case study to support their answers. The presentation must be submitted to the professor on the Monday of class that it is due before 9:30 am. The case study presentation time will be 30 minutes including discussions at the beginning of the class.

**Each student** is expected to participate in answering at least **2 questions with case studies**.

**Please sign up for at least two topics by the end of the day Monday, Sept. 13, 2021.**

The students leading the discussion on answering the questions related to the case study of the week are expected to provide examples related to the discussed topics from different sources. Students are expected to link the theory being read to the examples used.

## Assignment 1 (due 9:30 am 18/10/2021).

Assignment 1 will be a simple case of calculating the fare for a Light Rail line that will open in a City. You will be provided with the capital cost, operating costs, and expected ridership. Your goal will be to calculate the cost of the fare for the city should charge to pay back the loan and the amount of subsidy needed to keep operating and maintaining it. See assignment at the end of the course outline.

## Midterm (in class 25/10/2021)

The midterm will cover materials from the first 5 lectures in addition to a case study similar to Assignment 1 to calculate some kind of fare or do an impact assessment for a bus line. It will be in class time, if you cannot make it to this class please communicate with the professor.

## Assignment 2 (due 9:30 am 8/11/2021)

In this assignment, you will draft a one page memo arguing for or against one of the following two questions:

1. Should transit be free?
2. Should e-bikes be subsidized?

You should make use of case studies to support your position. Also, you should consider the policy interventions that are necessary in your arguments (e.g. where should operating funds come from if transit is free?) as well as the implications (e.g. equity impacts).

## Assignment 3 (28/11/2021)

This is a surprise assignment, you will receive an email from the professor with the assignment and you will have 3 hours to draft a 2 pages memo and respond to this assignment. Assignment will start at 2 p.m. on 28/11/2021 (Sunday) and will be due in the same day at 5 pm. If this date and time are not convenient for all students, other dates will be determined in class.

## Assignment 4 (due 9:30AM 13/12/2020)

For the fourth assignment, students will be allowed to select one of two options:

### Option 1

You will pick any of the below public transport project and complete a **business case** for this project stating why it's importance, and how to make it a successful one. Students are allowed to select any other projects currently under debate in Canada, so please do not limit yourself to this list. You can predict the demand for this new project and generate any kind of analysis needed to make the case for this project to go ahead or propose modifications to it from a demand or equity or environmental or social perspectives. For this assignment, you should bring examples from other cities around the world. The assignment will be written in a policy brief format (2 to 4 pages), business case guides and policy briefs writing guide are provided online under mycourses

| Project Name | CMA |
|---|---|
| Transit service along Taschereau Blvd in South Shore | Montreal |
| Transit service along Laurentides Blvd in Laval | Montreal |
| Extending the Westside of the Orange Metro in Montreal to reach Laval | Montreal |
| Extending the Yellow Metro line in the southshore | Montreal |
| Ottawa LRT | Ottawa |
| B-Line LRT project | Vancouver |
| REM extension to the East of Montreal | Montreal |
| LRT service from downtown Montreal to Lachine (above ground Pink line) | Montreal |
| London BRT | London |

|  |  |
|---|---|
| SmartTrack (including Eglinton West) | GTHA |
| Scarborough Subway Extension | GTHA |
| Relief Line | GTHA |

**Option 2**
After consultation with Prof. El-Geneidy, the student will prepare a 10 pages paper regarding an element of his or her transport-related Supervised Research Project or Thesis work.

In either case, before submission of the final assignment, each student will give a 2-3 minutes presentation during the final class Dec. 6, 2021 to receive feedback (presentation not evaluated).

You will have a time budget of 40 hours to conduct this analysis and prepare the presentation, all students should maintain a time log and should not exceed the 40 hours of work on the assignment. You won't be penalized if you do pass the hours, yet it's an indication that you need to work on your time management skills. **Time logs should be submitted** with the final assignment in an additional sheet.

**All PDF submissions must include two blank (empty pages) at the end for the professor to provide comments. All submissions should be uploaded to MyCourses as a pdf document prior to the due date.**

In accordance with McGill University's Charter of Students' Right, students in this course have the right to submit in English or in French any written work that is to be graded.

