Successful Online Learning for Sustainable Last Mile Logistics

SUSMILE e-Learning Module & Adaptive Learning Kit
User Guide

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1 About the SUSMILE project

Since the breakout of Covid19 in 2020, Covid19 has entered our lives and disrupted education all over the world. Vocational Education and Training (VET) teachers and trainers have faced many challenges in responding to the teaching difficulties posed by the pandemic. The pandemic has also dramatically accelerated the need for modernisation and digital transformation of education and training systems across Europe. The VET sector, having an important practical and work-based component, has had even more difficulties to adapt than other levels of education.

The SUSMILE project addresses this need through the provision of effective, engaging, and inclusive teaching tools, materials, resources, and methods to ensure distance learning in the area of sustainable last mile logistics, providing continuous learner monitoring and evaluation.

According to the VET providers interviewed while setting up this project, there are currently not enough training materials about sustainable last mile logistics available for VET teachers to use in their learning processes. On the one side, VET providers face the challenge to provide real-market based education in their logistics courses; on the other side companies belonging to the logistic industry need to hire professionals who can work efficiently and sustainably in a fast-changing environment, and are aware of the national and European context in which they will work in. The idea of SUSMILE is grounded on the recognition that there is a lack of training materials and tools for distance teaching of topics covering sustainable last mile delivery.

The aim of SUSMILE has been to develop a MOOC (Massive Open Online Course) and related e-learning resources for VET providers to be able to train their students on new, practical and innovative concepts related to sustainable last mile logistics. The MOOC has been developed to be used as self-study-based e-learning or in the context of distance learning guided by a trainer or teacher. At the same time, it allows the teachers to create educational progress and individualised paths with the available modules.

To develop this open educational resource, two objectives has been set:

- To address initial and continuing education through the developed e-learning modules.
- To develop a Serious Game to deliver a non-formal learning tool to logistics students using the SUSMILE MOOC.

2 This document and structure of the SUSMILE MOOC

The scope of this document is to explain the rationale and structure behind the SUSMILE's massive open online course (MOOC).

Specifically, the e-learning modules of the SUSMILE project aim at complementing and completing curricular VET courses in logistics with subjects that are not normally covered, focusing on sustainable approaches and measures in the last mile delivery logistics. They also include motivations and goals to shift to sustainable last mile logistics, trends and scenarios in last mile logistics, EU framework concerning freight and logistics, and real-life case studies. The e-learning aims to be innovative in its content, up to date but also useful to develop a critical mind and promote sustainability in logistics, stimulating learners to think critically. The Serious Game draws on the learnings that students should have acquired from the e-learning.

The SUSMILE's MOOC is focused on sustainable Last Mile Distribution (LMD), is composed by two products or Intellectual Outputs (IO):

- IO1: It concerns the e-learning modules with static and adaptive kit of training materials.
- IO2: A Serious Game, aiming to allow learners to experience a simulated environment of a set LMD situation

This document aims to give detailed information about IO1, including the specific information about the knowledge that learners would acquire with this training material, its organization structure, units, methodology, and so on.

The first point to highlight is that IO1 has two Learning outcomes (LO):

- LO1: To organise last mile logistics flows in an urban context
- LO2: To apply sustainable approaches for Last Mile Delivery (LMD) Logistics

Learning outcomes are defined as (Cedefop, 2014):

(a) "statements of what a learner knows, understands and is able to do on completion of a learning process, which are defined in terms of knowledge, skills and competence"

(b) "sets of knowledge, skills and/or competences an individual has acquired and/or is able to demonstrate after completion of a learning process, either formal, non-formal or informal".

In total, fifteen sets of knowledge were identified and listed in the table below.

Table 1 Sets of knowledge in SUSMILE and Learning outcomes

Number	Description
LO1_K1	Last mile distribution within logistic environment
LO1_K2	Variety of product flows in the LMD ecosystem
LO1_K3	Main stakeholders involved in the LMD ecosystem
LO1_K4	Urban freight transport and LMD environment
LO1_K5	Professional behaviour of urban logistics operators
LO1_K6	Urban freight delivery modes

LO1_K7	Urban LMD distribution schemes
LO1_K8	Specific logistics trends for the LMD
LO1_K9	Information management in selected distribution schemes
LO1_K10	Effectiveness of LMD based on cost and service efficiency
LO2_K1	Introduction to Global Compact Goals and Corporate Social Responsibility
LO2_K2	Environmental impacts of LMD
LO2_K3	Social impacts of LMD
LO2_K4	Environmental goals and regulating bodies/agencies
LO2_K5	Strategies to reduce environmental impacts in LMD

In the next chapters, each learning outcome is detailed and further explained.

