

Document Control Sheet

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1. INTRODUCTION

This document describes the actions taken within the Activity 5.1 of WP5 - Creation of new job profiles, professional training and business model development, specifically regarding the realization of the II Training Session.

The first Training Session was held in the third period of the project's lifespan and was organised in the form of a public conference. It set the groundings for the next Training Sessions to be held in the fourth period of the project.

The second training session was held in July. We have chosen different periods of the project's lifespan and different modalities and targets, to maximise the objectives of transferability, sustainability and durability.

The document illustrates the realization of the second training session starting from the preparation process and the procedure chosen to spread the knowledge on multimodality and the topics related to STEP-UP.

All the activities were performed in alignment with STEP-UP Project's objectives and **Project specific objective 3**: STEP-UP sustainability and transferability is the cross objective within consortium and the basis of the proposed activities. New business models and training sessions are the key elements to assure a steady growth to overcome the survival point.

WP5 set specific actions to sustain this objective because capitalize means to transfer knowledge: this is possible through the set of training sessions we organised to the attention of partners and (future) professionals in the field of transport. The goal is to educate on the aspects of mobility and travel planners, focusing on multimodal transport, new business model approaches for the sustainability of STEP-UP over the end of the project and on collecting, sharing and managing transport data.

A relevant key element is to give some instruments to the partners and new professionals to improve themselves and become as autonomous as possible, for this reason we created a specific website as a repository for the Training Session materials and to facilitate the audience in getting more information on STEP-UP and its related topics.

1.1 Purpose of this document

The purpose of this document is to describe the realization of the II Training Session. In particular, it proposes an overview on the ideation, organization and development of the II Training Session.

This document contains the collection of the activities, results and users' feedback related to the II Training Session, in fact, for all the three training sessions a preliminary analysis is performed to identify

the audience, topics, teachers or experts and the modalities of the session. Moreover, after each training session questionnaires are compiled, both by participants and by teachers and expert involved. The useful audience feedbacks are also presented in this document.

1.2 Structure of this document

Deliverable structure description (chapter by chapter). The document includes the following chapters:

- Chapter 1, An introduction to the document.
- Chapter 2, Describes the preliminary and preparation activities and research necessary to the realization of the II Training Session. It includes the identification of: audience, topics, teachers and experts involved and modality.
- Chapter 3, Description of the Training Session webinar.
- Chapter 4, Collection of Questionnaires and audience feedback related to the II Training Session.

1.3 Target audience

The target audience of this report is the STEP-UP partnership and eventually their external experts).

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2. Preparation activities for the realization of the II Training Session

2.1 II Training Session: Identification of the Audience

To **identify audience** and **organize** the training session the most adequately, a preliminary analysis was performed. For the second training session **project partners, local authorities** and **all the interested parties** could attend the remote conference. Dissemination has been made via invitation through electronic channels, e-mail, social channels and online bulletin boards. The I Training Session was designed to set the grounding knowledge on STEP-UP topics, so the vision offered was broad and general. Whereas, the II Training Session was designed to get deeper in some topics and to touch more technical and specific aspects in addition to the general and introductory ones. The target audience was consequently mainly composed by Project Partners, their external experts and other professionals in the fields related to STEP-UP topics. All the attendees to the webinar should own at least basic knowledge on some offered topics.

Description of the different actors involved in the II Training Session:

i. **Project Partners**

Each partner has expertise on specific topics, thanks to their institutional field of action, the support of their Technical Assistance and the know-how gained through previous projects.

The partnership was asked to communicate some areas of expertise they own and they were asked to contribute with a representative as speaker in at least one of the Training Sessions.

The partners were asked to stress the areas where they wanted to improve their knowledge. They mostly were interested in all the topics we suggested.

ii. **Stakeholders**

We invited some stakeholders to the training sessions and involved some of them as speakers (e.g. Port Authority of Trieste). Obviously, the stakeholders are active in the transportation or mobility field, so they already own some know-how. Although their knowledge might be positively task driven, they may lack some ground basis or some more technically specific knowledge. Addressing to stakeholders is therefore particularly tricky, since there must be a balance between concrete facts and accuracy. Topics must be captivating and useful for their daily work.

In particular, we involved as Target Groups:

- Target Group 8: Education and training organizations as well as universities and research institutes

A university is partner in the project and will provide training sessions, also broadcasted as live streaming, that will be attended by both project partners and all stakeholders interested on multimodal topics. Following those sessions, any other education or training organizations as well as other universities or research institutes, could replace similar initiatives, obviously with a previous agreement with the first university concerning the use of training materials.

- Target Group 2: Local, regional and national public authorities

Local, regional and national authorities, within IT-HR Programme Area, have to be considered fundamental because they represent the most important figures able both to increase the awareness about ecofriendly transportation and sustainable tourism among different subjects (potential suppliers and potential service providers) and to promote their effective realization, through the definition of useful policy initiatives and operational activities. They are amply represented in the partnership.

- Target Group 3: Regional development agencies.

Regional development agencies, as operative branches of Regional authorities, are in charge of implementing theoretical regional policies, into actual actions. For example, Regions and local authorities draws up specific Regional/Urban Mobility Plans and foresees detailed guidelines which include the increase of multimodal transport, but the risk that those indications could remain not applied is tangible if regional agencies do not take care of those guidelines.

- Target Group 5: Transport associations

Target group Transport Associations Description: Transport associations can have a primary role promoting and incentivizing the diffusion of multimodal transport systems among their participants, but often, that associations do not know enough about multimodal themes and their benefits. So, they will be addressed in particular during WP5 implementation. They will be encouraged to participate in training activities in order to improve knowledge and data analysis on multimodal transport sector.

2.2 II Training Session: Modality of the session

The II Training Session was designed to offer a more specific contribution and the selected target was therefore selected among partners and stakeholders already sharing interest and a basic knowledge on the offered topics.

This specific topics and the restricted audience selection made us propend for the Webinar format for practicality and also sustainability reasons.

All the speakers have been previously contacted and the topics, materials and modalities discussed with the organizers. Some presentations have been recorded by UNITS at a time agreed with the speaker using an appropriate software (the GoToMeeting software was previously selected and had already been used for the I Training Session) or have been recorded by each speaker following the instructions given by UNITS.



All the presentations have been edited to give an overall format coherence.

The recording of the presentations has been then transmitted via GoToMeeting at a selected date, after sending invitations.

The live streaming, coordinated by UNITS, lasted about 2 hours. All interested parties could connect for up to 150 people, which is the capacity of GoToMeeting.

The proposed dates for the direct streaming have been decided by investigating in lecturer possibilities, to have the desirable participation of all the speakers involved, in order to respond to questions and requests for clarification from viewers in real time. Anyone interested was given the opportunity to ask questions directly to the speaker during the conference through the chat available in the software.

2.3 II Training Session: Identification of the Topics

For the second training session the macro-topics already identified for the first were proposed again (follow in small at the end of the paragraph) and other topics of interest were outlined as emerged from the feedback received from the audience through the compilation of the questionnaires.

As done for the selection and definition of topics in the first session, to better tailor the training sessions on the overall needs the list was shared with all PP, to give them the possibility to provide comments on the topics, or suggest new ones,

Submission of the list to the Project Partners was also useful to **analyse their internal expertise**, possibly to be shared with the other partners during the Training Sessions, to **analyse their needs**, the areas where their knowledge or level of expertise needed to be improved through Training Sessions.

Follows the message sent to the partners to invite them to participate actively with suggestions and requests to enrich the panorama of knowledge on the issues pertaining to the STEP-UP project.

“

Dear partners,

This e-mail to inform you about the next steps of the Training Sessions activity.

The second Training Session is planned approximatively for the end of june, the third for the end of july. We will make public the dates as soon as we have defined them.

For the next two Training Sessions, we are going to record speakers separately (materials and presentations in English, about 20-30 minutes). Then we will assemble the presentations in two sessions, which will be broadcasted to you and other stakeholders (we will ask your support for the widest dissemination of the links). Speakers will be asked to join the session broadcasting in order to answer to eventual questions from the audience.

Speakers will be able to record their presentation with our technical support from their offices or any other place of preference, there will be no need to book travels. Presentations should include some materials (e.g. slides, pdf, suggested bibliography...) to be kept together with the presentation recording in the repository. If any partner should be willing to make a presentation, you find in attachment the first topics guideline and the topic suggestions that we collected through questionnaires after the first training session.

We are at your disposal to discuss about the topics you would like to deepen, the date suitable for the recording and any other technical request. Please mind that also the partners who already contributed are very welcome to give another presentation, since some topics could very easily have a "sequel", as we already discussed with some partners during the preparation phase of the first TS.

If you wish to discuss about an intervention, or should there be any other clarification needed, do not hesitate to write us.

”

The list of topics of interest that emerged from the questionnaires is the following:

Topics for the Second and Third Training Session – Suggestions through Questionnaires.