**Academic Integrity**

McGill University values academic integrity. Therefore, all students must understand the meaning and consequences of cheating, plagiarism and other academic offences under the code of Student Conduct and Disciplinary Procedures (see https://www.mcgill.ca/students/srr/honest for more information).

**Disabilities**

If you have a disability please contact the instructor to arrange a time to discuss your situation. It would be helpful if you contact the Office for Students with Disabilities at 398-6009 (online at http://www.mcgill.ca/osd) before you do this.

**Dealing with Stress**

If you feel stressed during the term do not hesitate to speak with the class instructors to discuss any possible needs around academic accommodations; students can also seek support from McGill's professional counseling services at: https://www.mcgill.ca/wellness-hub/access-care/meet-professional/.


**Safety**

McGill University shall strive to be recognized as an environmentally safe and responsible institution, and as a model of environmentally responsible living. (see www.mcgill.ca/tls/policy/environmental_policy). For all emergencies please contact McGill security Services at 514-398-3000.


*COVID-19 Situation*

*If you have any concerns or special requests due to the COVID-19 situation during the class time or off-hours please communicate with the professor to arrange accommodations.*


*In the event of extraordinary circumstances beyond the University's control, the content and/or evaluation scheme in this course is subject to change.*

Detailed Weekly Readings


**Week 2**: Transport and the Economy (Due 19/9/2021)
*Levinson, D. (2014). Wiki Book, Introduction*
*https://en.wikibooks.org/wiki/Transportation_Economics/Introduction*

*Bastiaansen, J., Johnson D., & Lucas K. (2020). Does transport help people to gain employment? A systematic review and meta-analysis of the empirical evidence. Transport Reviews, Vol. 40, Issue 5.*

*Eno Center for Transportation and Bipartisan Policy Center, (2012). The Consequences of Reduced Federal Investment in Transportation. Washington, DC: Eno Center for Transportation and Bipartisan Policy Center. http://bipartisanpolicy.org/wp-content/uploads/sites/default/files/BPC-Eno%20Transportation%20Report.pdf*

*Goetz, A. (2011). The global economic crises, investment in transport, and economic development. In Button, K. & Reggiani A. editors. Transportation and economic development. Northampton, MA: Edward Elgar Publishing.*

*Gwilliam, K. (2008). A review of issues in transit economics. Research in Transportation Economics, 23:4-22.*

Other recommended readings:
*Levinson, D. (2014). How to Make Mass Transit Financially Sustainable Once and for All. https://www.citylab.com/transportation/2014/06/how-to-make-mass-transit-financially-sustainable-once-and-for-all/372209/*

*Ansar et al. (2012). Does infrastructure investment lead to economic growth or economic fragility? Evidence from China. Oxford Review of Economic Policy, (32)3: 360-390.*

*Dev Bhatta, S. & Drennan. P. (2003). The economic benefits of public investment in transportation: A review of recent literature. Journal of Planning Education and Research, 22(3), 288–296.*

*World Bank, (2015). Transport: Sector Results Profile: Sustainable Transport for All: Helping People to Help Themselves.*
*http://www.worldbank.org/en/results/2013/04/14/transport-results-profile*

*World Bank. (2019). Belt and Road Economics: Opportunities and Risks of*

*Transport Corridors. Washington, DC: World Bank.*
*https://www.worldbank.org/en/topic/regional-integration/publication/belt-and-road-economics-opportunities-and-risks-of-transport-corridors*


**Week 3:** Demand, supply, and elasticity in transport (Due 26/9/2021)

**Videos to watch before Week 3 lecture**: Demand, supply, and elasticity
https://www.youtube.com/playlist?list=PLpyB3vxcRFmIO3b0VyLvnfAU0xCwWQm4D

*Button, K. (2010). Transport economics. Cheltenham UK: Edward Elgar; 3rd edition. Chapter 4.*

