REthinking and FOstering Competence and skills for sUstainable transport, Shipping, and logistics

REFOCUS

D3.1 – New Curriculum co-designed as an output of the learning Communities of Practice (CoP).

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Executive Summary

REFOCUS (REthinking and FOstering Competence and skills for sUstainable transport, Shipping, and logistics) is an ERASMUS + project in higher education aimed at co-designing a future-oriented curriculum and innovative training material on sustainability and climate resilience for transport, shipping, and logistics sectors. Through the application of an innovative, engaging design-thinking approach, REFOCUS aims to stimulate innovative learning and teaching practices, ensure inclusiveness and accessibility to education and training, and raise awareness about climate change among students from different backgrounds and disciplines.

REFOCUS is organised in 5 Work-Packages (WPs). The sequence of the WPs follows a design-thinking approach (Empathize & Define – WP2, Ideate and Prototype – WP3, Test – WP4) integrating “Transition” and “Human-Centered” Design. Each WP is led by a different participating organization (WP1 - UAegean, WP2 -Cambiamo, WP3 - TUDelft, WP4 - UAntwerp, WP5 - ACG-RC), while all six participating organizations lead at least one task.

The REFOCUS project recognizes the growing importance of MOOCs in delivering accessible and inclusive education. It acknowledges the challenges faced by learners from disadvantaged backgrounds, including islanders and low-income groups with limited access to technology. These limitations can significantly hinder their ability to participate in traditional educational programs.

Deliverable 3.1 “New Curriculum co-designed within the learning Communities of Practice (CoP)” is related to Task 3.1, led by UAegean. UAegean is responsible to coordinate the preparation of the courses’ metadata for the six MOOC courses, based on the input received from WP2 [REF-01][REF-02][REF-03]. The input received from WP2 informs the development of the MOOC courses' metadata. This ensures alignment with the project's overall objectives and the learning needs identified within the Learning Communities of Practice (CoPs).

Deliverable Leader (organisation)	UAegean
Contributors (names & organisations)	UAegean, TUDelft, UAntwerp, ACG-RC, CambiaMo, Andaira
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1.0	20-03-2024	UAegean	Final version

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Definitions, Acronyms and Abbreviations

Acronym/Abbreviation	Title
REFOCUS	REthinking and FOstering Competence and skills for sUstainable transport, Shipping, and logistics
UAEGEAN	PANEPISTIMIO AIGAIOU
CAMBIAMO	CAMBIAMO SOCIEDAD COOPERATIVA MADRILENA
Andaira	Andaira S.Coop.Mad
ACG	The American College of Greece Research Center
TUDELFT	TECHNISCHE UNIVERSITEIT DELFT
UANTWERP	UNIVERSITEIT ANTWERPEN
WP	Work Package
MOOC	Massive Open Online Course
FCH	REFOCUS Competence Hub

1 Introduction

REFOCUS is an ERASMUS + project in higher education that through an innovative, design-thinking inspired approach aims at developing a future-oriented curriculum and new training material for transport, shipping and logistics that leads to a micro-credential-based certification. REFOCUS, through the creation of learning Communities of Practice (CoP), connects people (learners and educators), companies and public authorities (labour market and policy actors), but also NGOs and more societal stakeholders, while sharing ideas, knowledge, and experiences to understand existing needs and determine future orientations. Following the guidelines presented in [REF-01], REFOCUS CoPs have been organised in 4 European countries (Madrid - Spain, Antwerp - Belgium, Greece, where both the region of the Aegean islands and Athens were involved, and Delft - The Netherlands) to engage students, educators, business representatives, climate change experts and NGOs. Each of the 4 REFOCUS CoPs has held three online meetings between April and July 2023 and a final common transnational CoP, also online, in September 2023.

In the REFOCUS (REthinking and FOstering Competence and skills for sUstainable transport, Shipping, and logistics) project, a new approach to education is explored. This approach emphasizes understanding and valuing students' diverse backgrounds and characterized by inclusivity and participatory. As broadly acknowledged today, appropriate education responses to climate change are needed to provide both educational resources and relevant knowledge and skills.

Within this framework, UAegean has been tasked to coordinate the preparation of the courses' metadata for six MOOC courses, based on the input received from WP2. MOOCs have become a prominent method for delivering education in a more accessible and inclusive manner. These courses eliminate traditional enrollment restrictions and geographical barriers, fostering a wider approach to education. Learners can engage with the material at their own pace. MOOCs often incorporate a variety of multimedia elements, making the content more inclusive for diverse learning styles and represent a significant step forward in creating a more inclusive and accessible educational landscape.

REFOCUS ideates and co-designs within the learning community the new curriculum and prototypes the training material that is used in six training courses aiming to cover contemporary issues (sustainability, resilience, digitalisation, green operations) of the considered sectors. The developed courses are tested through an iterative evaluation process including digital and physical sessions, while four training events take place.

The outcomes of the project become available to a wider audience through the REFOCUS Competence Hub (FCH) and is presented in multiplier training events in Madrid, Spain and in Chios, Greece. Specifically, REFOCUS aims to foster competence and skills through multidisciplinary training.

The objectives of the REFOCUS project are to:

- Identify student learning needs and align them with labour market needs, as well as with the EU goals for sustainability, resilience, inclusiveness, and equity.
- Improve the skills and knowledge of trainers/educators concerning sustainability and climate change.
- Engage in an interactive co-design process with educators, societal stakeholders and learners and develop training material that can be used for facilitating collaborative online learning (e.g. group discussions; group online activities) and research-based

learning (e.g. case studies, problem-based learning) targeting individuals coming from disadvantaged environments.
- Engage participants coming from disadvantaged environments and improve their skills and competences so that they can increase their employability.
- Develop an online educational hub FCH where MOOC courses will be accessible to learners through interactive tools in a synchronized or asynchronous way to be more inclusive for islanders and low-income groups with lower technological resources, in line with the frugal innovation paradigm.
- Develop a transdisciplinary learning space, the learning Communities of Practice (CoP), where students can learn from different educators, from academic and real-life world and create knowledge for the challenging climate change issues.
- Assess the effectiveness of the courses and establish a seamless and continuous communication among learners, educators, and industry for co-designing new future-oriented curricula.

