

BEA522 -Rural Logistics

Syllabus

Description

Remote and rural areas present unique challenges in terms of logistics and transportation planning. Low densities of people, long distances, and difficult access conditions make logistics and transportation activities and, therefore, planning, quite different from planning and operations in cities and densely populated areas. For example, access to services and their timing and uncertainty could be much more important than capacity - the ship is never full, but **is** there a ship? **When?** Almost half the world's population lives in such areas, yet the existing literature does not well cover logistic and transportation issues related to rural areas.

The course focuses on issues and models related to planning logistics and transportation services in remote and rural areas, including the High North. Professors from Europe and Canada will lecture and discuss their research topics, and interact with students from several countries.

Course coordinators

- Marilène Cherkesly, GERAD and Université du Québec à Montréal, Canada
cherkesly.marilene@uqam.ca
- Julio C. Góez, NHH Norwegian School of Economics, Norway,
julio.goez@nhh.no

General information

- Location: NHH, Bergen, Norway.
- Time: July 31 – August 4, 2023.
- Each day, the students will attend two lectures of 3 hours with a coffee each. Additionally, at the end of each day, there will be 30-minute sessions for open discussions.
- Assessment: Students aiming to obtain the ECT credits recognized for taking the course must submit the final assignment.

Course Lecturers

- Marilène Cherkesly, GERAD and Université du Québec à Montréal, Canada
- Alessia Calafiore, University of Edinburgh, Scotland
- Julio C. Góez, NHH Norwegian School of Economics, Norway
- Mario Guajardo, NHH Norwegian School of Economics, Norway
- Ahmad Hemmati, University of Bergen, Norway
- Günter Prockl, Copenhagen Business School
- Stein W. Wallace, NHH Norwegian School of Economics, Norway

Course content and schedule

The course has six modules:

Module	Content coordinators
Introduction	Günter Prockl
15-minute cities in the urban-rural nexus	Alessia Calafiore
Logistics & transportation	Ahmad Hemmati
Digitalization in rural areas	Günter Prockl
Uncertainty	Stein W. Wallace
Healthcare and humanitarian logistics in underserved areas	Marilène Cherkesly
Collaborative logistics	Mario Guajardo
What is next?	Julio C. Góez

The emphasis will be on the issues and challenges that may arise when planning logistics and transportation in areas with a low density of people, long distances, and difficult access conditions. In that sense, the main goal is to let the applications drive the discussions and bring operations management and operations research principles to facilitate planning and operations. We will also discuss the issues and challenges associated with obtaining data the principles related to developing appropriate models, particularly when uncertainty has to be explicitly considered, and solving the problem and validating and implementing results.

The following table outlines the proposed schedule week schedule:

	Morning (9:00 – 12:00)	Afternoon (13:00 – 16:30)
Monday	Introduction: Rural Supply Chain Management	
Tuesday	Logistics & transportation (Social event starts at 15:00)	
Wednesday	Digitalization	Uncertainty
Thursday	Healthcare in rural areas	
Friday	Collaborative logistics	What is next?

Modules and sessions description

Introduction to Rural Supply Chain Management

Günter Prockl

Though supply chain management is well-established in business practice and academic research, it apparently shows an almost exclusive focus on (global) supply chains that operate based on large volumes and are dominated by large global actors. Concepts that relate to distribution and supply of consumers focus on larger metropolitan contexts. Accordingly, existing literature on the physical aspects of Rural Supply Chain Management (RSCM), i.e. rural logistics is typically reduced to challenges associated with a difficult or inferior rural context in contrast to larger scale actors and activities. The holistic claim of supply chain management and the corresponding added value is often hidden by a one-sided cost perspective. In this first module, we start with a basic introduction to different perspectives on the management of logistics and supply chain management. These different understandings of logistics vs. supply chain management are then augmented and transferred to the specific context of rural logistics and rural supply chain management. The resulting more holistic view leads hereby to the idea of a multidimensional framework that deals with four pillars of rural supply chain management: rural logistics, policy, community, and innovation. These dimensions are then addressed individually and deepened in terms of specific content in the subsequent modules of the course.