*Lemp, J.D.& Kockelman, K.M. (2009). Understanding and Accommodating Risk and Uncertainty in Toll Road Projects. A review of the literature. Transportation Research Record (2132), 106-112.*

*Miller, C.& Savage, I. (2017). Does the demand response to transit fare increases vary by income? Transport Policy, 55: 79-86.*

*Rahman S. & Balijepalli, C.(2016). Understanding the determinants of demand for public transit: Evidence from suburban rail operations in five divisions of Indian Railways. Transport Policy, 48: 13-22.*

<u>Other recommended readings:</u>
*Börjesson (2014). Forecasting demand for high speed rail. Transportation Research Part A, 70: 81-92.*

*Chiang et al. (2011). Forecasting ridership for a metropolitan transit authority. Transportation Research Part A, 45, 696-706.*

*Small, K. & Winston, C. (1999). The Demand for Transportation Models and Applications. In Gomez-Ibenez, J., Tye, W., & Winston, C. editors. Essays in transportation economics and policy. Washington DC USA: Brookings Institution Press. 11- 55. Concentrate in the section starting from page 24 titled Advanced disaggregate demand models.*

*Steer. (2017). REM Forecasting demand*
*https://www.cdpqinfra.com/sites/default/files/pdf/rem_forecasting_2017_appendices.pdf*

**Week 4:** Costs and benefits of transport services (Due 3/10/2021)

**Videos to watch before Week 4 lecture**: Consumer and producer surplus, profit and costs, competition and monopoly

> https://www.youtube.com/playlist?list=PLpyB3vxcRFmIAhGk_wUR3rOFwCr4Yg41v

> *Kockelman, et al (2013). Chapter 1*

> *Levinson, D. (2014). Wiki Book, Costs*
> *https://en.wikibooks.org/wiki/Transportation_Economics/Costs*

> *Boarnet, M., Burinskiy, E., Deadrick, L., Guillen, D., & Ryu, N. (2017). The Economic Benefits of Vehicle Miles Traveled (VMT)-Reducing Placemaking: Synthesizing a New View. Davis, California: National Center for Sustainable Transportation.*

> *Love, P., & Ahiaga-Dagbui, D. (2018). Debunking fake news in a post-truth era: The plausible untruths of cost underestimation in transport infrastructure projects. Transportation Research Part A, 113: 357-368.*

> *Van Wee, B. (2007). Large Infrastructure projects: a review of the quality of demand forecasts and cost estimations. Environment and Planning B: Planning and Design, 34: 611- 625.*

Other recommended readings:

> *Bosch, P., Becker, F., Becker , H., & Axhausen, K. (2018). Cost-based analysis of autonomous mobility services. Transport Policy, 64: 76-91.*

> *Cantarelli, C., Flyvbjerg, B., van Wee, B., & Molin, E. (2010). Cost overruns in large-scale transportation infrastructure projects: Explanations and their theoretical embeddedness. European Journal of Transport and Infrastructure Research, 10: 5-18.*

> *De Grange, L. et al. (2018). Cost, production and efficiency in local bus industry : An empirical analysis for the bus system of Santiago. Transportation Research Part A, 108:1-11.*

> *Flyvbjerg, B. et al. (2018). Five things you should know about cost overrun. Transportation Research Part A, 118: 174-190.*

*Flyvberg, B. (2007). Cost overruns and Demand Shortfalls in Urban Rail and Other Infrastructure. Transportation Planning and Technology, 30 (1): 9-30.*

*Harford, J.D. (2006).Congestion, Pollution, and benefit-to-cost ratios of US public transit systems. Transportation Research Part D, 11: 45-58.*

*Metrolinx (2017). 2017-2018 Metrolinx Business Plan*
*[http://www.metrolinx.com/en/docs/pdf/board_agenda/20170628/20170628_BoardMtg_BusinessPlan_Report_EN.pdf](http://www.metrolinx.com/en/docs/pdf/board_agenda/20170628/20170628_BoardMtg_BusinessPlan_Report_EN.pdf)*

*Tirachini, A.& Hensher, A.D. (2011). Bus congestion, optimal infrastructure investment and the choice of a fare collection system in dedicated bus corridors. Transportation Research Part B, 45:828-844.*