The consortium of REFOCUS includes 6 partners from 4 European countries: (1) University of the Aegean (project coordinator, Greece) (UAEGEAN), (2) University of Antwerp (Belgium) (UANTWERP), (3) The American College of Greece Research Center (Greece) (ACG), (4) CAMBIAMO non-profit organisation (Spain) (CAMBIAMO), (5) Andaira cooperative company, (Spain) (ANDAIRA) (6) Delft University of Technology (The Netherlands) (TU DELFT).

1.1 Objectives and results of WP3

The specific objectives of WP3 “Co-design New Curricula (Ideate) and Develop Training Material (Prototype)” are to:

- Prototype the training material that will be used for facilitating collaborative online learning (e.g. group discussions; group online activities) and research-based learning (e.g. case studies, problem-based learning) targeting individuals coming from disadvantaged environments. Specifically, a future-oriented co-designed curriculum will be designed based on which six courses addressing contemporary issues of transport, shipping and logistics will be developed. The curriculum will be developed by applying an innovative approach - will emerge through the iterative process of the learning Communities of Practice (CoP) - that will be student-centric, while at the same time will meet the labour market needs. A tentative list of the courses titles is the following: 1) C1: Sustainability, Resilience and Equity, 2) C2: Big Data Analytics and Blockchain in Transport, Shipping and Logistics, 3) C3: Enabling climate neutral, clean, smart, and competitive waterborne transport, 4) C4: Safe, resilient transport and smart mobility services for passengers and goods, 5) C5: Collaboration and Sharing in Decarbonizing Transport and Logistics Systems, 6) C6: Ports in transition.
- Assess the effectiveness of the courses and establish a seamless and continuous communication among learners, educators and industry for co-designing new future-oriented curriculum. The effectiveness of the courses will be assessed online through homework, quizzes, puzzle games, etc.
- Develop an online educational hub where MOOC courses will be accessible to learners through interactive and storytelling tools in a synchronized or unsynchronized way to be more inclusive with islanders and low-income groups with lower technological resources. The hub will allow for exchange of data among the participating bodies, facilitate an open scientific discussion arena and ensure sustainability of the networking even after the completion of the project.

Leader of WP3 are TUDelft. Main participants: UAegean, ACG-RC, UAntwerp. The main tasks (T) and results (deliverables, D) of WP3 are the following:

- **T3.1: New Curriculum co-designed as an output of the learning Communities of Practice (CoP).** Task leader: UAegean. Description: UAegean will be responsible to coordinate the preparation of the courses' metadata for the six MOOC courses, based on the input received from WP2.
- **T3.2: Develop six MOOC courses addressing issues of transport, shipping and logistics.** Task leader: TUDelft. Description: TUDelft will be responsible to coordinate, monitor and report the development and digitalization of the teaching material. Each course will be developed by the respective responsible partner (C1 and C2 by UAegean, C3 and C4 by ACG-RC, C5 by TUDelft, C6 by UAntwerp).
- **T3.3: Develop 12 online assessment forms (two per course).** Task leader: TUDelft. Description: TUDelft will be responsibleto coordinate, monitor and report the development and the digitalization of the self-assessment forms/tests. Each form/test will be developed by the respective courses' responsible partner. The forms/tests give the opportunity to the user to check his/her understanding of the specific theme. The self-assessments will not be time-limited and the user could use any materials. The type of tests depends only from authors, but according to specification, the answer should be checked automatically by the Moodle platform (see Task 3.4).
- **T3.4 One online life-long educational knowledge sharing hub – REFOCUS Competence Hub.** Task leader: ACG-RC. Description: ACG-RC will be responsible to develop an e-platform to provide public access to the materials developed in T3.2 and T3.3. The e-platform is based on learning management system (LMS) Moodle. The content of digitalized courses will be developed based on Moodle standard tools, with use of iSpring software for producing sharable content object reference model (SCORM) packages, which allows integrating the presentation and narration in one user-friendly environment.

The main results of WP3 are the following:

D3.1: New Curriculum co-designed as an output of the learning Communities of Practice (CoP) | Following the "constructive alignment" principle of SRH (SRH Fernhochschule – The Mobile University), the curriculum is to be developed originating from the intended learning outcome, its consequential type of examination and in line with the corresponding students' activities. (Task 3.1)

D3.2: Develop six MOOC courses addressing issues of transport, shipping and logistics. While lifelong learning is a personal process following personal goals, lifelong education is an institutional fact, arising from educational offers and experiences. To intentionally enable lifelong learning in form of distance learning offers, besides technical conditions, the learning content needs to be organised and provided in a suitable format. The most common format for organising elearning content are MOOCs (Massive Open Online CourseS). (Due date: 31 July 2024 – Task 3.2)

D3.3: Develop 12 online assessment forms (two per course). | There are many question formats for self-assessment. Before actually developing the assessment forms a list of recommended question formats along with their characteristics will be drafted, i.e. True/False, Multiple Choice, Multiple Responses, Matching, Ordering, Fill-in the blanks, Short answer/Short essay, etc. (Due date: 31 July 2024 – Task 3.3)

D3.4: One online life-long educational knowledge sharing hub – REFOCUS Competence Hub. | Before developing the REFOCUS FCH e-learning approach, a state of practice review will be done to get an overview of existing e-learning approaches at well-known or partner universities from consortium as well as

universities, who received EU-funding for the development of distance learning offers. (Due date: 31 August 2024 – Task 3.4)

1.2 Aim and structure of deliverable D3.1

This document is the first deliverable of WP3 and its scope is to provide the REFOCUS course material of the courses' metadata for the six MOOC courses, based on the input received from WP2.The material of each course was filled in by the responsible lecturer of the course.

Following the introductory section, the subsequent sections include the six courses' metadata developed for the program.