- Sustainable/green/eco-tourism
- Trends in info mobility, acceptance of by the public
- Multimodality E-planning platforms
- Info-mobility
- European Project on mobility and sustainable tourism
- Services for passengers at transport nodes
- Complementariets and synergies should be stressed more
- e-Mobility, EU projects, Maas, New activities in the field of mobility from Pas perspective
- Alternative in transport to decrease CO2
- E-mobility, car sharing

The preliminary list of topics already proposed for the First Training Session:

STEP-UP	List Of Topics	
<p>1. Multimodality, Intermodality, Co-modality. Intermodal, multimodal public transport</p> <p>To look up to Multimodality is a necessary step to improve the quality, safety and environmental sustainability of marine and coastal transport services and nodes. This topic includes an introduction and an overview on mobility new perspectives e.g. Maas Mobility as a Service.</p> <p>1.1 Quality, safety and environmental sustainability</p> <ul style="list-style-type: none">- Impact of the transport sector on the energy consumption and on climate change. Improve air quality and to promote good practices to significantly reduce pollution and to promote intermodality, in order to foster the use of different means of transport.- Public transport with low carbon dioxide emission. <p>1.2 Marine and coastal transport services and nodes</p> <ul style="list-style-type: none">- Innovative and alternative ways to optimize the carriage of persons and goods specially in our touristic coastal area.- Presence of islands and rural areas, make also integrate connections necessary with focus on inland connections to the coast <p>1.3 New perspectives e.g. Maas Mobility as a Service</p> <p>1.4 Connecting urban/suburban rail/road</p> <ul style="list-style-type: none">- Seamless solution: using all transport modes (train, ferry, public transport, flexible transportation – Demand Responsive Transport, etc.) <p>1.5 Intermodal mobility</p> <ul style="list-style-type: none">- A resource for tourism development and encourage joint actions of the cross sector international partnerships aimed at developing new solutions for sustainable environmental development and intermodal transport <p>1.6 Tourism development prediction</p> <p>Analysis of the last years' trends and near future trends forecast.</p>	<p>2 European Projects concerning Mobility and Tourism</p> <p>An overview on European funded projects on Mobility and Tourism. European new perspective, trends and goals on multimodality, sustainability, e-mobility, enhancing waterways and making road flows lighter.</p> <p>2.1 Intermodal in European strategies 2030 and 2050</p> <p>2.2 Mentioned EU Project:</p> <ul style="list-style-type: none">▪ 4PILLARS▪ TISAR▪ EASEWAY▪ ECOMOBILITY▪ MOSES▪ ... <p>3 Touristic routes and connections between Italy and Croatia. Passengers transport and innovative systems. History, data, overview.</p> <p>This topic aims to deepen the knowledge on the Programme Area, to understand the already existing connections and traffic flow between the two Countries involved in the project. An in-depth analysis on geographical, economical and historical features of tourism and passengers' flow in the Adriatic area. This overview will underline the importance of tourism for social and economic development.</p> <p>The overview can include in a multidisciplinary approach a variety of aspects such as:</p> <ul style="list-style-type: none">- Urbanization, economic and entrepreneurial development, utilities, social welfare, education, traffic. <p>4 Data standardisation and harmonisation in the transportation field.</p> <p>In a multimodal travel planning platform, many travel aggregators receive property descriptions and availability data from different transport service providers. Each data provider may have its own data schema and structure that must be standardized before it can be used. This topic wants to propose an overview on the main requirements and characteristics of data storing and standardisation. Furthermore, an excursus on specific standards will be given: Standard GTFS (General Transit Feed Specification), SIRI (European Standard for real-time information), DATEX II, and other standards connected to Maas.</p> <p>The lesson aims to:</p>	

- Better understand the data standardization as a data processing workflow that converts the structure of disparate datasets into a Common Data Format. Data Standardization can also be thought of as the transformation rules engine in Data Exchange operations.
- Better understand how data standardization enables the data consumer to analyse and use data in a consistent manner. Standardizing data helps you make the source data internally consistent; that is, each data type has the same kind of content and format.
- Give the fundamental knowledge towards the creation of a common communication protocol between different systems (ICT platforms) and services.
- Collect data in INTERMODAL projects.
- Work on a system based on standard protocols for different objective and scenarios managed: tourists' and travellers' needs including those for existing citizens.

5 Big-data for transportation and tourism.

Data fusion

Big data refers to data sets that are too large or complex for traditional data-processing application software to adequately deal with. The topic proposes an overview:

- on Big Data concept;
- on the potential of Big Data applied to transportation and tourism;
- on Big Data characteristics (Volume, Variety, Velocity, Veracity);
- on Big Data Architecture. "5C architecture" (connection, conversion, cyber, cognition, and configuration);
- on the concept of Big Data applied to transportation and tourism. An overview on Big Data.

5.1 Collecting, sharing and managing transport data

5.2 Algorithms for the optimization of multimodal transport

The lesson aims to:

- Better understand the algorithms for the optimization of multimodal transport, and on collecting, sharing and managing transport data

6 ICT Platforms for touristic purpose.

This topic presents an overview on ICT Platforms for touristic purpose. Focusing on:

6.1 ICT Platforms for touristic purpose. State of the art on existing platforms.

- Example of existing platform (e.g. Transport for London).
- Local ICT platform.

6.2 High level platform design.

6.3 APPs and info-mobility data for tourism

6.4 Weather data integrated to ICT Platforms

The lesson aims to:

- Evidence the main requirements and possibilities, such as database creation with useful and relevant mobility data including the real-time information thanks the integration with AVM system.
- Design and developing of added modules such as booking & ticketing to offer a complete solution according to a global vision.
- Develop high quality level of services, improve the ITS level at Regional level, make the current services more reliable and attractive.
- transfer the ICT/ITS applications also during low season in other scenarios (e.g. info-mobility system)
- Permits both citizens and tourists, will be able to have benefits in terms of a better travel planning (more sustainable and with less time spent finding best solutions or purchasing tickets thanks to the ICT channel)

7 ETA

Estimated Time of Arrival, requirements and how to integrate this added module to the platform.

8 Unified ticket, dynamics and governance. E-Ticketing.

This topic presents an overview on:

8.1 Unified ticket as added module fundamental to increase platform efficiency and impact.

8.2 Main requirements and strategies. Examples of virtuous existing

8.3 e-roaming?

Tourist information useful for an extended mobility services such as e-roaming that enables additional visibility and promotion of multimodal transportation across inland (network of electric vehicles and electric bicycles)

9 E-mobility, E-cars.

This topic presents an overview on E-mobility, E-cars, Multimodality integrated with E-Mobility.

9.1 Eco -Mobility

This aspect, the involvement of the Project Partners, was particularly important to enhance the effectiveness of the Training Sessions.

2.4 II Training Session: Identification of the Teachers and Experts

For the second training session, were searched and selected speakers who could offer a more technical overview of the topics of the STEP-UP project.

Before each speaker, we added a very short introduction including the motivation for the invitation.

For each expert we added some basic information. Beside the name and title of the speaker, his actual professional role is indicated (if they are Project Partner that is also specified). A brief biography (in grey) summarises in a few lines the experience and the qualification of each speaker.

The lecturer **Daniela Vasari** was invited to deepen the topic related to MaaS on which she has a demonstrated expertise. She had already collected clear interest from the audience present at the first training session and the feedback from the audience highlighted a desire to deepen MaaS related topics.

Daniela Vasari

Project manager, solution designer in ITS projects and International cooperation, Pluservice, Technical Assistance of Marche Region (STEP-UP project Lead Partner)

Daniela Vasari graduated in Computer Engineering, in March 2009. She works in PluService since 2009 as Solution Designer for ITS in Passenger Transportation and since 2014 as Senior Project Manager. She is involved in EU-International-National projects on topics such as Demand Responsive Transport, Multi-modal Traveller Information Systems, Automatic Vehicle Monitoring systems. She is the Project Manager of several European funded projects.

Giorgia Fanesi was invited to participate at the second training session making available, especially to all Project Partners, but at the same time to all the interested technical notions related to the applications developed for the STEP-UP project.

Giorgia Fanesi

Software analyst and project manager, Pluservice, Technical Assistance of Marche Region (STEP-UP project Lead Partner)

After her Master Degree in industrial engineering at the University of Bologna and an internship at IRU, Giorgia Fanesi has worked on ICT projects for PluService s.r.l. and is currently Software Analyst and Project Manager at myCicero.

To extend the potentiality of an ICT platform and share the experience of Trieste we chose **Valentina Boschian** to introduce the STEP-UP partnership to the internal ICT and data structure used by the Port Network Authority of the Eastern Adriatic Sea.

Valentina Boschian

Dott. Ing, Ph.D.

Port Network Authority of the Eastern Adriatic Sea – Port of Trieste, Digital Port Area

Dott. Ing. Valentina Boschian, Ph.D., works at the Port Network Authority of the Eastern Adriatic Sea – Port of Trieste, in the Digital Port Area. Since 2008, her expertise is focused on consultancy activities related to the analysis of ICT impact on new business cases, mainly in the field of transport and logistics. After obtaining a degree in Management Engineering and a PhD in Computer Science Engineering, she worked as a project manager in several international research projects. She is also expert in business model innovation.

Main skills: Analysis and modelling of processes; Assessment analysis (based on KPIs definition); Management of complex systems with analytical models; Analysis of business scenarios, Use Case identification and User Requirement definition; Project management, ICT applications in logistics and transportation management.