**Week 5:** No Readings, No Lecture on 14/10/2021

**Week 6:** Value of Time and consumer utility (Due 17/10/2021)

*Small, Kenneth A. (2012). "Valuation of travel time". Economics of Transportation. 1, 2–14*

*Wardman, M. (2004). Public transport values of time. Transport Policy 11 (2004) 363-377.*

*Oort, C.J. (1969). The Evaluation of Travelling Time. Journal of Transport Economics and Policy, Sept. 1969, Vol. 3, No. 3, 279-286.*

*Li, Z, Hensher, D., & Rose, J. (2010), Willingness to pay for travel time reliability in passenger transport: A review and some new empirical evidence.* Transportation Research Part E: Logistics and Transportation Review, 46(3) 384-403.

*Other recommended readings:*

*Diab, E. & El-Geneidy A. (2012), Understanding the impacts of a combination of service improvement strategies on bus running time and passenger's perception. Transportation Research Part A: Policy and Practice.  Vol. 46, Issue 3.*

*Liao, Y, et al. (2020). Disparities in travel times between car and transit: Spatiotemporal patterns in cities. Nature: Scientific Reports volume 10, Article number: 4056 (2020).*

*Miller, H. (1991), Modelling accessibility using space-time prism concepts within geographical information systems. International Journal of Geographic Information Science, 5:3, 287-301.*

**Week 7:** Pricing of transport services (Due 24/10/2020)
*Levinson, D. (2014). Wiki Book, Pricing*
*[https://en.wikibooks.org/wiki/Transportation_Economics/Pricing](https://en.wikibooks.org/wiki/Transportation_Economics/Pricing)*

*Kockelman, et al (2013). Chapter 2*

*Delucchi, M. (2000). Should we try to get the prices right? Access, 16: 14–21.*
*Eliasson, J.&Mattson, L-G (2006). Equity effects of congestion pricing. Quantitative methodology and a case study for Stockholm, Transportation Research Part A, 40: 602-620.*

*Inci, E. (2015). A review of the economics of parking. Economics of Transportation, 4: 50-63.*

Other recommended readings:
*Fabusuyi, T. & Hampshire, R.C. (In press). Rethinking performance based on parking pricing: A case study of SFpark. Transportation Research Part A.*

*Proost et al. (2002). How large is the gap between present and efficient transport prices in Europe. Transport policy, 9:41-57.*

*Miller, C.& Savage, I. (2017). Does the demand response to transit fare increases vary by income? Transport Policy, 55: 79-86.*

*Sharaby, N. & Shiftan, Y. (2012). The impact of fare integration on travel behavior and transit ridership. Transport Policy, 21:63-70.*

**Week 8:** Regulations and competition in transport (Due 31/10/2021)
*Levinson, D. (2014). Wiki Book, Regulation*
*[https://en.wikibooks.org/wiki/Transportation_Economics/Regulation](https://en.wikibooks.org/wiki/Transportation_Economics/Regulation)*

*Kockelman, et al (2013). Chapter 3*

*Hensher, D.A.& Stanley, J. (2010). Contracting regimes for bus services: What have we learnt after 20 years? Research in Transportation Economics, (29)1:140-144.*

*Mouwen, A. & Rietveld, P. (2013). Does competition tendering improve customer satisfaction with public transit? A case study for the Netherlands. Transportation Research Part A, 51:29-45.*

<u>Other recommended readings:</u>

*Aarthaug et al. ( 2018). 20 years of competitive tendering in the Norwegian bus industry-An analysis of bidders and winning bids. Research in Transportation Economics, In Press.*

*Amaral et al. (2009). Auction procedures and competition in public services: The case of urban public transport in France and London, Utilities Policy, (17)2:166-175.*

**Week 9:** Movement and Location (Due 7/11/2021)
*Kockelman, et al (2013). Chapter 4*

*O'Regan, K. & Quigley, J. (1999). Accessibility and economic opportunity. In Gomez-Ibenez, J., Tye, W., & Winston, C. editors. Essays in transportation economics and policy. Washington DC USA: Brookings Institution Press. 437- 466.*