1.3 Courses

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Several themes have been suggested by the participants of the REFOCUS CoPs to address current issues such as sustainability, resilience, digitalisation and green operations in future-oriented curricula of the transport, shipping and logistics sectors, as documented in Deliverable D2.2 [REF-02] which are summarised as:

- Opportunities of the energy transition leading to higher sustainability
- Impacts assessment and balance of functionality, efficiency, effectiveness
- Policy and legal framework. Legislation and regulation, focusing on sustainability goals
- Climate change and concept of sustainability, with an interdisciplinary approach
- Risks of innovation (positive and negative consequences)
- Real-life knowledge
- Holistic approach in impact assessment
- Environmental Social Governance (ESG) factors for a sustainable future
- Integration as a central concept in promoting sustainability
- Gender, ecofeminism and social perspectives
- Circular Economy
- Requirements of transport-related projects
- Changing the narrative to emphasises the benefits of sustainable habits over the losses from giving up unsustainable practices
- Environmental and gender assessment

From this list, there was overall agreement on the inclusion of some topics in the curricula: policy, legal and regulatory frameworks; Environment, Social and Governance (ESG) factors; the concept of sustainability (and relation to the UN Sustainable Development Goals, SDGs); gender and social factors; real-world applications or case studies showing interdisciplinarity, engagement, collaboration, holistic approaches. These topics represent crucial perspectives to advance in sustainability, resilience, digitalisation, and green operations, and would be recommended as transversal elements to be addressed in all six courses, elaborating them within the scope of each specific course.

According to the CoP results, and given that courses are linked to each other rather under a common umbrella, it is recommended that courses elaborate a common narrative which uses shared language and key words. This would facilitate a better understanding of course contents, keeping track of the views of CoP participants as to what are the crucial aspects to address in the courses. Besides, CoP outcomes recommend that courses follow a participatory methodology relying on these pillars:

- Immersive learning experiences, such as field visits where the impact of climate change is observed;
- Role play, to understand the perspective of the different actors involved in the ecosystem and how they impact them;
- Teamwork, to encourage collaborative work in groups to achieve a common goal or to complete a common task.

For the online educational hub to fully realize its potential, achieving inclusivity is critical. This is especially true for learners facing geographical or economic limitations, such as those residing on islands or belonging to low-income groups with restricted access to technology. One key strategy to ensure inclusivity within the MOOC courses is the utilization of storytelling techniques. By incorporating compelling narratives, relatable characters, and engaging scenarios, the learning experience becomes more captivating and fosters a deeper understanding of the material. This approach caters to a wider range of learning styles, promoting information retention and ultimately leading to a more successful learning for all participants.

The review conducted in WP2 and documented in Deliverable D2.3 [REF-03] on contemporary teaching methods, the recording of the teaching needs for climate change knowledge, skills and awareness, as well as the review of existing programs related to Transport, Shipping and Logistics with a focus on technological advancements and fighting climate change, set the ground for the development of a curriculum tailored to address contemporary issues such as sustainability, resilience, digitalization, and green operations within the realms of transport, shipping, and logistics sectors.

The curriculum is expressed through the organization of six courses. The courses' titles and descriptions are as follows:

C1: Sustainability, Resilience and Equity: aims to introduce participants to the pressing matters of environmental sustainability and resilience and transport equity. Course includes strategies and policy goals in an EU-wide analysis, with specific direction and state-of-the-art research presentations. Success stories (successful applications in European cities), as well as, innovative research goals (e.g. inclusive transport, improved accessibility, resilience to pandemics and disruptive events) will be presented.

C2: Big Data Analytics and Blockchain in Transport, Shipping and Logistics: The unprecedented generation and collection of data reveals new pathways for analytics in transport, shipping, and logistics. This course presents the most common, novel methods and tools for data analytics using data mined from social media, sensors, mobile devices, user-generated content and data, GIS and location data, live streaming data, etc. Additionally, innovative methods and applications such as using blockchain as a ledger in logistics, transport and inventories are presented utilizing successful use-cases.

C3: Enabling climate-neutral, clean, smart, and competitive waterborne transport: This course focuses on presenting the pioneering strategies and technologies which are transforming the maritime and waterborne transport sector into climate-neutral, smart and adaptive. C3 hosts representatives from the industry from maritime companies which are leaders in the transformation of the sector along with research experts who present and analyze the critical measures and steps towards the transformation.

C4: Safe and resilient transport and smart mobility services for passengers and goods: This course focuses on the technological and innovation aspect of transport and smart mobility

services rather than the sociological. Recent and disruptive technologies and services in passenger and goods transport (CAVs, Drones, MaaS, crowdshipping, etc.) are presented as well as the expected impact they will have on the transport sector, urban environment, and society is discussed. Successful implementations, existing and future pilots and demonstrations, indicators and KPIs are presented, and policy- implication, barriers and opportunities are discussed.

C5: Collaboration and Sharing in Decarbonizing Transport and Logistics Systems: Future trends in freight transport and logistics require strong collaboration between transport providers, public authorities, producers, and consumers. REFOCUS will develop a multiplier digital game that teaches collaboration mechanisms between stakeholders. It trains learners to understand the business models of the business engaged in supply chains, the needs of every actor for information, and trains students on how to develop trust mechanisms.

C6: Ports in transition: In this course REFOCUS will walk learners through the types of ports, teach them how to take strategic decisions on port development and familiarize them with the management of port operations. Learners are introduced to the major challenges faced by the ports nowadays and are presented with the major trends that will lead ports to a next generation. Actual case studies from ports around the world will be discussed.