3 LO1: Organising last mile logistic flows in an urban context

After completing LO1, a student will have competences in the organisation of flows in last mile delivering, having a strong theorical knowledge presented in the sets below.

Each learning outcome will address different EQF level so it will be differentiated based on the target.

3.1 Sets of knowledge in LO1

Table 2 Sets of Knowledge in Learning Outcome 1 and EQF level involved

1	**Last mile distribution within logistic environment** (EQF 4-5-6): • Scope and definition (logistic, urban freight, LMD); • Characteristics and complexity of urban freight logistics (variety of classification – introduction to point 2-3-4-5-6)
2	**Variety of product flows in the LMD ecosystem** (EQF 4-5-6) • Express, courier and postal services • Retail • Hotel, restaurant and catering • Waste • Construction and road services
3	**Main stakeholders involved in the LMD ecosystem (EQF 4-5-6)** Presentation of stakeholders and interaction among each other: • supply chain actors (shippers, logisticians - 3PL, transport operators, urban couriers/drivers) • public authorities • customers / end users • resource supply stakeholders (infrastructure providers, infrastructure operators (managers), and landowners) • impactees (other traffic participants, city residents and city users, visitors / tourists) • Others (providers of vehicles, information technologies (IT) support systems and others)
4	**Urban freight transport and LMD environment (EQF 4-5-6)** 1. Sharing of public space a. Loading and unloading areas 2. Infrastructure characteristics: a. Consolidation centres: Urban consolidation centres and Micro-hubs b. Pickup points (Parcel lockers, shops, …) c. Construction Consolidation Centres d. Nearby Delivery Areas 3. Regulatory measures a. Time schedule, Weight …. b. Night delivery, ….
5	**Professional behaviour of urban logistics operators (EQF 4)** • Professional behaviour in contact with clients • Adaptation to clients' needs • Challenges of good communication • Handling of claims and complaints • Stress resistance

6	**Urban freight delivery modes** (EQF 4-5-6) • Internal combustion engine vehicles (trucks, light utility vehicles, …) • Low carbon and zero-emission vehicles (cargo bikes, electric vehicles, …) • Multimodal approaches
7	**Urban LMD distribution schemes (EQF 4-5-6)** • According to active parties in the sale (B2B, B2C, C2C) • According to the roles (transport/logistic operator, distributor, retailer, restaurant, e-commerce...) • According to the stock (volume), needs of the product and clients (delivery in 2 hours, 24h…)
8	**Specific logistics trends for the LMD** (EQF 4-5-6) • Traffic Congestion and conflicts in the use of space (e.g. roads, loading and unloading spaces) • Consumers' behaviour and expectations (e-commerce) • Regulations (City Road maps) • Evolution of technologies (i.e. IA, big data, blockchain, autonomous deliveries/ vehicles, drones, software, micromobility) • Impact of disruptive events on LMD (e.g. Covid19 pandemic)
9	**Information management in selected distribution schemes** (EQF 5-6)
10	**Effectiveness of LMD based on cost and service efficiency** (EQF 5-6)

3.2 LO1 Skills and competences

Upon completion of LO1, the students will have acquired the following skills and competences:

1. Distinguish logistics-related concepts in the urban area (EQF 4-5-6) in relation to knowledge set 1-2-3-4-5-6-7;
2. Identify delivery solutions adapting to each product flow (EQF 4-5-6) in relation to knowledge set 2-3-4-6-7;
3. Build up a basic scheme for LMD logistics according to the product flow (EQF 5-6) in relation to knowledge set 2-3-4-6-7;
4. Differentiate the stock management consequences for each product flow (EQF 4-5-6) relation to knowledge set 2-3-4-5-6-7;
5. Identify the most optimal transport solution according to the LMD service to display (EQF 4-5-6) in relation to knowledge set 2-3-4-6-7-8-9-10;
6. Evaluate feasibility of a set scenario (EQF 5-6) in relation to knowledge set 2-3-4-5-6-7-8-10.

3.3 LO1 Assessment criteria

In relation to each set of knowledge, a selection of assessment criteria was identified.