*Pereira, R. & Karner, (2021). Transportation Equity. In R. Vickerman (Ed.), International Encyclopedia of Transportation. 1st Edition, Elsevier.*

*Pickrell, D. (1999). Transportation and land use. In Gomez-Ibenez, J., Tye, W., & Winston, C. editors. Essays in transportation economics and policy. Washington DC USA: Brookings Institution Press. 403- 435.*

<u>Other recommended readings:</u>

*Kennedy et al. (2006). The four pillars of sustainable urban transportation. A Transdisciplinary Journal, (25) 4: 393-414.*

*Cervero, R. & Dai, D. (2014). BRT TOD: Leveraging transit oriented development with bus rapid transit investments. Transport Policy, 36: 127-138*

**Week 10:** Investment, financing of transport, and revenues of transport (Due 14/11/2021)
*Levinson, D. (2014). Wiki Book, Revenue*
*[https://en.wikibooks.org/wiki/Transportation_Economics/Revenue](https://en.wikibooks.org/wiki/Transportation_Economics/Revenue)*

*Kockelman, et al (2013). Chapter 5*

*Chang, Z. & Phang, S.-Y. (2017). Urban rail transit PPPs : Lessons from East Asian cities. Transportation Research Part A, 105 :106-122.*

Lederman, J., Brown, A., Taylor, B., Wachs, M. *(2020). Arguing over transportation taxes: An analysis of equity debates in transportation ballot measures. Urban Affairs Review, Vol. 56(2) 640-670.*

*Yen, B., Mulley, C., Zhang, M. (2020), Equity in financing public transport infrastructure: Evaluating funding options. Transport Policy, Vol. 95, pp. 68-77.*

Other recommended readings:

*Levinson, D. (2014). Transportist, A different way to evaluate new transport investment subsidy.*
*https://transportist.org/2014/11/04/a-different-way-to-evaluate-new-transport-investment-subsidy/*

*Sharma, R. & Newman, P. (2018). Can land value capture make PPP's competitive in fares? A Mumbai case study. Transport Policy, 64:123-131.*

*Roukouni, A. & Medda, F. (2012). Evaluation of Value Capture mechanisms as a funding source for urban transport: the case of London's Crossrail. Procedia Social and Behavioral Sciences, 48:2393-2404.*

*Greene, D.L. (2011).What is greener than a VMT tax? The case for an indexed energy user fee to finance us surface transportation. Transportation Research Part D, 16: 451-458.*

*Translink (2013). Overview of Potential Transportation funding Sources.*
*https://www.translink.ca/-/media/Documents/plans_and_projects/regional_transportation_strategy/Research/Overview%20of%20Potential%20Transportation%20Funding%20Sources.pdf*

*Chang, Z. (2014). Financing new metros – The Beijing metro financing sustainability study. Transport Policy, 32, 148-155.*

*Ljungberg, A. (2016). Marginal cost-pricing in the Swedish transport sector – An efficient sustainable way of funding local and regional public transport in the future?Research in Transportation Economics, 59:159-166.*

**Week 11:** Freight logistics (Due 21/11/2021)*

\* Note: You may wish to complete your reading and submit your reflection by no later than Saturday because you will be completing an assignment on the Sunday when this would normally be due.

> *Button, K. (2010). Transport economics. Cheltenham UK: Edward Elgar; 3rd edition. Chapter 10.*

> *Allen et al.(2018). Understanding the impact of e-commerce on last-mile light goods vehicle activity in urban areas: The case of London. Transportation Research Part D, 61: 325-338.*

> *Goodchild, A. & Toy, J. (2018.) Delivery by drone: An evaluation of unmanned aerial vehicle technology in reducing $CO_2$ emissions in the delivery service industry. Transportation Research Part D, 61:58-57.*

> *Malik et al. (2017). Urban freight-parking practices: The cases of Gothenburg (Sweden) and Delhi (India). Research in Transportation business & Management, 24:37-48.*