2 Sustainability, Resilience and Equity

Table 1: Course 1 metadata

Course C1	
Title	Sustainability, Resilience, and Equity in Transportation
Responsible Institute	University of the Aegean
Lecturer	Dr. Ioanna Pagoni, Assistant Professor
Aim	- Get introduced to sustainability and resilience in the context of transportation. - Understand the concept of transport equity and its significance. - Discuss EU-wide policy for sustainable and equitable transport. - Learn from success stories of transportation applications in European cities, with a focus on sustainable, inclusive transport, improved accessibility, and resilience to disruptive events.
Learning outcomes	
Participants will: - Gain a comprehensive understanding of the challenges and opportunities related to sustainability and resilience in the transport sector. - Acquire knowledge of transport equity principles and their role in building inclusive and accessible transportation systems. - Develop teamwork skills through collaborative projects	
Prerequisites (if any)	
None	
Language	English
Hours	4.5
Keywords	Sustainability, Resilience, Equity, Transportation, Mobility
Syllabus	The course is divided in three parts. The first part concerns sustainability in transportation, where participants will be presented with its definition, the environmental impacts of mobility, as well as the EU policies that are currently in place regarding sustainability in transport. The second part extends to resilience in transportation systems and strategies for adapting to climate change, including case studies and lessons learned. Finally, the lecture on equity and accessibility delves into addressing social and economic disparities, improving inclusiveness in transportation, and discussing relevant case studies. Throughout the course, participants will be presented with best practices in sustainable mobility and transportation resilience, fostering a holistic view of creating environmentally friendly, resilient, and equitable transportation systems.
Bibliography	○ Christodoulou A., Demirel H. (2018). Impacts of climate change on transport - A focus on airports, seaports and inland waterways, EUR 28896 EN, Publications Office of the European

	Union, Luxembourg, 2018, ISBN 978-92-79-97039-9, doi:10.2760/378464, JRC108865. ○ EIT Urban Mobility Marketplace. (n.d.). Learn from shared experiences gained during implementation. Retrieved from https://marketplace.eiturbanmobility.eu/best-practices/?name_or_keyword=&sort_by= ○ European Environment Agency (EEA) (2021). Nature-based solutions in Europe: Policy, knowledge and practice for climate change adaptation and disaster risk reduction. Luxembourg: Publications Office of the European Union, 2021. ○ Filippova, R., & Buchoud, N. (2020). A Handbook on Sustainable Urban Mobility and Spatial Planning: Promoting Active Mobility (No. ECE/TRANS/298). ○ Greenham, S., Workman, R., Ferranti, E., McPherson, K., Quinn, A., Street, R., Dora, J., Fisher, R., Mills, S., Packham, K., Baxter, W., Roberts, C. 2022. Climate-Resilient Transport: A policy guide for low-income countries in Africa and South Asia. Prepared by the University of Birmingham and TRL, UK. February 2022. ○ Material on the European Commission's policy documents and Communication regarding the European Green Deal: https://commission.europa.eu/strategy-and-policy/priorities-2019-2024/european-green-deal/delivering-european-green-deal_en ○ United Nations. Sustainable transport, sustainable development. Interagency report for second Global Sustainable Transport Conference. 2021 ○ Di Ciommo, F., & Shiftan, Y. (2017). Transport equity analysis. Transport Reviews, 37(2), 139-151. ○ Lucas, K., Martens, K., Di Ciommo, F., & Dupont-Kieffer, A. (Eds.). (2019). Measuring transport equity. Elsevier. ○ Arsenio, E., Martens, K., & Di Ciommo, F. (2016). Sustainable urban mobility plans: Bridging climate change and equity targets?. Research in Transportation Economics, 55, 30-39. ○ OECD / International Transport Forum. (2021). Transport Innovation for Sustainable Development: A Gender Perspective. Retrieved from https://www.itf-oecd.org/itf-work-gender-transport.	
Teaching methods	Lecture	x
	Case study	x
	Hands on/games	
	Exercises	
	Other	
Evaluation methods	Homework	
	Class project	
	Other *(Quiz with multiple choice questions)*	x
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Lecture content (add text below in case you have put an "x" in the teaching methods above, otherwise erase)		

1	**Sustainability in Transportation** Definition of sustainability in transportation; Sustainability goals and ESG principles; Environmental impacts of transport; challenges in achieving sustainability; EU policy on sustainable transportation; climate change awareness in transport; climate change as a social endeavour with the involvement of all stakeholders; climate change adaptation via regulation, financial incentive, and behavioural change; sustainability innovation and solutions in transport sector
2	**Transport Resilience and Adaptation to Climate Change** Understanding the concept of resilience in transportation systems; Impacts of climate change on transportation; climate change adaptation strategies in transportation; overview of case studies and discussion of lessons learnt.
3	**Equity and Accessibility in Transportation** Definition of transport equity and accessibility; Addressing social and economic disparities in transportation; the gender perspective in mobility; social perspective in transportation studies; improving inclusiveness and accessibility in transportation; co-creation approached in transportation; overview of case studies and discussion of lessons learnt.
Case study (add text below in case you have put an "x" in the teaching methods above, otherwise erase)	
During the lectures, the participants will be presented with specific case studies from European cities that have faced disruptive events impacting mobility, or have implemented specific measures for offering sustainable, resilient and/or equitable mobility. In addition, they will be offered the possibility to participate in a role-playing game to understand the perspective and roles of the different actors involved in the mobility ecosystem.	

3 Big Data Analytics and Blockchain in Transport, Shipping and Logistics

Table 2: Course 2 metadata

Course C2	
Title	Big Data Analytics and Blockchain in Transport, Shipping and Logistics
Responsible Institute	University of the Aegean
Lecturer	Dr. Maria Karatsoli
Aim	- Build Fundamental Understanding: Provide participants with a foundational understanding of big data, analytics and blockchain technology in the context of transport, shipping, and logistics. - Explore Conceptual Applications: Explore the theoretical concepts and potential applications of data analytics in optimizing logistics, transport, and inventory management. - Promote Awareness and Discussion: Encourage participants to think critically about the impact, benefits, and challenges of adopting these technologies in the industry through discussion and analysis of theoretical scenarios with a focus on solutions towards sustainability.
Learning outcomes	
By the end of the course, participants will be able to: - Explain the fundamental principles of big data analytics and its relevance to the transport, shipping and logistics sectors. - Describe the theoretical foundations of blockchain technology and its potential applications in supply chain management. - Analyse and discuss hypothetical use-cases and theoretical scenarios for data analytics and blockchain in transport, shipping, and logistics, focusing on sustainability and solutions against climate crisis.	
Prerequisites (if any)	
None	
Language	English
Hours	4.5
Keywords	Big Data Analytics, Blockchain Theory, Transport, Shipping, Logistics, Data Concepts, Theoretical Applications, Supply Chain, Technology Impact, GPS data, social media data, Bluetooth data, sensors, mobile devices, user-generated content and data, location data, live streaming data.
Syllabus	The course is consisted of three main parts. The first part includes an introduction of big data, then big data sources in the field of transport, shipping and logistics are presented. In the second part, the potential applications of data analytics in transport, shipping and logistics sector are discussed. Then, theoretical applications of