References

- Prockl, G.; Williger, B.; Tampe, M.; Vakulenko, Y.; Hellström, D.: Rural supply chain management: a multidimensional framework for future research in Europe, in: International Journal of Business and Systems Research, 15(2021)6, 701-726.

15-minute cities in the urban-rural nexus

Alessia Calafiore

In the wake of the Covid-19 pandemic, the idea of planning 15-minute cities gained momentum and was posited as a panacea to achieving more sustainable and liveable cities; but where does this idea come from? Is it a working planning solution in any context? What are the advantages and disadvantages of such an approach to urban design? In this lecture, we will try to answer these questions through a seminar and guided group discussions.

The seminar will introduce the academic debate around the 15-minute city and how the idea has been translated into city plans so far. It will also show how data-driven approaches to operationalise the concept can and have been applied to real world case-studies. Some of the most discussed limitations of the 15-minute city will be also introduced.

A discussion-based session will divide students in groups and provide them with a reproducible notebook to compute access to destination metrics and make maps to visualise the results. Each group will be asked to discuss the evidence found and think critically of what is mostly needed to achieve the ideals of a 15-minute city with a specific focus on the rural-urban nexus.

References

- Moreno, C., Allam, Z., Chabaud, D., Gall, C., & Pratlong, F. (2021). Introducing the “15-Minute City”: Sustainability, resilience and place identity in future post-pandemic cities. *Smart Cities*, 4(1), 93-111.
- <https://www.mdpi.com/2624-6511/4/1/6>
- Logan, T. M., Hobbs, M. H., Conrow, L. C., Reid, N. L., Young, R. A., & Anderson, M. J. (2022). The x-minute city: Measuring the 10, 15, 20-minute city and an evaluation of its use for sustainable urban design. *Cities*, 131, 103924.
- <https://www.sciencedirect.com/science/article/pii/S0264275122003638>
- World Economic Forum The 15-minute city meets human needs but leaves desires wanting. Here’s why. <https://www.weforum.org/agenda/2021/11/15minute-city-falls-short/>

Logistics & transportation

Ahmad Hemmati

Transportation and logistics are interlinked aspects of supply chain management. Transportation refers to the movement of people, and goods from one point to another with a variety of modes, from road and rail to air and water to pipeline and even space. Logistics, meanwhile, is defined as the part of supply chain management that plans, implements, and controls the efficient, effective forward and reverse flow and storage of goods, services, and related information between the point of origin and the point of consumption in order to meet customers' requirements.

The concept of rural logistics encompasses transport, distribution, storage, material handling, and the packaging of goods in rural areas, as well as the flow of information and funds in support of rural production and consumption. Rural logistics encompasses more than just the outbound flow of agricultural products from rural areas. It includes the movement of agricultural inputs and consumer products into rural areas, as well as the movement of light industrial goods produced in villages.

We will explore the supply of goods and services to and from rural environments where we should consider the specific configuration and design of logistics networks in a rural context. We will touch upon optimization challenges through case studies.

Digitalization and Rural Business Models

Günter Prockl

The ongoing digitalization also affects supply chains and logistics and thus represents a continuous challenge in the context of an urban-rural divide. The innovation of appropriate digital business model thus appears also essential for future developments of the rural space. Research and literature address this challenge with different assessments of chances of success and resulting normative recommendations. There is a “connectivity theme” whose proponents claim that growing differences in the quality of digital infrastructure between urban and rural areas are persistent and likely to grow even more. While in contrast an “inclusion theme” is taking also other pillars than just technology and (infra) structure of the rural pillar model more into account. Regardless of the point of view actually chosen, it is at least clear that business models that work in an urban context encounter different challenges in the rural context and have to meet different requirements and design options accordingly.

This teaching module addresses questions of business model configuration, especially at the interface between digitalization and related physical logistics. The focus is less on digital technology as such, but more on the embeddedness of the respective service providers and their competitive position within the rural business ecosystem.