Other recommended readings:
> *Bhoopalam et al. (2018). Planning of truck platoons: A literature review and directions for future research. Transportation Research Part B, 107: 212-228.*

> *Levinson, M. (2006). The box. How Shipping Container Made the World Smaller and the World Economy Bigger. UK: Princeton University Press, Chapter 2, p. 16 to 35 (Book available online - McGill library Website)*

> *Wygonik, E.& Goodchild A.V. (2018). Urban form and last-mile goods movement: Factors affecting vehicle miles travelled and emission. Transportation Research Part D ,61:217-229.*

**Week 12:** Transport project evaluation, forecasting, and positive externalities (Due 28/11/2021)
> *Levinson, D. (2014). Wiki Book, Positive Externality*
> [*https://en.wikibooks.org/wiki/Transportation_Economics/Positive_externalities*](https://en.wikibooks.org/wiki/Transportation_Economics/Positive_externalities)

> *Kockelman, et al (2013). Chapter 6*

> *Thomopoulos, S. et al. (2009). Incorporating equity considerations in transport infrastructure evaluation: Current practice and a proposed methodology. Evaluation and Program Planning, 32:351-359.*

*Macharis, C. & Bernardini, A. (2015). Reviewing the use of Multi-Criteria Decision Analysis for the evaluation of transport projects : Time for a multi-actor approach. Transport policy, 37: 177-186.*

*Croft McKenzie, E. & Durango-Cohen (2012). Environment life-cycle assessment of transit buses with alternative technology. Transportation Research Part D, 17: 39-47.*

Please watch the following Video from the ENO Transportation Foundation
https://www.enotrans.org/event/webinar-saving-time-and-making-cents-a-blueprint-for-building-better-transit/

You can also read the executive summary from pages 1-12 from the document from 2021, which is attached to this weeks readings

<u>Other recommended readings:</u>

*Ward, E.J. et al. (2016). Theory and background of multi-criteria analysis : Toward a policy-led approach to mega transport infrastructure project appraisal. Research in Transportation Economics, 58:21-45.*

*Van Wee, B. (2012).  How suitable is CBA for the ex-ante evaluation of transport projects and policies? A discussion from the perspective of ethics. Transport Policy, 19:1-7.*

*Rothengatter, W. (2017). Wider economic impacts of transport infrastructure investments: Relevant or negligible? Transport Policy,124-133.*

*Vickerman, R. (2017). Beyond cost-benefit analysis: the search for a comprehensive evaluation of transport investment. Research in transportation Economics, 63:5-12.*

*Tudela, A. et al. (2006). Comparing the output of cost benefit and multi-criteria analysis: An application to urban transport investments. Transportation Research Part A, (40)5:414-423.*

**Week 13:** Economic impact analysis and negative externalities (Due 5/12/2021)
*Levinson, D. (2014). Wiki Book, Negative externality*
*https://en.wikibooks.org/wiki/Transportation_Economics/Negative_externalities*

*Kockelman, K. et al. (2013). Chapter 7*

City of Ottawa (2017) Transportation Impact Assessment Guidelines.
*https://documents.ottawa.ca/sites/documents.ottawa.ca/files/tia_guidelines_en.pdf*

*Laird, J.J & Venables, A.J. (2017). Transport investment and economic performance: A framework for project appraisal. Transport Policy, 56:1-11.*

# Assignment 1

Please answer the below problem and make sure to include a print out of your calculations and explain your steps in generating the answers. You are allowed to use excel in deriving the mortgage calculations and you are allowed to use a calculator as long as you explain your steps and values clearly in your answer sheet that you will have to print and hand to the professor at the beginning of the coming class.