	blockchain in supply chain and inventory management are presented. In the last part, theoretical challenges, ethical considerations, future trends, and possibilities in data analytics and blockchain are explored. The course concludes with the presentation of a case study with the objective of deepening the understanding of application of big data in a transport study.	
Bibliography	Lifeng Ni, Elnaz Irannezhad (2024) Performance analysis of LogisticChain: A blockchain platform for maritime logistics, Computers in Industry, Volume 1 54, 2024, 104038. Oksana Iliashenko, Victoria Iliashenko, Ekaterina Lukyanchenko (2021) Big Data in Transport Modelling and Planning,Transportation Research Procedia,Volume 54, Pages 900-908, Wang, Michael, Wu, Yong, Chen, Bruce, Evans, Melissa. (2020). Blockchain and Supply Chain Management: A New Paradigm for Supply Chain Integration and Collaboration. Operations and Supply Chain Management: An International Journal. 14. 111-122. 10.31387/oscm0440290. Borgi, Tawfik & Zoghlami, Nesrine & Abed, Mourad. (2017). Big data for transport and logistics: A review. 44-49. 10.1109/ASET.2017.7983742. Gang Wang, Angappa Gunasekaran, Eric W.T. Ngai, Thanos Papadopoulos, (2016) Big data analytics in logistics and supply chain management: Certain investigations for research and applications, International Journal of Production Economics,Volume 176, Pages 98-110 Andrea De Mauro, Marco Greco, Michele Grimaldi; What is big data? A consensual definition and a review of key research topics. AIP Conf. Proc. 9 February 2015; 1644 (1): 97–104. Sudheer Gupta, Omkar D. Palsule-Desai (2011) Sustainable supply chain management: Review and research opportunities, IIMB Management Review, Volume 23, Issue 4, 2011, Pages 234-245 Dabić, M., Obradović, T., Vlačić, B., Sahasranamam, S., & Paul, J. (2022). Frugal innovations: A multidisciplinary review & agenda for future research. Journal of Business Research, 142, 914-929.	
Teaching methods	Lecture	x
	Case study	x
	Hands on/games	
	Exercises	
	Other (describe)	
Evaluation methods	Homework	
	Class project	
	Other (describe)	x
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Lecture content (add text below in case you have put an “x” in the teaching methods above, otherwise erase)	
1	Introduction to big data
2	Big data and big data sources in transport, shipping, and logistics
3	Theoretical framework and applications of big data analytics
4	Theoretical Foundations of Blockchain in Logistics
5	Challenges, future trends, and possibilities towards sustainability and solutions against climate crisis
6	Case study
7	Suggested literature

Case study (add text below in case you have put an “x” in the teaching methods above, otherwise erase)
In this course a case study with big data analytics is presented. In the context of this case study the participants will learn about the types of big data, the types of sources, the analysis tools, the collection methods that are used to organise and carry out a transport study.
Hands on/games (add text below in case you have put an “x” in the teaching methods above, otherwise erase)
-
Exercises (add text below in case you have put an “x” in the teaching methods above, otherwise erase)
-
Other (add text below in case you have put an “x” in the teaching methods above, otherwise erase)
Quiz with multiple choice questions

4 Enabling climate neutral, clean, smart, and competitive waterborne transport

Table 3: Course 3 metadata

Course C3	
Title	Enabling climate neutral, clean, smart, and competitive waterborne transport.
Responsible Institute	The American College of Greece
Lecturer	Prof. Peter J. Stavroulakis, Prof. George Kokosalakis, Prof. Athena Tsirimpa
Aim	- Introduction to the basic concepts, importance, and structure of maritime transportation - Explore the various technologies that can provide cleaner, smarter, and more competitive maritime transportation - Analyse the importance of cost externalization and sustainability in maritime transportation
Learning outcomes	
- Outcome 1: Understand the importance, components, and dynamics of maritime transportation - Outcome 2: Analyse the various concepts and technologies that can assist the maritime industry towards greener shipping - Outcome 3: Evaluate the various technologies under a total cost approach	
Prerequisites (if any)	
- Basic knowledge and understanding of waterborne transportation and world trade - Elementary knowledge of sustainability and total cost concepts	
Language	English
Hours	4.5
Keywords	Green shipping, Externalities, Total cost, Transportation sustainability, Digitalization, GHGs.
Syllabus	• Global climate systems and their association with transportation systems with special focus in shipping • Waterborne transportation externalities • Sustainability and total cost concepts • Technologies towards sustainable shipping • Smart technologies for competitive waterborne transport
Bibliography	**Textbooks** • Sustainable Energy Systems on Ships, Novel Technologies for Low Carbon Shipping, ISBN 978-0-12-824471-5, DOI: https://doi.org/10.1016/C2020-0-01975-4, Elsevier, 2022. • Sustainable Shipping in a Changing Arctic, Lawrence P. Hildebrand, Lawson W. Brigham, Tafsir M. Johansson, DOI: https://doi.org/10.1007/978-3-319-78425-0, Springer Nature, 2018, ISBN: 978-3-319-78424-3.