References

- Leong, C.; Pan, S.; Newell, S.; Cui, L.: The emergence of self-organizing e-commerce ecosystems in remote villages of china: a tale of digital empowerment for rural development, in: MIS Quarterly, 40(2016)2, 475-484.
- Prockl, G.; Roeck, D.; Jensen, T.; Mazumbara, S.; Mukkamala, R.: Beyond Task-technology Fit: Exploring Network Value of Blockchain Technology Based on Two Supply Chain Cases, in: Proceedings of the 55th HICSS Conference.

Uncertainty

Stein W. Wallace

Almost all decisions are made under relevant uncertainty about the future. Some uncertainty is long-term and describes uncertainty about where we are headed – what we are making tactical or strategic decisions for. A typical example is investments in transportation infrastructure, where the investment will affect us far into the future. Other uncertainty is short-term, and it describes operational uncertainty that our tactical or strategic decisions must handle. An example is demand uncertainty, be that for passengers or goods, or maybe the weather. Both are relevant for rural logistics. The main focus in this lecture is to discuss how to think about these questions, how to approach modeling and data handling. A particular focus will be on what might happen if we try to use deterministic models to handle the uncertainty. What can go wrong?

Healthcare and humanitarian logistics in underserved areas

Marilène Cherkesly and Marie-Ève Rancourt

The course gives an overview of specific challenges encountered in providing healthcare and humanitarian services in rural and underserved areas, where conventional supply chains cannot effectively reach the most remote communities. We will discuss alternative network designs to overcome these challenges. Such networks lead to, among others, different planning, scheduling, and routing problems where mathematical programming can be applied to provide efficient solutions. An objective of this course is to understand the process of developing a mathematical model to support decision making in such a context. In the course, we will:

Part 1 (lecture)

- Provide a general introduction to problems related to healthcare and humanitarian logistics in rural and underserved areas.

Part 2 (group activity)

- Discuss the challenges to provide healthcare in underserved areas.
- Present how to develop alternative network design to facilitate access to healthcare and to provide humanitarian services in the context of rural and underserved areas.

- Determine which elements (e.g., stakeholders and objectives, physical infrastructure, equipment) should be considered to design the proposed networks.
- Formulate and present a mathematical model to support the design of the alternative networks.
- Illustrate the importance of developing alternative networks and specific mathematical models for a real-life application.

References

- Cherkesly, M., Rancourt, M. È., Smilowitz, K. R. (2019). Community healthcare network in underserved areas: design, mathematical models, and analysis. *Production and Operations Management*, 28(7), 1716-1734.
- Güneş, E. D., Melo, T., Nickel, S. (2019). Location problems in healthcare. In *Location science* (pp. 657-686). Springer, Cham.
- Kara, B. Y., Rancourt, M. È. (2019). Location problems in humanitarian supply chains. In *Location science* (pp. 611-629). Springer, Cham.

Collaborative Logistics

Mario Guajardo

Collaboration among different agents (companies, players) is an effective way to improve logistic operations. The improvements include, for example, cost savings, reduction of emissions, and increased service levels. The current state-of-the-art covers collaborative approaches for a variety of well-known problems such as the classic transportation problem, the traveling salesperson problem, and inventory pooling. A recent trend is to study such collaborative situations as cooperative games. In this part of the course, we will overview concepts, models, methods, and applications in the intersection of logistics and cooperative game theory. These include, for example, the use of linear programming to model stability conditions and to design cost allocation methods, and the use of integer programming to group players in coalitions. We will illustrate the relevance of cooperation in rural logistics by cases arising in Scandinavian regions.

What is next?

Students and lecturers, moderator: Julio C. Góez

The last half-day of the school is dedicated to an open discussion on what is coming or could come that could impact logistics and transportation in general and in rural regions in particular.

A list of topics will be set up by the lecturers. The students will be asked to form teams, and each team will be assigned a particular topic at the beginning of the week. Each team will then present its topic during the last period including why it is or might become important, challenges, dangers, and opportunities, as well as personal prediction of what is most likely to happen. An open discussion will then follow.

Course evaluation

The evaluation is a requirement for those planning to get recognition for the 5 ECTS credits the course may grant. It consists of an essay relating the topics to real cases. 15 – 20 pages. Those not planning to request the ECTS credits are not required to take the evaluation.