1.1. Explain the definition for each logistics term employed in LMD environment (EQF 4-5-6) 1.2. Determine appropriate term needed in a specific context (EQF 4-5-6)
2.1 Identify the flows in an urban context (EQF 4) 2.2. Extrapolate information based on the urban context and apply them to LMD planning (EQF 5-6)
3.1. Select the right options among actors and infrastructures to satisfy a specific delivery objective (EQF 4-5-6) 3.2. Justify the choices from distributor's warehouse to final customer, for each step of the delivery scheme (EQF 5-6)

4.1. Identify a minimum stock requirement for a set delivery objective (EQF 4-5-6) 4.2. Determine the right stock management method to prevent stockout (EQF 5-6) 4.3. Estimate a stock capacity requirement for LMD operations, for a set scenario (EQF 5-6)
5.1. Identify and select most adapted skills required from a logistician when working in LMD environment (EQF 4-5-6) 5.2. List existing challenges that LMD logisticians face when dealing with other stakeholders upon delivery conditions (EQF 4-5-6)
6.1. Identify different delivery modes adapted to LMD operations (EQF 4-5-6) 6.2. Define each mode's advantages and disadvantages (EQF 4-5-6) 6.3. Estimate transport mode and number to satisfy LMD service on set product needs (EQF 5-6)
7.1. Build-up a Drivers' rotation planning in respect of legal working hours (EQF 4-5-6) 7.2. Identify alternatives to optimize service availability (EQF 5-6)
8.1. List a few examples of technologies that will directly impact LMD logistics in the next 5-10 years (EQF 4-5-6) 8.2. Formulate advantages and disadvantages for each LMD trends currently known (EQF 5-6)
9.1. Breakdown the key communication steps among actors implicated into LMD operations (EQF 5-6) 9.2. Select appropriate information that will be required to operate as logistics operators in LMD (EQF 5-6)
10.1. Identify all cost-related aspects of a LMD transport operation (EQF 4-5-6) 10.2. Set accurate breakdown costs for a LMD operation (EQF 4-5-6) 10.3. Determine rentability of LMD operation on a set simulation and volume of activity (EQF 5-6)

4 LO2: Applying a sustainable approach to Last Mile Delivery

After completing LO2, a student will have competences to use a sustainable approach to Last Mile Delivery. The student will have a comprehensive understanding of corporate social responsibility, sustainable development goals, the environmental and social impacts of last mile delivery. The student will understand which regulating bodies/agencies operate at national, regional and local level, and will be able to identify environmental reduction strategies in LMD.

Each learning outcome will address different EQF level so it will be differentiated based on the target.

4.1 Sets of knowledge in LO2

1	**Introduction to Global Compact Goals and Corporate Social Responsibility (CSR)** (EQF 4-5-6) • Definition of Sustainability and Sustainable Development • Sustainable Development Goals • Doughnut Economics • Corporate Social Responsibility • European Green Deal
2	**Environmental impacts of LMD** (EQF 4-5-6) • Pollution and climate change (air emissions, air pollution, noise) • Measurement and indicators linked to environmental sustainability and environmental performance (EQF 4-5-6) • Reverse logistics environmental impacts of: i. Postal services ii. Waste iii. Retail (e-commerce) iv. Construction v. Ho.Re.Ca. (Hotel, restaurants, etc.)
3	**Social impacts of LMD** (EQF 4-5-6) • Customers' expectations and requests (incl. the effects of always shorter delivery times) • Reverse logistics (EQF 4-5-6) • Attractivity and working conditions of LMD jobs (Working conditions) • Social utility of LMD for society (vaccines distribution, primary needs secured distribution)
4	**Environmental goals and regulating bodies/agencies** (EQF 5-6) Environmental targets at EU level, at national level, at local level
5	**Strategies to reduce environmental impacts in LMD**(EQF 5-6) • Logistic operations: optimisation of logistic operations (loading & trips, reduction of trips (trip frequency), cooperation of companies/partners + Sustainable business case studies) • Drivers: Impacts of urban drivers' behaviours • Technology: better technology existing technologies & trends + *Sustainable business case studies* • Energy change (energy change & impact on the environment) • Circular economy: • Packaging solutions and sustainability • Reverse logistic) pooling • *Sustainable business case studies* • Consumer: Raising consumers' awareness *about the impact of their consumption behaviour* • Regulations (LEZ, ….)