A North American city is planning a new automated light rail network. This City has a population of 4 million people. The system will be operating with an average speed of 45 km/h. The length of the system will be 67 km including 27.8 km of shared sections where multiple lines operate with 26 stations distributed along 4 lines. Please note that LRT train needs 1 minute at every end of the branch to rotate. The proposed length of the four lines is as follows:

14.35 km Branch 1

20.5 km Branch 2

29 km Branch 3

31 km Branch 4

The new automated LRT line will be going through some of the highest density areas and some of the suburbs with an expected demand of 104,717 unlinked passenger trips during a weekday and 34,905 during the weekend day and national holidays assuming 261 working days per year. These numbers are calculated for the opening year of 2021. It is also expected that the demand for the new service will increase by 6.8% per year from 2021 to 2026 and 0.8% per year from 2027 to 2031, and 1% from 2032 to 2050. The average passenger will use the system for 14.62 km per trip in all the years. Assume a starting operating cost of $0.24 per passenger-km that will increase every year by 2% compared to the previous year.

The expected construction cost is $90,149,253 per km including all costs of LRT vehicles, tunnels, land acquisition, station constructions, depot and maintenance facility and utility changes around stations. The project developer will be purchasing 200 LRT vehicles to operate the different lines, which are included in the estimated construction cost. Note the developer will be paying $2,670,000,000 in capital costs. The planning agency will start paying back this amount to the developer starting in 2021 for 30 years that the LRT is in operation (ending by the end of 2050). The interest on this loan is fixed at 8% with monthly payments. While the remaining capital costs $3,370,000,000 will come from the federal and provincial government funds, where the government is expecting to recover this amount with an interest of 1% only after the developer has obtained all his construction money back (capital cost).

a- First calculate the operating headway (service frequency) in the am and pm peak. The am peak starts at 7:00 am and ends at 9:00 am while pm peak starts at 4:00 pm and ends at 7:00 pm. Assume that 2% of the total purchased vehicles will be staying in the garages every day for emergency and that each LRT train contains 4 vehicles, each with a design capacity of 120 persons. Assume equal headway for the first iteration of your calculations and you don't have to round headway to nearest minute. Next, if we want 3 minutes headway maximum at peak period on each line, how many additional trains should they buy in total.

b- Second calculate the headway of the LRT during the off-peak time. The LRT will open every day at 5:30 am and will close at night at 2:00 am where 20% of the vehicles should be in the garage for cleaning and maintenance during the off-peak period. Assume the same train configuration and headway requirements as part a.

c- Given the growth in ridership in 30 years, what will be the expected passenger load on each LRT train on each line during peak and off-peak periods? Assume demand on each line is the same (each line gets a demand that is equal to the total demand divided by 4) and off-peak demand is lower than peak by 18% of the total daily demand (but demand between each hour in the peak or off-peak period is equal). Check if the 200 purchased vehicles and the calculated recommended headway in section (a) will meet the expected demand in 2050.

d- Assuming a fare of $3.25 in 2021 that will increase by 1% every year, calculate the subsidy needed from the government per year so the developer can recover all his money in 30 years from the planning agency after the opening of the new service in 2021 (i.e. planning agency need to pay off all of developer's costs using the fare revenue and government subsidy). First give the average value of the subsidies needed for each year and then as a total by the end of the 30 years (assuming no inflation).

e- Calculate the average fare (during the 30 years period) that should be charged so that the annual fare box recovery ratio is 0.45 (i.e. the fraction of total expenses met by fare revenue in any given year is 45%). The rest will be paid using government subsidy.

f- Ridership forecasts are always subjected to errors, calculate the total subsidy needed from the government if the ridership projections provided for 2021 was overestimated by 10% (i.e. higher than actual by 10%). Ignore the farebox ratio.

g- The developer has been negotiating other payment schemes with the planning agency (i.e. not a yearly loan repayment).
The developer is planning on charging the planning agency 72 cents (without inflation) per passenger km based on the original ridership estimations (without the 10% in part f) to recover his capital costs. First calculate the amount that the planning agency would need to pay to the developer under this scheme each year. This amount, as well as the fare collected, would be used to pay off the developer's annual operating costs incurred by the developer as well as their capital costs of $2,670,000,000. Then, calculate in which year the developer would be able to pay off their capital costs under this scheme given that there is an 8% interest rate on any remaining capital costs left in each year.

Hints:

1- Use a mortgage calculator in excel
2- Number of trains needed for a route = circuit time/headway