	• Sustainable Shipping, A Cross-Disciplinary View, Harilaos N. Psaraftis, DOI: https://doi.org/10.1007/978-3-030-04330-8, Springer Nature Switzerland AG 2019, ISBN 978-3-030-04329-2, 2019. • Sustainable Transportation and Smart Logistics Decision-Making Models and Solutions, 1st Edition - November 10, 2018, Editors: Javier Faulin, Scott Grasman, Angel Juan, Patrick Hirsch, ISBN: 9780128142424. • Sustainable Transportation Systems Engineering, 1st Edition, Francis M. Vanek, et al. ISBN: 9780071800129. **Papers** • Lindstad, E. et al. Wise use of renewable energy in transport, Transportation Research Part D: Transport and Environment, Volume 119, 2023, https://doi.org/10.1016/j.trd.2023.103713. • Oloruntobi, O et al., Sustainable transition towards greener and cleaner seaborne shipping industry: Challenges and opportunities, Cleaner Engineering and Technology, Volume 13, 2023, https://doi.org/10.1016/j.clet.2023.100628. • Yuen, et al. Antecedents and outcomes of sustainable shipping practices: The integration of stakeholder and behavioural theories, Transportation Research Part E: Logistics and Transportation Review, Volume 108, 2017, https://doi.org/10.1016/j.tre.2017.10.002. • Ziaul Haque Munim, et al. Towards a prioritization of alternative energy sources for sustainable shipping, Marine Policy, Volume 152, 2023, https://doi.org/10.1016/j.marpol.2023.105579. • OECD / International Transport Forum. (2021). Transport Innovation for Sustainable Development: A Gender Perspective. Retrieved from https://www.itf-oecd.org/itf-work-gender-transport	
Teaching methods	Lecture	X
	Case study	
	Hands on/games	X
	Exercises	X
	Other (describe)	X
Evaluation methods	Homework	
	Class project	X
	Other (describe)	
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Lecture content (add text below in case you have put an "x" in the teaching methods above, otherwise erase)	
1	Introduction to world trade
2	Maritime transportation as a component of the global transportation system

3	Maritime transportation externalities
4	Sustainability and total cost approaches for transportation and shipping
5	Green technologies for shipping
6	Smart technologies for smart shipping
7	Future trends for green shipping
8	Strategy for a total cost approach in shipping

Case study (add text below in case you have put an "x" in the teaching methods above, otherwise erase)

Hands on/games (add text below in case you have put an "x" in the teaching methods above, otherwise erase)

- The Team-Based Learning (TBL) methodology offers a dynamic approach to active teaching and learning, emphasizing collaboration, critical thinking, and the practical application of knowledge. This method will be implemented across three lectures, chosen for their suitability in allowing critical thinking and multiple correct answers. The methodology follows a structured process:
- **Individual Pre-class Work**:
  - Students independently study topic materials using various resources like online modules, videos, or readings to prepare for discussions.
  - Engaging resources facilitate understanding and readiness for interactive sessions.
- **Individual Readiness Assurance Test (IRAT)**:
  - Class begins with a multiple-choice quiz, promoting problem-solving skills.
  - Completed individually.
- **Team Readiness Assurance Test (TRAT)**:
  - Identical to IRAT but completed in teams.
- **Clarification Session**:
  - Facilitator clarifies any points of confusion.
- **Focused Application Task (FAT)**:
  - Teams participate in complex problem-solving activities, applying acquired knowledge.
  - Requires teams to make decisions collectively and present them simultaneously.

Exercises (add text below in case you have put an "x" in the teaching methods above, otherwise erase)

- Develop a proposal for creating sustainable maritime transportation

Other (add text below in case you have put an "x" in the teaching methods above, otherwise erase)

- Participation in discussions and group activities

5 Safe, resilient transport and smart mobility services for passengers and goods

Table 4: Course 4 metadata

Course C4	
Title	Safe, resilient transport and smart mobility services for passengers and goods
Responsible Institute	The American College of Greece
Lecturer	Prof. Athena Tsirimpa, Prof. George Kokosalakis, Prof. Peter J. Stavroulakis
Aim	- Introduction to the concepts of safe and resilient transport - Explore smart mobility services for passengers and goods - Understand the integration of technology in transport systems
Learning outcomes	
- Outcome 1: Understand the principles of safe transportation systems. - Outcome 2: Analyse the resilience of transport networks. - Outcome 3: Evaluate smart mobility solutions for efficiency and sustainability.	
Prerequisites (if any)	
-Basic knowledge and understanding of transportation systems	
Language	English
Hours	4.5
Keywords	Smart Mobility, Resilient Transport, Passenger Safety, Goods Transportation, Sustainable Mobility
Syllabus	Overview of Smart Mobility, Safety Standards in Transport, Resilience in Transport Infrastructure, Technological Innovations in Mobility, Case Studies in Smart Transport Systems.
Bibliography	• Adnan Khurshid, Khalid Khan, Sardar Fawad Saleem, Javier Cifuentes-Faura, Adrian Cantemir Calin, Driving towards a sustainable future: Transport sector innovation, climate change and social welfare,Journal of Cleaner Production,Volume 427,2023, https://doi.org/10.1016/j.jclepro.2023.139250. • Sharmin Nasrin, Jonathan Bunker, Gender equality through sustainable transport policy,Transport Policy, Volume 149, 2024,Pages 59-79, https://doi.org/10.1016/j.tranpol.2024.02.001. • Adnan Khurshid, Khalid Khan, Javier Cifuentes-Faura, 2030 Agenda of sustainable transport: Can current progress lead towards carbon neutrality?, Transportation Research Part D: Transport and Environment, Volume 122, 2023, https://doi.org/10.1016/j.trd.2023.103869.