4.2 LO2 Skills and competences

- Understand the impact of sustainable development goals on LMD (EQF 4-5-6) in relation to knowledge set K1-2-4-5
- Identify measures to reduce the environmental impact of LMD (EQF 4-5-6) in relation to knowledge set 1- 2-5
- Identify customer's constraints and requirements linked to sustainable environmental approaches for LMD (EQF 4-5-6) in relation to knowledge set 2-3-5
- Identify main social indicators related to LMD operations (EQF 5-6) in relation to knowledge set 3-5
- Identify proper regulating bodies in terms of environment protection and their competences (EQF 5-6) in relation to knowledge set 4
- Evaluate the feasibility of a solution among a set of scenarios to operate LMD with a reduced environmental impact (EQF 5-6) in relation to knowledge set 2-3-5

4.3 LO2 Assessment criteria

1.1 Relate to historical events and appropriate lexicon when presenting the current environmental targets and Corporate Social Responsibility (CSR) (EQF 4-5-6) 1.2. Determine appropriate use of terms or regulations when related to enterprise's sustainability term needed in a specific context (EQF 4-5-6) 1.3. Clarify why LMD operations can impact specific sustainable development goals (EQF 4-5-6)
2.1. Identify key customer requirements that have an impact on the environment (EQF 4-5-6) 2.2. Determine environmental impact of each LMD transport mode presented (EQF 4-5-6)
3.1. List all LMD known consequences on current social working conditions (EQF 4-5-6) 3.2. Identify existing alternatives to improve social conditions of LMD operations (EQF 4-5-6)
4.1. Select the right regulating body according to its level of influence toward the LMD environment (EQF 5-6) 4.2. Identify reliable and official sources of information with regards to environment regulations (EQF 5-6)
5.1. List qualitative sustainability impacts of a set scenario related to LMD operations (EQF 5-6) 5.2. Suggest operational alternatives to a set scenario to improve its sustainability within an acceptable budget range (EQF 5-6) 5.3. Point at existing or prospective technologies that could provide alternative and sustainable output to operations in a set scenario (EQF 5-6)

5 Structure of the e-learning Modules

The e-learning Modules is structured in two learning outcomes, those in three chapters, the chapters in units and the units in capsules, which can be of four types.

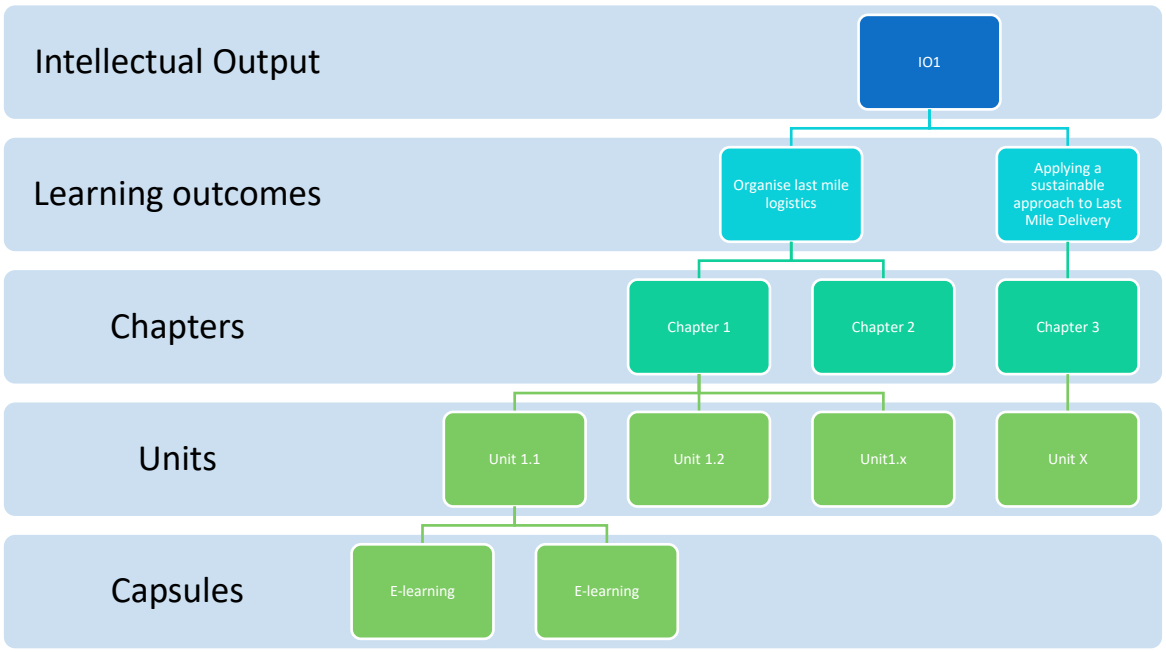

Figure 1 Structure of the SUSMILE e-learning

In the next paragraphs, the meaning of each item in the e-learning of SUSMILE will be explained, in relation to the sets of knowledge and learning outcomes of SUSMILE.