Education

- *Ph.D. in Information Technology Engineering, University of Trieste (2012)*
- *Degree in Management Engineering and Integrated Logistics (graduation with first class honours, "110/110 e lode"), University of Trieste (2008)*
- *Degree in Management Engineering (graduation with first class honours, "110/110 e lode"), University of Trieste (2003).*

To enlarge the knowledge related to electric vehicles, a topic of interest, as emerged from the first Project Partners meetings and Steering committee meetings, we invited the professor **Romeo Danielis** to provide a technical and economical overview of the variety, potential and limits of the electric lanes

Romeo Danielis

professor of Economics at the University of Trieste.

Romeo Danielis is full professor of Economics at the University of Trieste. He teaches Industrial Economics, Transport Economics and Logistics, and Market and Business Economics.

The last speaker involved in this second training session, aimed primarily at satisfying the needs of the project partners, is **Andrea Molinaro**. He is the expert representative involved in the proposal of the business model that is best suited to the STEP-UP project. During this session he is invited to present the basics of his work and the fundamentals necessary for the well definition of an adequate business model.

Andrea Molinaro

Consultant at Studio Peloso & Associati - expert in design thinking, business organization and subsidized finance

2.5 II Training Session: Presented Topics

The final topics were chosen in collaboration with the lecturers invited to participate in the first training session. Below is the summary list of the selected titles and again to follow the presentations offered during the conference.

1. **The role of Mobility as a Service (Daniela Vasari)**
2. **The economics of electric vehicles (Romeo Danielis)**
3. **ICT tool in use at the Port of Trieste: The Port Community System Sinfomar (Valentina Boschian)**
4. **How to use GTFS (Giorgia Fanesi)**
5. **MaaS Business Models (Andrea Molinaro)**

2.5.1 The role of Mobility as a Service [Daniela Vasari]



Interreg Italy - Croatia STEP-UP EUROPEAN UNION

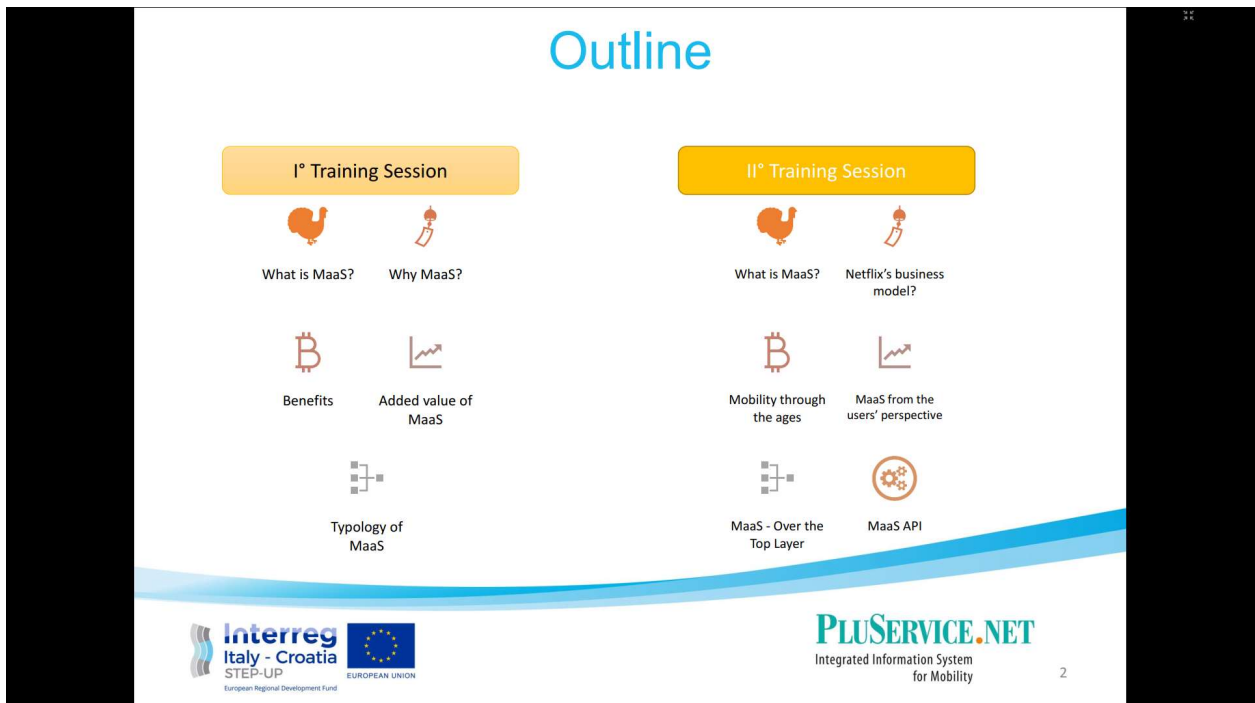
PLUSERVICE.NET
Integrated Information System for Mobility

The role of Mobility as a Service












Pluservice srl
II Training Session | 28th June 2019

European Regional Development Fund

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Outline

I° Training Session	II° Training Session
 What is MaaS?	 What is MaaS?
 Why MaaS?	 Netflix's business model?
 Benefits	 Mobility through the ages
 Added value of MaaS	 MaaS from the users' perspective
 Typology of MaaS	 MaaS - Over the Top Layer
	 MaaS API

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Integrated Information System for Mobility

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What is MaaS?



Mobility as a Service (MaaS) is the integration of various forms of transport services into a single mobility service accessible on demand. To meet a customer's request, a MaaS operator facilitates a diverse menu of transport options, be they public transport, ride-, car- or bike-sharing, taxi or car rental/lease, or a combination thereof. For the user, MaaS can offer added value through use of a **single application to provide access to mobility**, with a single payment channel instead of multiple ticketing and payment operations. For its users, MaaS should be the **best value proposition**, by helping them meet their mobility needs and solve the inconvenient parts of individual journeys as well as the entire system of mobility services.

The aim of MaaS is to provide an **alternative to the use of the private car** that may be as convenient, more sustainable, help to reduce congestion and constraints in transport capacity, and can be even cheaper.



Netflix's business model

If Netflix's business model were applied to urban transportation, how might that change the way city dwellers get around?



Mobility through the ages

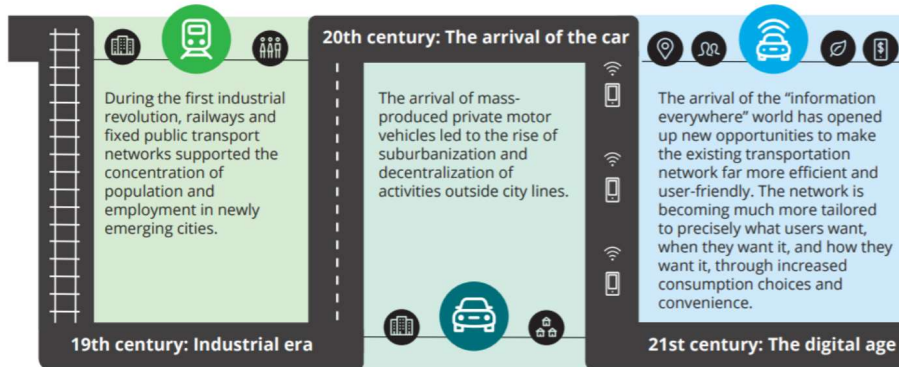
Streaming services like Netflix have fundamentally changed the way people search for, consume, and pay for media. Transportation now stands on a similar frontier.

At its core, MaaS relies on a **digital platform that integrates end-to-end trip planning, booking, electronic ticketing, and payment services** across all modes of transportation, public or private. It's a marked departure from where most cities are today, and from how mobility has been delivered until now.

Rather than having to locate, book, and pay for each mode of transportation separately, MaaS platforms let users plan and **book door-to-door trips using a single app**. By answering the question of how best to get individual users where they're going based on real-time conditions throughout the network, taking account of all the possible options and each user's own preferences (for example, time and convenience vs. cost), and facilitating seamless mobile payment, **MaaS starts to move us toward a more user-centered mobility paradigm**.

SOURCE: Deloitte analysis – Deloitte University Press

Mobility through the ages



SOURCE: Deloitte analysis – Deloitte University Press

MaaS: a new concept

MaaS is a new concept in the transport sector; it provides a new way of thinking in terms of how the delivery and consumption of transport is managed:

- Integrated and seamless mobility services offered to a client by a public or private mobility aggregators
- MaaS is based on disruptive digital business services and models
- MaaS is generally based on subscription business model, but could accept micro-transaction



MaaS could be seen as an Over The Top service

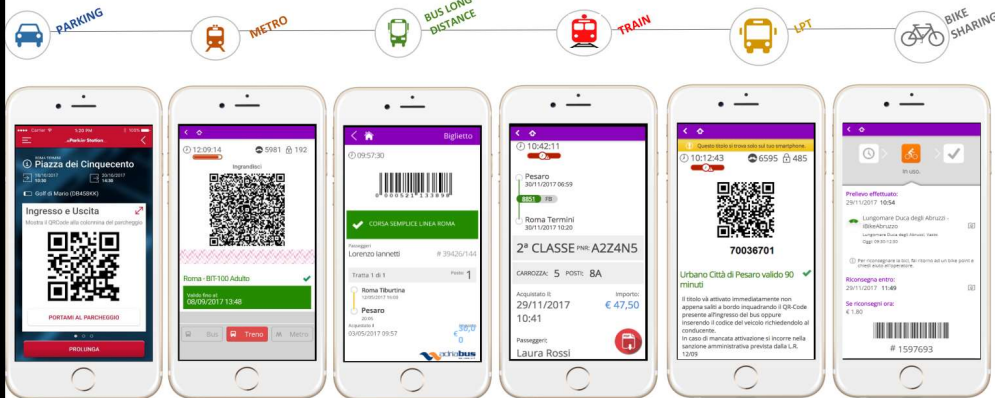
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MaaS - Over the Top Layer



Jumping in (8:00) and out of a metro, bus (8:15), and bike-sharing (booked at 9:00) and pay the right amount or the best fare calculated.