	• Frank E. Alarcón, Alejandro Mac Cawley, Enzo Sauma, Electric mobility toward sustainable cities and road-freight logistics: A systematic review and future research directions, Journal of Cleaner Production, Volume 430, 2023, https://doi.org/10.1016/j.jclepro.2023.138959. • Meizhi Jiang, Benmei Wang, Yingjun Hao, Shijun Chen, Yuanqiao Wen, Zaili Yang, Quantification of CO2 emissions in transportation: An empirical analysis by modal shift from road to waterway transport in Zhejiang, China, Transport Policy, Volume 145, 2024, https://doi.org/10.1016/j.tranpol.2023.10.026. • P.N. Solonshickov, A.N. Luchnikov, I.A. Tolstoukhova, D.V. Kuznetsovskya, K.A. Chervotkin, Ensuring Transport Safety During Passenger Transportation, Transportation Research Procedia, Volume 68, 2023, Pages 526-533, https://doi.org/10.1016/j.trpro.2023.02.071. • Xueke Chen, Bao-Jie He,Planning for heat-resilient 15 min-cities: Opportunities, measurement, mechanism, and pathways, Environmental Impact Assessment Review, Volume 105, 2024, 107406, https://doi.org/10.1016/j.eiar.2023.107406. • Steve Cinderby, Gary Haq, Romanus Opiyo, Cassilde Muhoza, Amanda Ngabirano, Yusuf Wasike, Daniel Mwamba, Howard Cambridge, Inclusive climate resilient transport challenges in Africa, Cities, Volume 146, 2024, https://doi.org/10.1016/j.cities.2023.104740. • OECD / International Transport Forum. (2021). Transport Innovation for Sustainable Development: A Gender Perspective. Retrieved from https://www.itf-oecd.org/itf-work-gender-transport	
Teaching methods	Lecture	x
	Case study	x
	Hands on/games	x
	Exercises	x
	Other (describe)	
Evaluation methods	Homework	
	Class project	x
	Other (describe)	
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Lecture content (add text below in case you have put an “x” in the teaching methods above, otherwise erase)	
1	Introduction to Smart Mobility and Its Importance.
2	Safety Standards and Regulations in Transportation.
3	Building Resilient Transport Networks.

4	Technological Advances in Mobility Services.
5	Environmental Impact of Transportation Systems.
6	Case Studies: Successful Implementation of Smart Mobility.
7	Future Trends in Transport and Mobility.
8	Ethical Considerations in Transportation Planning.

Case study (add text below in case you have put an "x" in the teaching methods above, otherwise erase)

Hands on/games (add text below in case you have put an "x" in the teaching methods above, otherwise erase)

- The Team-Based Learning (TBL) methodology offers a dynamic approach to active teaching and learning, emphasizing collaboration, critical thinking, and the practical application of knowledge. This method will be implemented across three lectures, chosen for their suitability in allowing critical thinking and multiple correct answers. The methodology follows a structured process:
- **Individual Pre-class Work**:
  - Students independently study topic materials using various resources like online modules, videos, or readings to prepare for discussions.
  - Engaging resources facilitate understanding and readiness for interactive sessions.
- **Individual Readiness Assurance Test (IRAT)**:
  - Class begins with a multiple-choice quiz, promoting problem-solving skills.
  - Completed individually.
- **Team Readiness Assurance Test (TRAT)**:
  - Identical to IRAT but completed in teams.
- **Clarification Session**:
  - Facilitator clarifies any points of confusion.
- **Focused Application Task (FAT)**:
  - Teams participate in complex problem-solving activities, applying acquired knowledge.
  - Requires teams to make decisions collectively and present them simultaneously.

Exercises (add text below in case you have put an "x" in the teaching methods above, otherwise erase)

- Develop a proposal for improving local transport systems.

Other (add text below in case you have put an "x" in the teaching methods above, otherwise erase)

- Participation in discussions and group activities.

6 Collaboration and Sharing in Decarbonizing Transport and Logistics Systems

Table 5: Course 5 metadata

Course C5	
Title	Collaboration and Sharing in Decarbonizing Transport and Logistics Systems
Responsible Institute	Delft University of Technology
Lecturer	Dr. Frederik Schulte (Asst. Prof.)
Aim	- Build Fundamental Understanding: Provide participants with a foundational understanding of necessary steps to achieve decarbonization and climate across multiple transportation modalities. - Explore Conceptual Applications: Explore research and practical applications of collaboration and sharing as means to decarbonize transport and logistics systems. - Promote Awareness, Discussion, Real-World Implementations: Encourage participants to reflect on transport and logistics systems in their context and discuss actual steps that are required to implement effective decarbonization measures for these systems.
Learning outcomes	
By the end of the course, participants will be able to: - Explain the fundamental principles, policies, and steps needed to effectively decarbonize transport and logistics systems. - Describe the theoretical foundations of collaboration and sharing as effective means to decarbonize transport and logistics systems. - Analyse and discuss real-world use-cases and scenarios for collaboration and sharing in transport and logistics systems to initiate new related projects in their individual regional and cultural contexts.	
Prerequisites (if any)	
-	
Language	English
Hours	4.5
Keywords	Collaborative Transport and Logistics, Collaboration, Sharing, Decarbonization, Net Zero, Sustainability, Climate Targets.
Syllabus	This course aims to provide participants with a comprehensive understanding of the fundamental steps required to achieve decarbonization and enhance climate resilience across various transportation modalities. Exploring both theoretical concepts and practical applications, participants will gain insights into

	collaborative approaches and sharing mechanisms as effective means to address decarbonization challenges in transport and logistics systems.	
Bibliography	Aloui, A., Hamani, N., Derrouiche, R., & Delahoche, L. (2021). Systematic literature review on collaborative sustainable transportation: overview, analysis and perspectives. Transportation Research Interdisciplinary Perspectives, 9, 100291. Beirigo, B. A., Schulte, F., & Negenborn, R. R. (2022). A learning-based optimization approach for autonomous ridesharing platforms with service-level contracts and on-demand hiring of idle vehicles. Transportation Science, 56(3), 677-703. Bjørn, A., Tilsted, J. P., Addas, A., & Lloyd, S. M. (2022). Can science-based targets make the private sector Paris-aligned? A review of the emerging evidence. Current climate change reports, 8(2), 53-69. Cleophas, C., Cottrill, C., Ehmke, J. F., & Tierney, K. (2019). Collaborative urban transportation: Recent advances in theory and practice. European Journal of Operational Research, 273(3), 801-816. Gota, S., Huizenga, C., Peet, K., Medimorec, N., & Bakker, S. (2019). Decarbonising transport to achieve Paris Agreement targets. Energy Efficiency, 12(2), 363-386. Los, J., Schulte, F., Spaan, M. T., & Negenborn, R. R. (2020). The value of information sharing for platform-based collaborative vehicle routing. Transportation Research Part E: Logistics and Transportation Review, 141, 102011. Schulte, F., Lalla-Ruiz, E., González-Ramírez, R. G., & Voß, S. (2017). Reducing port-related empty truck emissions: a mathematical approach for truck appointments with collaboration. Transportation Research Part E: Logistics and Transportation Review, 105, 195-212.	
Teaching methods	Lecture	x
	Case study	
	Hands on/games	
	Exercises	
	Other (describe)	
Evaluation methods	Homework	
	Class project	
	Other (describe)	
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Lecture content (add text below in case you have put an “x” in the teaching methods above, otherwise erase)	
1	Introduction collaboration and sharing for decarbonizing transport systems
2	Defining decarbonization targets for transport and logistics systems
3	Overview on technological options
4	Modelling and digital twinning
5	Policy and climate scenarios
6	Collaborative transport game
7	Case studies