5.1 Contents of each Chapter

There are 3 chapters in IO1. The knowledge involved in each one are:

Chapter 1 The environment of Last Mile Distribution logistics
1.1 Last mile distribution within logistic environment
1.2 Variety of product flows in the LMD ecosystem
1.3 Main stakeholders involved in the LMD ecosystem
1.4 Urban freight transport and LMD environment
2.4 Environmental goals and regulating bodies/agencies
Chapter 2: LMD logistics operations and impacts
1.1 Last mile distribution within logistic environment
1.4 Urban freight transport and LMD environment
1.6 Urban freight delivery modes (EQF 4-5-6)
1.7 Urban LMD distribution schemes (EQF 4-5-6)
1.8 Specific logistics trends for the LMD (EQF 4-5-6)
2.1 Introduction to Global Compact Goals and Corporate Social Responsibility (CSR) (EQF 4-5-6)
2.2 Environmental impacts of LMD (EQF 4-5-6)
2.3 Social impacts of LMD (EQF 4-5-6)

Chapter 3: Trends for more effective LMD logistics
1.2. Variety of product flows in the LMD ecosystem (EQF 4-5-6)
1.5. Professional behaviour of urban logistics operators (EQF 4)
1.8. Specific logistics trends for the LMD (EQF 4-5-6)
1.9. Information management in selected distribution schemes (EQF 5-6)
1.10. Effectiveness of LMD based on cost and service efficiency (EQF 5-6)
2.2 Environmental impacts of LMD (EQF 4-5-6)
2.5. Strategies to reduce environmental impacts in LMD (EQF 5-6)

5.2 SUSMILE E-learning Chapters

In the following figures, each chapter is represented with its units and capsules.