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MaaS from the users' perspective

MaaS offers an attractive value proposition by providing a better customer experience in terms of:

Journey Planning: real-time journey planning allows a user to plan his journey, choosing from multiple modes that are «intelligently» suggested based on his personal preferences (like for example, cost, comfort, time)

Ease of Transaction: the user can access mobility using a range of payment channels for example a phone, watch, smartcard or bank card regardless of which modes of transport he use

Flexible Payment terms: the users can pay for their mobility choice via pre-pay, post-pay or pay-as-you-go

User Experience: data analytics will enhance the overall user experience. This feature may be seen as a virtual «concierge service» that provides the user with the best possible whole journey experience by managing the choices they make

Personalized Service: a fully personalized service that builds a relationship between the user and the MaaS provider by allowing two-way communication. The MaaS 'service' will be highly customer relevant and focused and will react to user feedback

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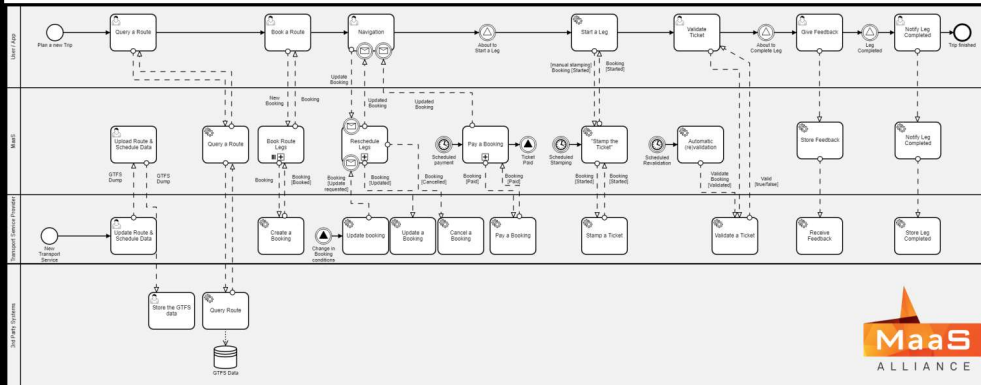
MaaS API

An important factor in making MaaS a success will be getting all of the players to work together, especially the Transport Service Provider point of view .



How MaaS interacts with Transport Service Provider?

Life-cycle of an individual trip from a TSP point of view



Documentations and Links

- <https://maas-alliance.eu/>
- <https://maas.guide/>
- https://en.wikipedia.org/wiki/Mobility_as_a_service
- <https://www2.deloitte.com/content/dam/Deloitte/nl/Documents/consumer-business/deloitte-nl-cb-the-rise-of-mobility-as-a-service.pdf>
- <https://github.com/maasglobal/maas-tsp-api/blob/master/specs/Booking.md>
- <https://www.slideshare.net/welkaim/mobility-as-a-service-maas>

Thank you for your attention!

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2.5.2 The economics of electric vehicles [Romeo Danielis]



The slide features a blue and white design with a large blue shape on the right containing the text "STEP-UP Sustainable Transport E-Planner to Upgrade the IT-HR mobility". On the left, there are logos for "Interreg Italy - Croatia STEP-UP" and the "EUROPEAN UNION". Below the main title, it says "STEP-UP II TRAINING SESSION". At the bottom, there is a row of logos including "European Regional Development Fund", "REGIONE MARCHE", "Regione Emilia Romagna", "Città di Livenza", "UNIVERSITÀ DEGLI STUDI DI TRIESTE", "Sri Lanka International Energy", "Gad Elbark El-Khatib", and "redair airport". The URL "www.italy-croatia.eu/stepup" is also present. A small number "1" is in the bottom right corner.

Interreg Italy - Croatia STEP-UP EUROPEAN UNION

STEP-UP
Sustainable Transport
E-Planner to Upgrade
the IT-HR mobility

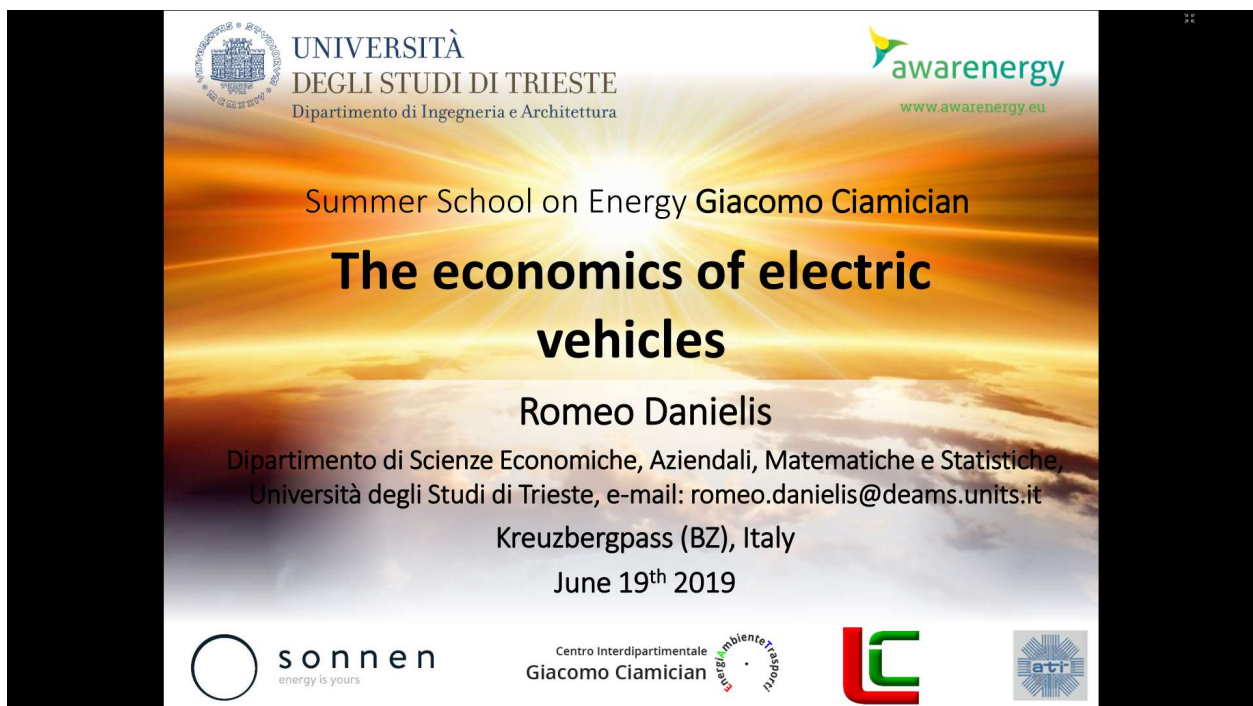
STEP-UP II TRAINING SESSION

www.italy-croatia.eu/stepup

European Regional Development Fund REGIONE MARCHE Regione Emilia Romagna Città di Livenza UNIVERSITÀ DEGLI STUDI DI TRIESTE Sri Lanka International Energy Gad Elbark El-Khatib redair airport

1

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The slide has a background of a sunset over clouds. At the top left is the logo of "UNIVERSITÀ DEGLI STUDI DI TRIESTE Dipartimento di Ingegneria e Architettura". At the top right is the logo for "awareenergy www.awareenergy.eu". The main text in the center reads "Summer School on Energy Giacomo Ciamician" followed by "The economics of electric vehicles" in large bold letters, and "Romeo Danielis" below it. Further down, it lists "Dipartimento di Scienze Economiche, Aziendali, Matematiche e Statistiche, Università degli Studi di Trieste, e-mail: romeo.danielis@deams.units.it", "Kreuzbergpass (BZ), Italy", and "June 19th 2019". At the bottom, there are logos for "sonnen energy is yours", "Centro Interdipartimentale Giacomo Ciamician", a stylized "LC" logo, and "atp".

UNIVERSITÀ DEGLI STUDI DI TRIESTE Dipartimento di Ingegneria e Architettura

awareenergy www.awareenergy.eu

Summer School on Energy Giacomo Ciamician

The economics of electric vehicles

Romeo Danielis

Dipartimento di Scienze Economiche, Aziendali, Matematiche e Statistiche,
Università degli Studi di Trieste, e-mail: romeo.danielis@deams.units.it

Kreuzbergpass (BZ), Italy

June 19th 2019

sonnen energy is yours

Centro Interdipartimentale Giacomo Ciamician

LC

atp

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Outline

- Why do we need for Evs?
- Are EVs technologically feasible?
- Is there an economic case for EVs?
- Which EVs are available? For which transport modes?
- Is it possible to decarbonise transport?