7 Ports in transition

Table 6: Course 6 metadata

Course C6	
Title	Ports in transition
Responsible Institute	University of Antwerp
Lecturer	Prof. Edwin van Hassel & Prof. Thierry Vanelslander
Aim	- Get insight in the way ports are functioning and the actors involved in them - Get acquainted with the latest developments in seaports and the impact those have on cost structures and revenues - Get a view on the major challenges faced by the ports nowadays and the major trends that will lead ports to a next generation
Learning outcomes	
- Participants have insight in the way ports are functioning and the actors involved in them. - Participants are acquainted with the latest developments in seaports and the impact those have on cost structures and revenues. - Participants have a good view on the major challenges faced by the ports nowadays and the major trends that will lead ports to a next generation	
Prerequisites (if any)	
A healthy interest in the topic	
Language	English
Hours	4.5
Keywords	Port actors, port trends and developments, transition, sustainability, costs and revenues,
Syllabus	The course consists of seven parts. The first four transfer knowledge and insights to users. They consecutively deal with the role of maritime transport and ports in supply chains and society, the actors active in ports, statistics on European ports, and global trends impacting on ports. Part 5 introduces a framework that can be used to analyse for a specific port the outcome of the interplay of the many changing and influencing factors. Part 6 consists of two games that will be explained, and with which the participants can apply and test their acquired knowledge of the future port environment. Part 7 finally concludes with main observations and lessons.
Bibliography	- Competition concerns in ports and port services, Van de Voorde Eddy, Meersman Hilde, Vanelslander Thierry, Proceedings of the OECD Round Table on Competition concerns in Ports and Port Services - Paris, 2011, http://www.oecd.org/dataoecd/23/21/48837794.pdf

	- A combined approach to forecast container throughput demand : scenarios for the Hamburg-Le Havre range of ports, Rashed Yasmine, Meersman Hilde, Sys Christa, Van de Voorde Eddy, Vanelslander Thierry, Transportation research : part A : policy and practice - ISSN 0965-8564 - 117(2018), p. 127-141, Full text (DOI uitgever): https://doi.org/10.1016/J.TRA.2018.08.010 - Innovation among seaport operators : a QCA approach for determining success conditions, Vanelslander Thierry, Sys Christa, Carlan Valentin, BNPPF Innovation Event 2015, University of Antwerp, 23 April 2015 - 2015, p. 1-35, Full text (open access): https://repository.uantwerpen.be/docman/irua/d10684/127918.pdf - Port greening : discrete choice analysis investigation on environmental parameters affecting container shipping companies' behaviors, Vanelslander Thierry, Franchi Lorenzo, Sustainability - ISSN 2071-1050 - 13:31(2021), 7010, Full text (DOI uitgever): https://doi.org/10.3390/SU13137010 - Sustainability of maritime supply chain : economic analysis to comply with environmental regulations and social issues, Mohseni Seyed Abolfazl, Vanelslander Thierry [Promotor], van Hassel Edwin [Promotor], Antwerp, University of Antwerp, Faculty of Business and Economics, Department of Transport and Regional Economics, 2022, xviii, 225 p.	
Teaching methods	Lecture	x
	Case study	x
	Hands on/games	x
	Exercises	
	Other (describe)	
Evaluation methods	Homework	x
	Class project	
	Other (describe)	
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Lecture content (add text below in case you have put an "x" in the teaching methods above, otherwise erase)	
1	The function of transport and ports
2	Actors in the port environments (maritime, port, hinterland)
3	Statistics: Case study Europe + Hamburg – Le Havre
4	Global trends (digitalisation, sustainability and climate change, automation, energy, capacity increase, production location, demographics, deglobalization)
5	Impact framework
6	NOVIMOVE + Simultra games
7	Concluding views

Case study (add text below in case you have put an "x" in the teaching methods above, otherwise erase)

Concepts and statistics are visualised with and applied to the European and Hamburg – Le Havre port range context.
Hands on/games (add text below in case you have put an “x” in the teaching methods above, otherwise erase)
Participants play the indicated online games, which illustrate port operations and make them see the impact of decisions made.
Exercises (add text below in case you have put an “x” in the teaching methods above, otherwise erase)
Other (add text below in case you have put an “x” in the teaching methods above, otherwise erase)

8 Conclusions and next steps

The co-designed curriculum, informed by the Learning Communities of Practice (CoPs), has proven effective in addressing the needs of a diverse learner population, especially those facing geographical or economic limitations. MOOCs, with their accessibility and ability to incorporate multimedia elements, provide a strong foundation for the online educational hub. Deliverable 3.1, focusing on the MOOC courses' metadata, ensures alignment with the project's overall goals and the learning needs identified within the CoPs. Moving forward, continued evaluation through both digital and physical sessions will further refine the MOOCs. Exploring the "frugal innovation paradigm" can further optimize accessibility, while leveraging established communication channels within the CoPs ensures the curriculum remains future-oriented and relevant. The next steps involve finalizing the MOOC development, implementing the evaluation process, disseminating the online hub, and fostering ongoing collaboration within the CoPs for future curriculum updates.

References

Reference	Name of document
[REF-01]	REFOCUS. (2023) Report T2.1. Report on structuring the learning Communities of Practice (CoP).
[REF-02]	REFOCUS. (2023) Report T2.2. Implement and run the Communities of Practice (CoP).
[REF-03]	REFOCUS. (2023) Report T2.3. Report on best teaching practices and needs, existing programs, and co-designing the curriculum.