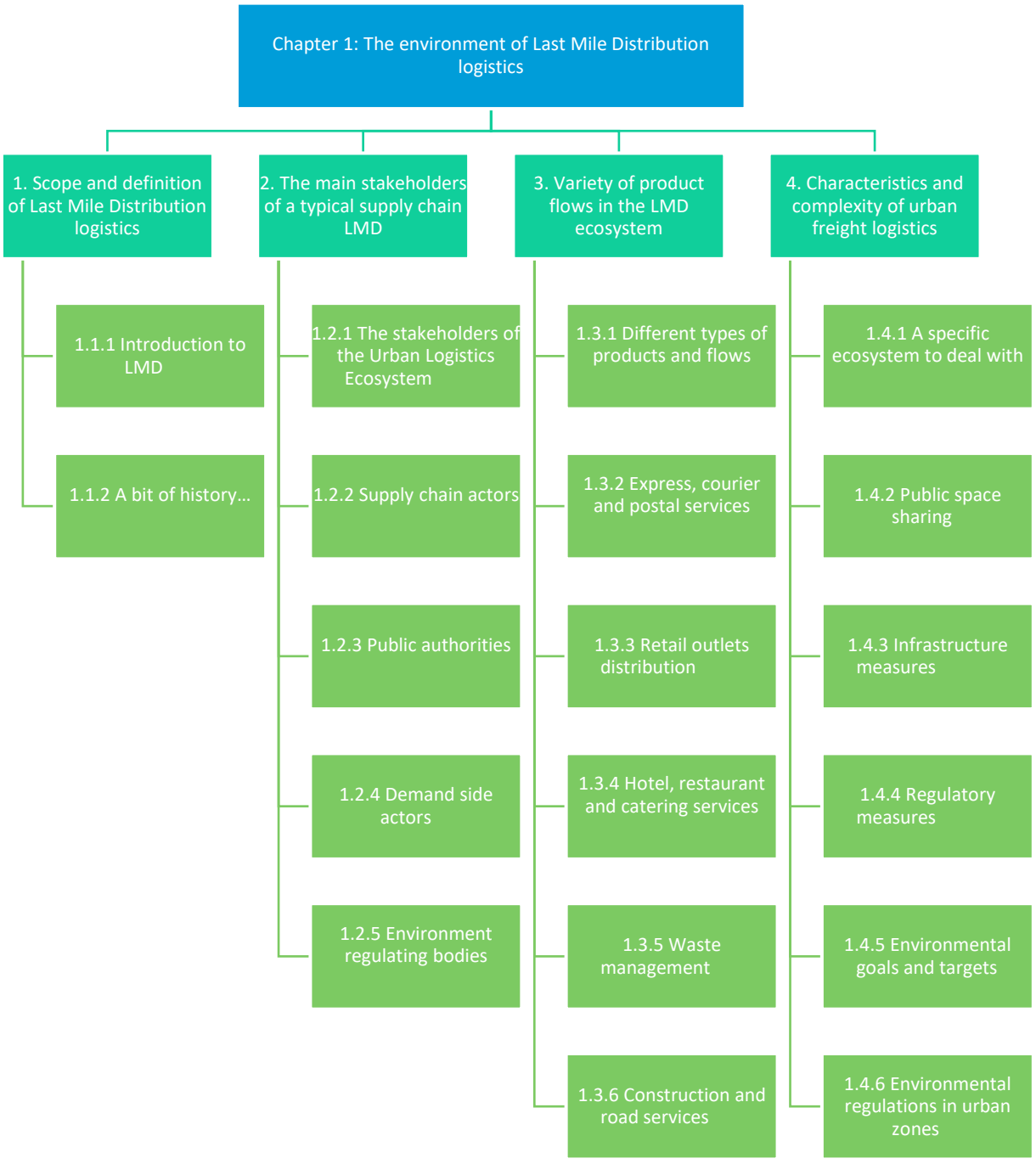

Figure 2 Chapter 1 of SUSMILE e-learning module

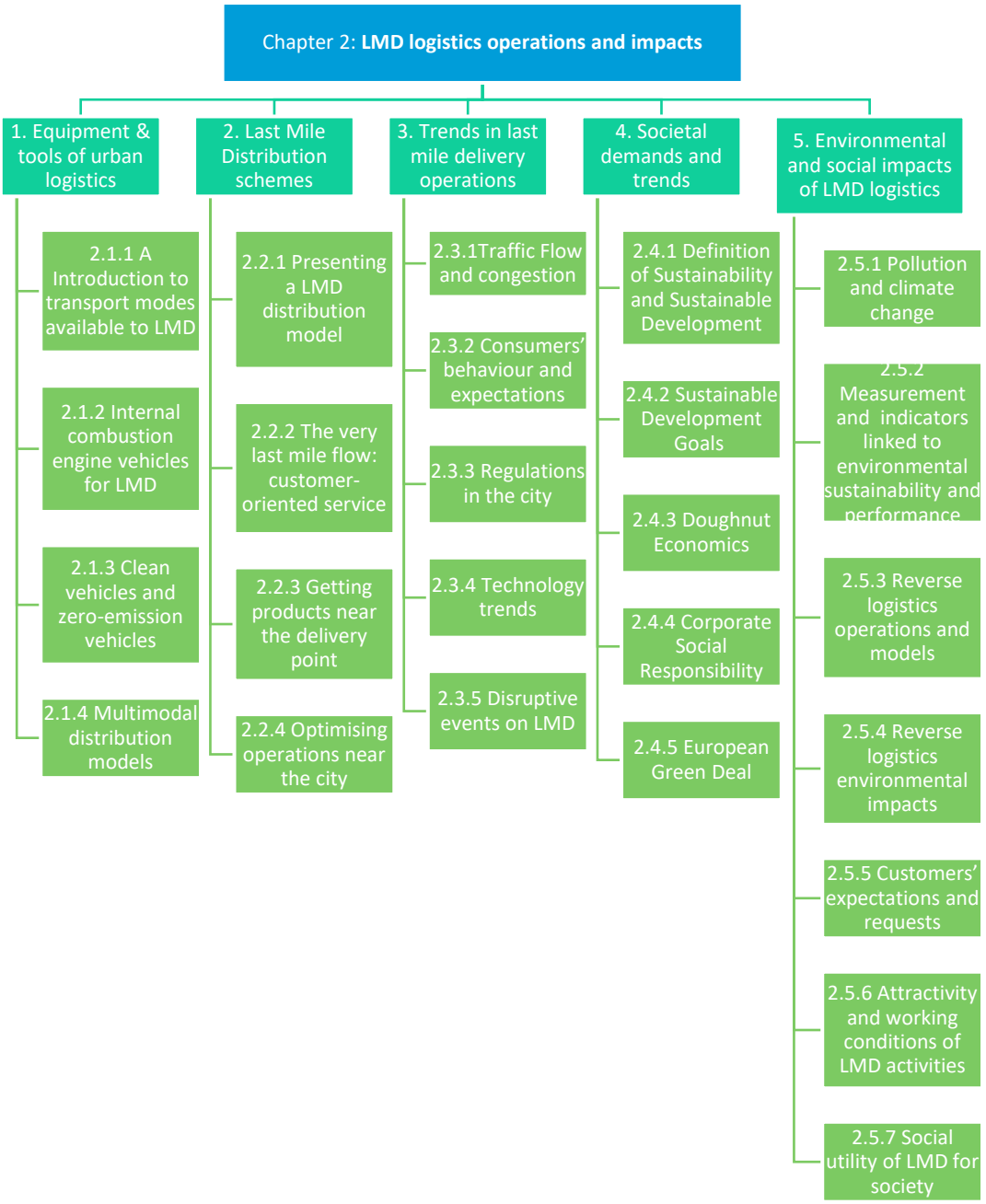

Figure 3 Chapter 2 of SUSMILE e-learning Module

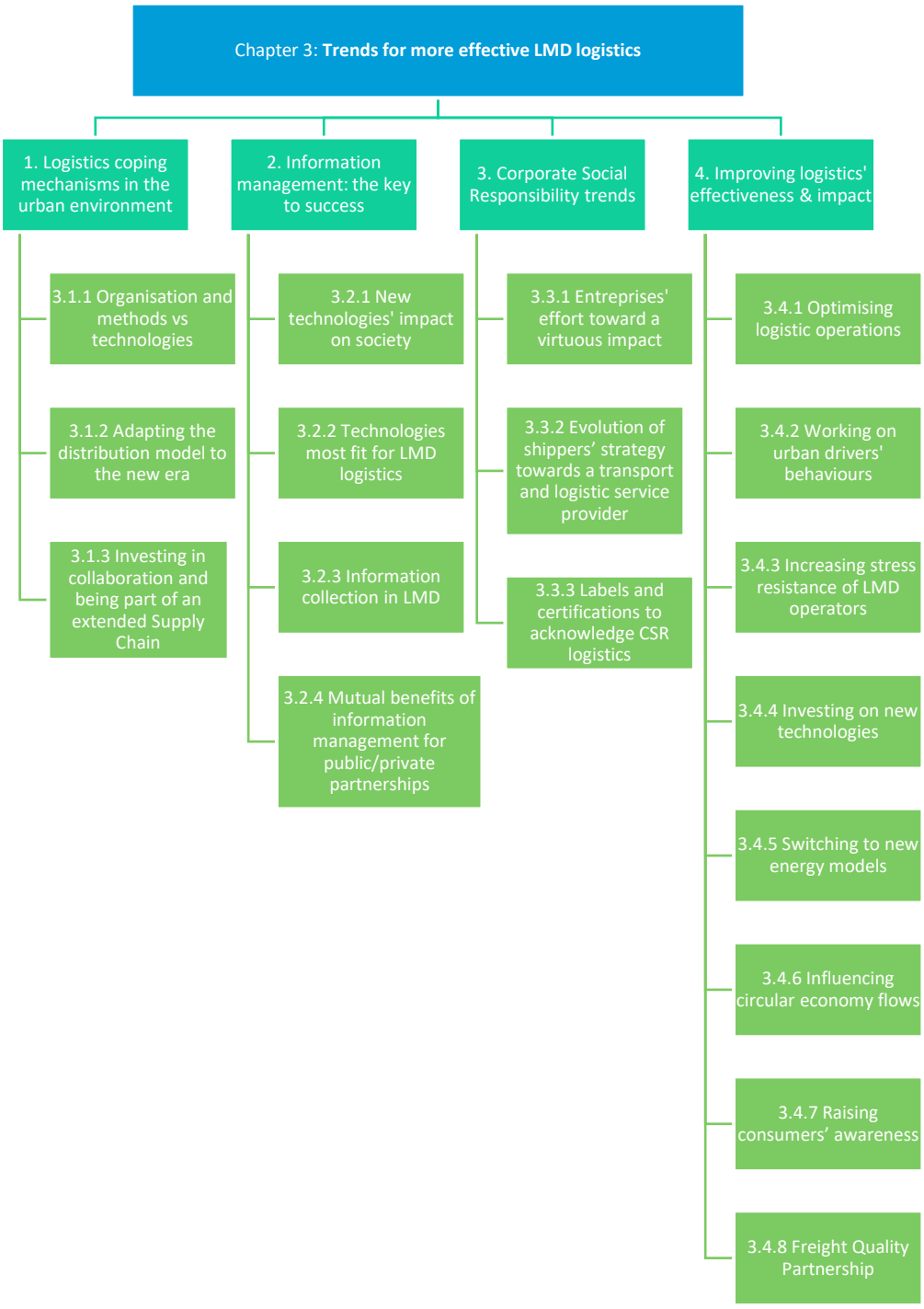

Figure 4 Chapter 3 of SUSMILE e-learning Module

6 Capsule development

It is important to detail the nature of the capsule. In fact, capsule can be of four different types and content:

- **E-learning category capsule**:

It is a training material developed by SUSMILE Consortium, to bring a dedicated "learning content" to students in Last Mille Delivery (LMD). Through this capsule, less dynamic knowledge of last mile delivery is exposed and normally are the most extended capsules.