3

Slide 3/58

Do we need electric vehicles?

Two potential environmental motivations:

- Local urban air emission
- Global CO₂eq emissions

4

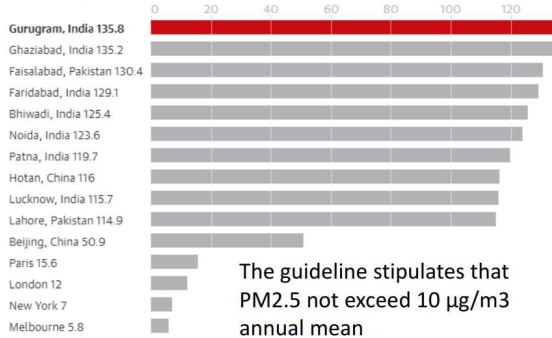
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Local air emissions

64% of cities globally exceed WHO guidelines. Every single measured city in the Middle East and Africa exceeds the WHO guidelines, as well as 99% of cities in south Asia and 89% in east Asia.

Gurugram in India was the most polluted city in the world in 2018

Annual mean concentration of particulate matter with diameter of 2.5 microns or less. Micrograms per cubic metre



The WHO estimates that 7 million people a year die prematurely from exposure to air pollution globally, with the World Bank calculating the cost to the world economy in lost labour as \$225bn.

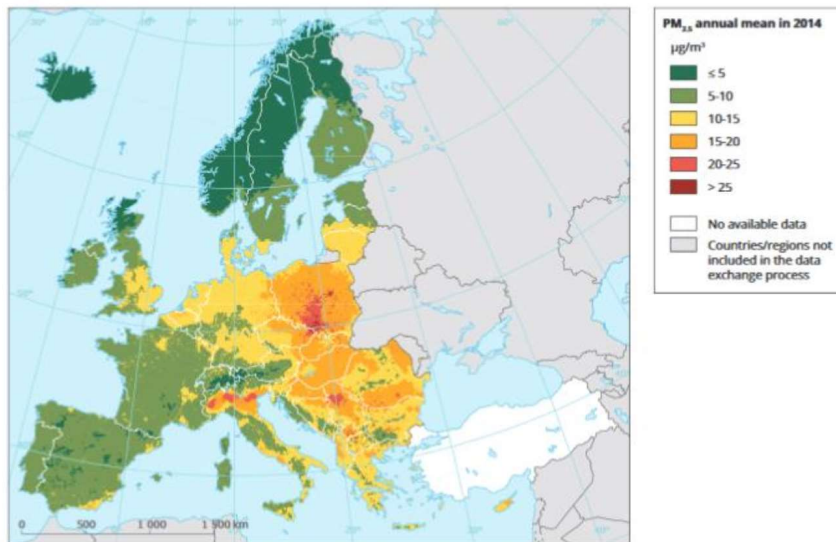


Guardian Graphic | Source: Greenpeace/AirVisual

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Local air emissions in Europe



<https://www.eea.europa.eu/publications/air-quality-in-europe-2017>

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Global CO2eq emissions

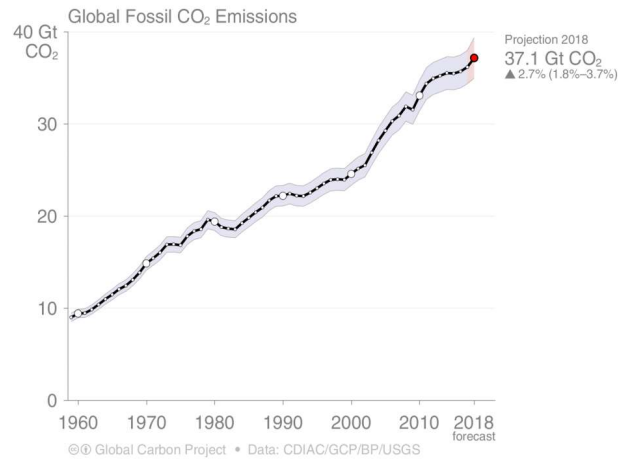


Figura 1 - Estimates for 2015, 2016 and 2017 are preliminary ; 2018 is a projection based on partial data.

Source: [CDIAC](#); [Le Quéré et al 2018](#); [Global Carbon Budget 2018](#)

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Transport's CO2 emissions on the rise..

In EU è il 27% nel 2014:

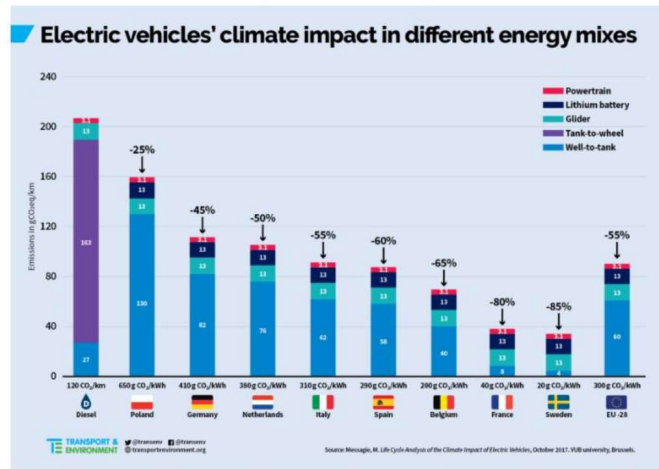
(20,8 Transport; 3,2% international navigation, 3,2% international shipping)

	1990		2014		Difference
Transport	785.5	13.9%	889.9	20.8%	104.4
International navigation	109.4	1.9%	135.2	3.2%	25.8
International aviation	69.7	1.2%	137.1	3.2%	67.4
Energy supply	1861.4	32.8%	1334.3	31.1%	-527.1
Industry	1376.4	24.3%	866.1	20.2%	-510.3
Agriculture	643.6	11.4%	514.1	12.0%	-129.5
Residential and commercial	726.5	12.8%	524.4	12.2%	-202.1
Other	31.7	0.6%	10.7	0.2%	-21
Land use, land use change and Fores	-255.2	-4.5%	-302.6	-7.1%	-47.4
Waste management	243.5	4.3%	146	3.4%	-97.5
CO2 emissions from biomass	198.2	3.5%	506.1	11.8%	307.9
Total excl. LULUCF	5668.7	100.0%	4285.6	100.0%	-1383.1
All transport		17.0%		27.1%	
	5790.7		4761.3		

Figura 5 – Emissione di gas serra per settore economico in EU (fonte: <https://www.eea.europa.eu/data-and-maps/daviz/change-of-co2-eq-emissions-2#tab-dashboard-01>)

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Europe and Italy

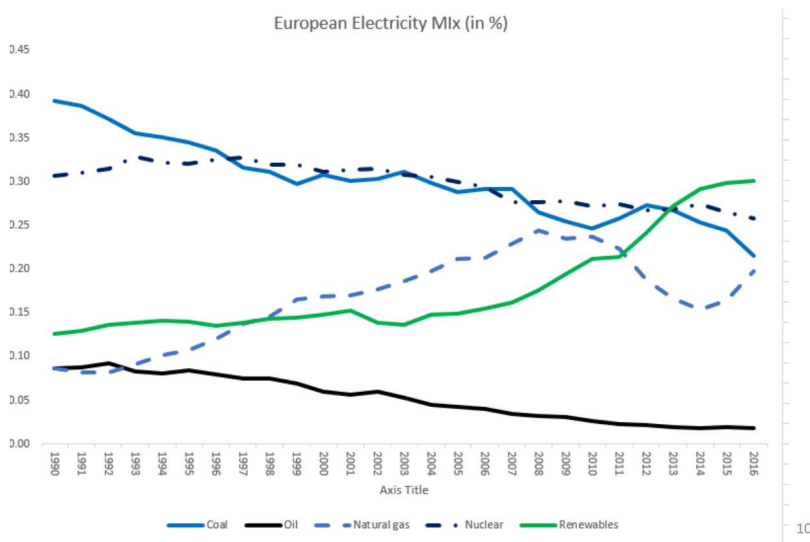


Transport & Environment (T&E)- Electric cars emit less CO₂ over their lifetime than diesels even when powered with dirtiest electricity (Italy, Europe -55%)

Romeo Danielis - Le emissioni di CO₂ delle auto elettriche e delle auto con motore a combustione interna. Un confronto per l'Italia tramite l'analisi del ciclo di vita, WP SIET (<http://sietitalia.org/pubblicazioni.htm>). «le auto elettriche emettono complessivamente meno CO₂ delle automobili con motori a combustione interna più vendute in Italia: il 19% in meno delle auto a benzina, il 18% in meno delle auto diesel ed il 9% in meno delle ibride.»

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Europe..and the grid is getting cleaner

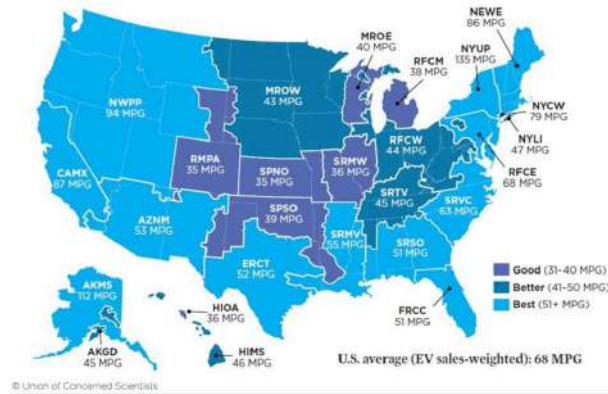


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USA: Life Cycle Electric Vehicle Emissions (2015) Union of Concerned Scientist

global warming emissions of electric cars on a *life cycle* basis—from the manufacturing of the vehicle's body and battery to its ultimate disposal and reuse

Electric Vehicle Global Warming Pollution Ratings and Gasoline Vehicle Emissions Equivalents by Region



How many miles per gallon would a gas car have to achieve to produce global warming emissions equivalent to an EV? The answer depends on where you live. Numbers based on the EPA's eGRID 2015 database. Click to enlarge.

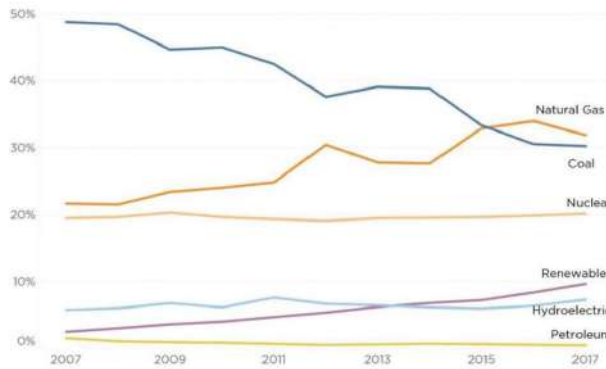
The fuel economy of new U.S. cars and trucks hit a record 24.7 miles per gallon in the 2016 model year, a government report said

<https://www.ucsusa.org/clean-vehicles/electric-vehicles/life-cycle-ev-emissions>

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USA ...and the grid is getting cleaner



17% in 2018

Utility-scale electric power generation. Power from coal has dropped over the last decade and clean renewable power has increased. Data Source: US Department of Energy, Energy Information Agency.

In 2018, about 4,178 billion kilowatthours (kWh) (or 4.18 trillion kWh) of electricity were generated at utility-scale electricity generation facilities in the United States.¹ About 63% of this electricity generation was from fossil fuels (coal, natural gas, petroleum, and other gases). About 20% was from nuclear energy, and about 17% was from renewable energy sources. The U.S. Energy Information Administration estimates that an additional 30 billion kWh of electricity generation was from small-scale solar photovoltaic systems in 2018

<https://www.eia.gov/tools/faqs/faq.php?id=427&t=3>

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EVs: are they technically feasible?

Batteries: main component

- More than 5 million electric cars in the streets in December 2018, million miles driven
- Battery lifespan: many charging cycles (most manufacturers are offering 8-year/100,000-mile warranties), degradation curve (3-5% initially then slowing down). “Tesla Batteries Have 90% Capacity After 160,000 Miles, May Last For 500,000 miles”
(<https://cleantechica.com/2018/04/16/tesla-batteries-have-90-capacity-after-160000-miles-may-last-for-500000-miles/>)
- Rare components: cobalt free (Tesla), new materials
- Battery recycling
- Safety: catching fire
- New batteries, solid state batteries (Toyota)

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EVs: are they technically feasible?

EV charging infrastructure

- Home charging: main advantage (if you own a garage)
- Availability: Chicken-egg problem? No, charging stations follow, regulation (and incentives) needed
- Charging time: up to 350 kW existing, 400 kW CHADEMO announced, 900 kW in China tentative

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The Tesla network

1.533 stazioni Supercharger con 13.344 paline Supercharger



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The IONITY network: the power of 350 KW



IONITY is a joint venture of BMW Group, Daimler AG, Ford Motor Company, and Volkswagen Group with Audi and Porsche. Our goal is simple: Building a high power charging network for electric vehicles along major highways in Europe.

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Fastned: 350 kW



Fastned opens its 100th fast charging station
13 June 2019

For all types of electric vehicle

Fastned offers all fast charging standards at all its stations and is compatible with all electric cars, such as:

- ✓ Tesla Model S / X
- ✓ Nissan Leaf
- ✓ BMW i3
- ✓ Hyundai Ioniq

[Can my car fast charge?](#)

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EVs: Are they economically feasible?

- The consumers' point of view (demand side of the market)
 - Monetary attributes: total cost of ownership
 - Non monetary attributes: time to charge, driving range, other social motives
- The automotive industry's point of view (supply side of the market)

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Total cost of ownership

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The TCO model

2. Total Cost of Ownership model and break-even BEV MSRP

The private TCO of a vehicle covers all costs occurring over its lifetime. It includes one-time costs, i.e. the lump-sum initial costs (IC), the annual operating costs (AOC) during the period of use minus the residual value (RV) of the vehicle at time T, when it is sold or scrapped.

Initial costs are equal to:

$$IC = MSRP - RD - SUB + RC + HC$$

where MSRP is the manufacturer's suggested retail price, RD is the retailer's discount, SUB is the government subsidy, RC is the registration cost and, in the case of electric vehicles, HC is the cost for acquiring and installing the home charging equipment (e.g., wall-box).

AOC includes all the costs incurred during the period of ownership T of the vehicle. For every year $t \in [1, T]$, AOC is equal to:

$$AOC_t = CT_t + INS_t + MAINT_t + FE_t$$

where CT is the circulation tax, INS is the insurance premium, MAINT are the repair and maintenance costs, and FE stands for the fuel/electricity cost to run the car. These costs vary with the propulsion system and the annual distance travelled.

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FE is the product of the fuel/energy efficiency (FE_E) and fuel/electricity price (FE_P). We specify FE_E as follows:

$$FE_E = \gamma \cdot (\alpha \cdot FE_{urb} + (1 - \alpha) \cdot FE_{exturb})$$

where γ is the weather-adjustment factor, FE_{urb} and FE_{exturb} the fuel/energy efficiency in urban and in extra-urban roads, respectively, and α is the percentage of trips driven in an urban area. We specify FE_P as:

$$FE_P = \begin{cases} \beta \cdot EP_{home} + (1 - \beta) \cdot EP_{public} & \text{for BEVs} \\ \text{average price of diesel/petrol} & \text{for HEVs, D_ICEVs and P_ICEVs} \end{cases}$$

For BEVs, the electricity cost depends on whether charging takes place at home or at public chargers. Therefore, we compute the weighted average of the electricity price paid at home, EP_{home} , and that at the public charger, EP_{public} , where β is the percentage of electricity charged at home. For diesel and petrol cars, we consider the average price paid.

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The total amount to be paid to the retailer when purchasing the vehicle is equal to MSRP-RD-SUB. If financed with borrowed money at a given APR, its annual amount is equal to:

$$\frac{(MSRP - RD - SUB) \cdot APR}{1 - (1 + APR)^{-T}}$$

Further components of the initial costs are RC and HC. Their annualized value is obtained multiplying them by the CRF⁹, i.e. the capital recovery factor equal to $(i(1+i)^T)/((1+i)^T - 1)$:

$$(RC + HC) \cdot CRF$$

The sum of these two components represents the Annualized Initial Cost (AIC):

$$AIC = \frac{(MSRP - RD - SUB) \cdot APR}{1 - (1 + APR)^{-T}} + (RC + HC) \cdot CRF$$

⁹ APR is expressed as a percentage that represents the actual yearly cost of funds over the term of a loan. This includes any fees or additional costs associated with the transaction but does not take compounding into account.

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AOC takes place during the lifetime of the vehicle. We discount it and compute its average value, obtaining the average annual operating cost (AAOC):

$$AAOC = \frac{1}{T} \sum_{t=1}^T \frac{AOC_t}{(1+i)^t}$$

Finally, we add the discounted and annualized residual value (DARV):

$$DARV = \frac{RV}{(1+i)^T} \cdot CRF$$

where RV can be expressed as a percentage η of the MSRP.

Therefore, the annualized TCO metric is the following:

$$ATCO = AIC + AAOC - DARV$$

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Therefore, the annualized TCO metric (ATCO) is the following:

$$ATCO = AIC + AAOC - DARV$$

Dividing this sum by the annual distance travelled (ADT) in kilometers, we finally obtain the metric ATCO/km, which represents the average cost per kilometer of owning a given vehicle:

$$\frac{ATCO}{\text{km}} = \frac{ATCO}{ADT} = \frac{1}{ADT} \left(\frac{(MSRP - RD - SUB) \cdot APR}{1 - (1 + APR)^{-T}} + (RC + HC) \cdot CRF + \frac{1}{T} \sum_{t=1}^T \frac{AOC_t}{(1+i)^t} - \frac{\eta \cdot MSRP}{(1+i)^T} \cdot CRF \right)$$

An interesting indicator is to compute which BEVs' MSRP would make BEVs' ATCO/km equal to that of an alternative propulsion system. Solving the above equation with respect to BEVs' MSRP, one gets the following result:

$$\text{Break - Even BEV MSRP} = \frac{ATCO_{\text{comp}} - AAOC + \frac{(RD + SUB) \cdot APR}{1 - (1 + APR)^{-T}} - (RC + HC) \cdot CRF}{\frac{APR}{1 - (1 + APR)^{-T}} - \frac{\eta \cdot CRF}{(1+i)^T}}$$

where $ATCO_{\text{comp}}$ is the average ATCO of the propulsion system we want to compare BEVs with. We define it as the ATCO/km break-even BEV MSRP.