- **Document, source category capsule**:

In this case, the SUSMILE Consortium use thirds parties document or sources to explain a specific topic linked to LMD. In this way, at the beginning of the capsule instructions are included about the number of sources included in the capsule, and about their objectives. Also, a summary of the document or source it is included, but if the student wishes to delve into the subject, he/she must browse the web pages that are proposed, or read in detail the documents that have been chosen.

As contents can evolve over time, has been tried to use primary sources.

- **Conference, interview category capsule:**

With the idea that the contents are internalized in the most practical and natural way possible, it is proposed to have the participation of different experts of the area, so that they can present their point of view. In this sense, instructions are given to organise these conferences, or some carried out by the consortium itself are included.

- **Practical activity category**

The practical exercises always come at the end of the chapter. There will be 2 per chapter to test students over the content that has been displayed. Each practical activity has exercises for two students' level: EQF 4 and EQF 5/6.

7 Glossary

Term	Definition
Capsule	A "Capsule" of the MOOC is the lowest sub-section, part of a Unit to further clarify a specific point. A "Capsule" may vary in format as to appear as an e-learning module, a document, a video, etc. See E-learning
Chapter	A "Chapter" of the MOOC is a general section in which we will develop a topic.
Competences	The proven ability to use knowledge, personal, social and methodological skills in a work or study environment and also for professional and personal development. In the context of the EQF, competence is described in terms of responsibility and autonomy. (European Council, 2017)
Digital competences	Involves the confident, critical and responsible use of, and engagement with, digital technologies for learning, at work, and for participation in society. It includes information and data literacy, communication and collaboration, media literacy, digital content creation (including programming), safety (including digital well-being and competences related to cybersecurity), intellectual property related questions, problem solving and critical thinking.
e-commerce	Electronic Commerce (EC): Also written as e-commerce. Conducting business electronically via traditional EDI technologies, or online via the Internet. In the traditional sense of selling goods, it is possible to do this electronically because of certain software programs that run the main functions of an e-commerce website, such as product display, online ordering, and inventory management. The definition of e-commerce includes business activity that is business-to-business (B2B), business-to-consumer (B2C)[1].
E-learning[2] module	An e-module has no more than one or two learning concepts and incorporates a blend of teaching and assessment tools that may include video clips, direct instruction, gaming elements and social media. See Capsule
EQM	European Qualifications Framework

1 Council of Supply Chain Management Professionals. Glossary https://cscmp.org/CSCMP/Educate/SCM_Definitions_and_Glossary_of_Terms.aspx

2 https://www.unmc.edu/elearning/resource-center/emodules.html#:~:text=An%20e%2Dmodule%20is%20a,gaming%20elements%20and%20social%20media.

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Knowledge	The result of processing information through learning. Knowledge is the totality of facts, principles, theories and practice in a work or study environment. In the European Qualifications Framework knowledge is described either as theoretical or factual. (ECVET Glossary)
Learning outcomes	Statements of what a learner knows, understands and is able to do on completion of a learning process defined in terms of knowledge, skills and competence. (ECVET Glossary)
LMD	Last Mile Delivery
MOOC	Stands for "Massive Open Online Course," a type of course that is completely delivered online, is open to be accessed by anyone without cost, entry qualifications or other restrictions; participant numbers are often high. These courses can have in-person components, e.g., encouraging local participant meetings, and formal assessment, but tend to use peer review, self-assessment and automated grading. There are many variations of MOOCs, focused on specific sectors, target groups (e.g., vocational focus, teachers, etc.) or teaching methods. MOOCs funded under Erasmus+ must be open to all and both the participation and a certificate or badge of completion are free of charge for participants. The open access requirement for educational resources applies also to MOOCs and other complete courses.
Skills	It is the ability to apply knowledge and use know-how to complete tasks and solve problems. In the European Qualifications Framework, skills are described as either cognitive (logical, intuitive and creative thinking) or practical (involving manual dexterity, applying and using learned methods, materials, tools and instruments) (European Council, 2017)
Unit	A “Unit” of the MOOC is a sub-section of a Chapter, in which we will decompose key messages to explain the elements of the topic.
VET	Vocational Education and Training