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Summary of TCO determinants

- **Market variables:** MSRP, (partly) petrol\diesel and electricity price
- **Financial variables:** Interest rate, own funds or nominal annual percentage rate of charge (APR)\effective APR (or EAPR). In Italy, TAN (tasso annuale nominale)\TAEG (tasso annuo effettivo globale)
- **Policy variables:** subsidies, reduced registration taxes, (partly) petrol\diesel and electricity price, reduced parking, fees to access restricted areas (LTZ),
- **Mobility variables:** Annual distance travelled, % of urban trips
- **Charging habits and location variables:** at home (garage availability) or at public charges

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Model implementation in Excel

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Further analysis and conclusions

- The TCO model can be further refined including uncertainty and dynamics
- Main conclusions: EVs are not yet cost competitive unless
 - High annual travelled distances
 - Incentivising policies (subsidies, discounts, free parking, etc.)
 - Urban driving
 - Charging at home
- ...but people make decisions not only based on monetary variables, but also attitudes, beliefs, time constraints and so on..

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Discrete choice modelling

All variables are considered;

- Monetary: MRSP, AOC (fuel, maintenance, annual excise fees)
- Technical: acceleration, driving range, emissions, noise
- Time: charging time and charging stations availability
- Mobility needs: cars in the household, % of longer trips, traffic restrictions

Preference data are collected

The discrete choice model is estimated

The discrete choice model is used to forecast EVs uptake

The role of driving range in consumers' purchasing decision for electric cars in Italy
M Giansoldati, R Daniels, L Rotaris, M Scorrano
Energy 165, 267-274

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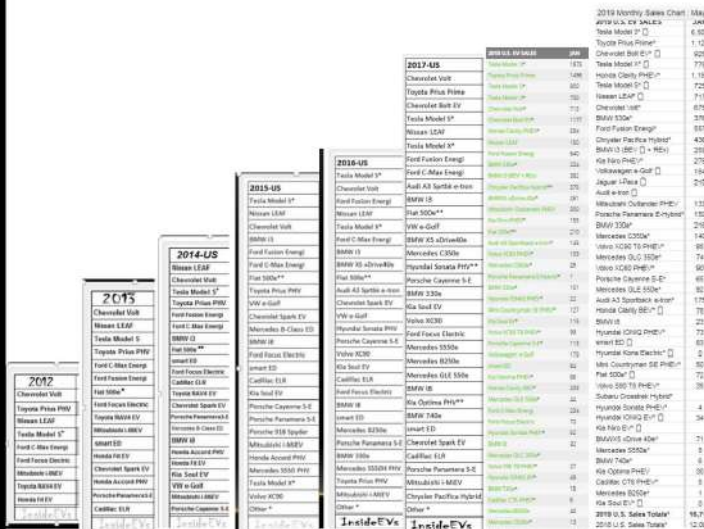
The automotive industry's point of view (supply side of the market)

- Increased variety
- Increasing number of charging stations
- Large investments

Variety is increasing: BEV, PHEV, EREV (no HEV) in the USA

Source:

InsideEvs.com
 Jan. 2012: 9
 Jan. 2013: 16
 Jan. 2014: 22
 Jan. 2015: 24
 Jan. 2016: 26
 Jan. 2017: 32
 Jan. 2018: 42
 May, 2019: 45



Coming models 2019-20

- VW: Volkswagen ID.3, Volkswagen ID Crozz, Volkswagen ID Buzz and Cargo Concept
- Audi e-tron SUV, Audi e-Tron GT, Porsche Taycan
- Skoda Citigo, Seat El-Born, Seat Mii electric
- BMW: Mini Cooper SE, BMW i4
- Peugeot e-208
- Tesla Model Y, Tesla semi, Tesla pick up
- Rivian electric SUVs and pick-ups
- Chinese related: Byton EV SUV, Faraday Future FF-91, Polestar 2, Vauxhall Corsa-e
- Honda e

} VW group

- And Toyota???

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Large investments

Table 1. Electric vehicle and battery manufacturing plant investments

Automaker group	Announced investment*	Electric models*	Annual global electric sales (shares)*
Nissan-Renault-Mitsubishi	• \$9 billion over 2018-2022 (in China only)	• 12 electric models by 2022	3 million (30%) by 2022
Volkswagen Group	• \$40 billion manufacturing plant by 2022 • \$60 billion battery procurement	• 80 electric models by 2025 • 300 electric models by 2030	2-3 million (20%- 25%) by 2025
Toyota	• (not available)	• All vehicles hybrid, battery, or fuel cell electric by 2025	2 million (25%) by 2025
Chongqing Changan	• \$15 billion by 2025	• 21 electric models by 2025 • 12 plug-in hybrid models by 2025	1.7 million (100%) by 2025
BAIC	• \$1.5 billion by 2022 • \$1.9 billion (with Daimler)	• (not available)	1.3 million (100%) by 2025
Geely	• (not available)	• All models hybrid or electric by 2019 (Volvo)	1.1 million (90%) by 2020
General Motors	• (not available)	• 20 electric models by 2023	1 million (12%) by 2026
Tesla	• \$4-5 billion battery manufacturing	• 3-4 electric models (S, X, 3, Y)	0.5 million (100%) by 2020
Mercedes	• \$12 billion manufacturing plant • \$1.2 billion battery manufacturing	• 10 electric models by 2025 • 50 electrified models by 2025	0.4-0.6 million (15%-25%) by 2025
BMW	• \$2.4-3.6 billion procurement by 2025	• 12 electric models by 2025 • 13 plug-in hybrid models by 2025	0.4-0.6 million (15%-25%) by 2025
Ford	• \$11 billion manufacturing plant by 2022	• 16 electric models by 2022 • 24 plug-in hybrid models by 2022	(not available)
Great Wall	• \$2-8 billion over 10 years	• (not available)	(not available)
Jaguar	• (not available)	• All models hybrid or electric by 2020	(not available)
Infiniti	• (not available)	• All new models plug-hybrid or electric by 2021	(not available)

Note. Details are from press statements from the companies and media reports at time of announcements.
*Assume 1 euro to \$1.2 conversion, based on mid-2017 exchange. *Models in this column refer to plug-in electric and non-plug-in hybrids. *Final column has approximated sales and shares of new vehicles based on announced commitments and 2016 sales volume (excluding non-plug-in hybrids).

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The crucial factor: the battery

chemistries, , power-to-weight ratio (per unit weight), energy to weight ratio (specific energy is energy per unit mass) and energy density (per unit volume), cycles (before degradation), recharging time, disposal



Fig. 1. Basic outline of Japanese Government progression supporting R&D in EVs and FCVs.
 Source: Mori (2008), Government policy and the development of electric vehicles in Japan. Energy Policy, 34 (4): 433-443.

Under the New Strategy Programme, R&D in polymer electrolyte fuel cells (PEFCs) has been undertaken since 1992. Research is also conducted under the same programme on lithium batteries through the organization LIBRES since 1992. The aim was to develop both stationary and vehicle applications of the next generation of batteries based on lithium.
 In 1997, the MITI initiated the Advanced Clean Energy (ACE) think programme. This is an R&D programme extending from 1997 to 2003 with the objective of developing efficient high-energy efficient hybrid vehicles.

Lithium batteries technology

- Lithium batteries were proposed by J. S. Whinnier, now at [Battelle Columbus](#), while working for General Motors.
- Dora, Sony and ABB-Gates released the first commercial lithium ion battery in 1991. The [1990s](#) saw a rapid growth in the market for lithium ion batteries to create the world's first commercial hybrid electric vehicle.
- 2004 - China again achieved performance for the [affordable](#) production of lithium ion batteries. This was due to the high energy density (300 Wh/kg) and performance. Commercialisation led to a rapid growth in the market for higher capacity cells, as well as a period of intense battle between China and [USA](#).
- 2012 - [China](#) (Guangdong, Beijing, Jiangsu) and [USA](#) (Tesla) received the 2012 [MIT](#) Medal for Environmental and Safety Technologies for developing the lithium ion battery.



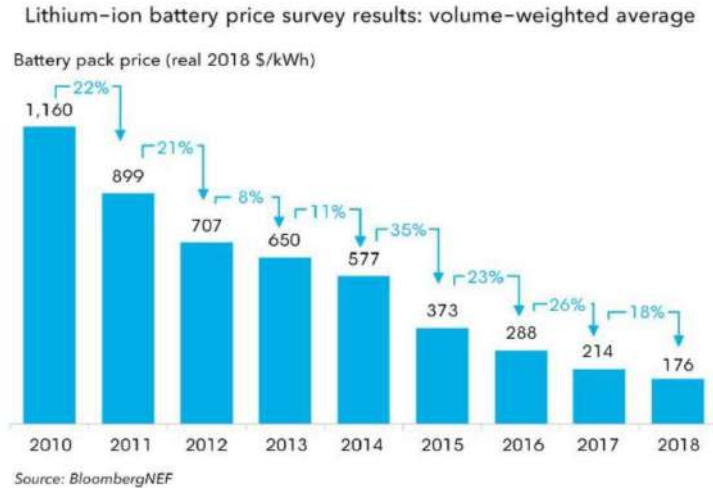
Current Li Ion Batteries and Future Targets

Parameters	Now	Target
Energy density (Wh/kg, Wh/L)	220Wh/kg	500Wh/kg
Cell cost (\$/kWh)	\$130/kWh	\$60/kWh
Cycle life and calendar life	1,000 cycles 7 years	3,000-10,000 cycles 15-25 years
Charge rate	1-2 hours	<10min
Safety	Not Safe	Safe

Stanford

<https://www.youtube.com/watch?v=vp--eMUexPs>

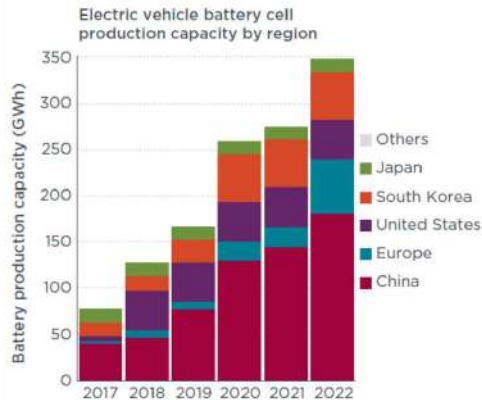
Declining battery prices (Bloomberg annual survey)



<https://about.bnef.com/blog/behind-scenes-take-lithium-ion-battery-prices/> 35

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Increasing battery production, economies of scale (Cina, Corea, Giappone, USA)



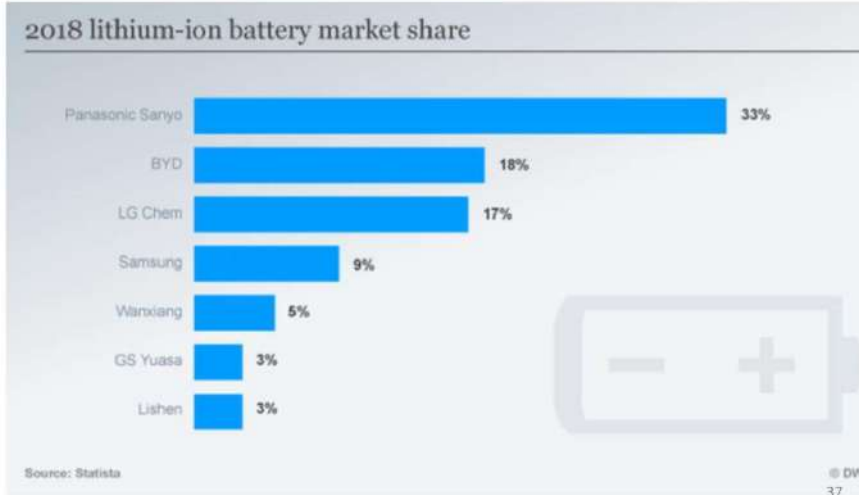
Announced electric vehicle battery pack production capacity for 2017–2022, by company and region.

icct
THE INTERNATIONAL COUNCIL
ON CLEAN TRANSPORTATION

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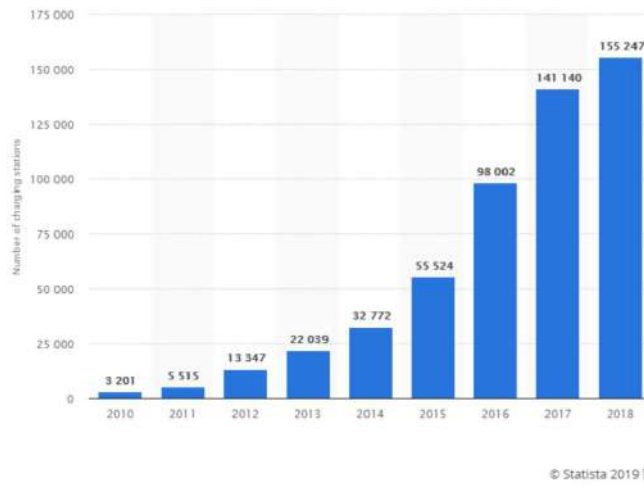
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<https://www.forbes.com/sites/jackperkowsky/2017/08/03/ev-batteries-a-240-billion-industry-in-the-making/#1c496603f084>



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Increasing number of charging stations

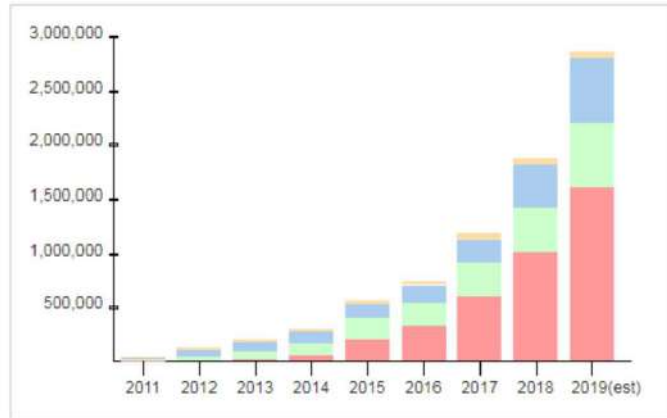


<https://cleantechnica.com/2018/03/07/stop-comparing-number-gas-stations-ev-charging-stations/>

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Annual sales of light-duty plug-in EVs



Annual sales of light-duty plug-in electric vehicles in the world's top markets between 2011 and 2017.^{[2][8][15][21]}

■ China ■ North America
■ Europe ■ Japan

https://en.wikipedia.org/wiki/Electric_car_use_by_country

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Passenger plug-in market share of total new car sales between 2013 and 2018 for selected countries and selected regional markets

Country	2018	2017	2016 ^{[15][74]}	2015 ^{[75][76]}	2014 ^[77]	2013 ^[78]
 Norway ^{[50][16]}	49.1%	39.2%	29.1%	22.39%	13.84%	6.10%
 Iceland ^{[79][80][81][82]}	19%	14.05%	4.6%	2.93%	2.71%	0.94%
 Sweden ^{[83][84][83]}	8.2%	5.2%	3.5%	2.62%	1.53%	0.71%
 Netherlands ^{[61][85]}	6.5%	2.6%	6.7%	9.9%	3.87%	5.55%
 Finland ^{[79][86]}	4.7%	2.57%	1.2%	N/A	N/A	N/A
 China ^{[77][87][88][23][89]}	4.2%	2.1%	1.31%	0.84%	0.23%	0.08%
 Andorra ^[90]		5.6%	0.81%	N/A	N/A	N/A
 Portugal ^[91]	3.6%	1.9%	N/A	N/A	N/A	N/A
 Austria ^{[79][92][93]}	2.6%	2.06%	1.6%	0.90%	N/A	N/A
 Switzerland ^{[79][94]}		2.55%	1.8%	1.98%	0.75%	0.44%
 UK ^{[95][96][54]}	2.53%	1.86%	1.37%	1.07%	0.59%	0.16%
 Belgium ^{[79][97]}	2.5%	2.7%	1.8%	N/A	N/A	N/A
 Canada ^[62]	2.16% ⁽³⁾	0.92%	0.58%	0.35%	0.28%	0.18%
 France ^{(1)[97][58]}	2.11%	1.98%	1.4%	1.19%	0.70%	0.83%
 USA ^{[98][49][99][100]}	2.1%	1.13%	0.90%	0.66%	0.72%	0.60%
 Denmark ^{[101][102]}	2%	0.4%	0.6%	2.29%	0.88%	0.29%
 Germany ^{[77][87][103][60][59][104]}	1.9%	1.58%	1.1%	0.73%	0.43%	0.25%
 Japan ^{[2][52][105]}	1.0%	1.1%	0.59%	0.68%	1.06%	0.91%
 New Zealand ^[106]	0.96%	0.72%	0.50%	0.23%	0.21%	N/A
Global Total						
 California ^{[67][107]}	7.8%	4.8%	3.6%	3.1%	3.2%	2.5%
 Europe ^{[66][79][108][109][110][111][2]}	2.5%	1.74%	1.3%	1.41%	0.66%	0.49%

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The future of EVs

International Energy Agency «Global EV Outlook 2019»

- **Electric mobility is expanding at a rapid pace.** In 2018, the global electric car fleet exceeded **5.1 million**.
- **Policies play a critical role** (fuel economy standards, incentives for zero- and low-emissions vehicles), policy support to address the strategic importance of the battery technology value chain.
- **Technology advances are delivering substantial cost cuts.** Key enablers are developments in battery chemistry and expansion of production capacity in manufacturing plants. Other solutions include the redesign of vehicle manufacturing platforms.
- **Private sector response to public policy signals confirms the escalating momentum** for electrification of transport.
- **Positive outlook.** In 2030, in the New Policies Scenario, global electric car sales reach **23 million** and the stock exceeds **130 million vehicles**. In the EV30@30 Scenario, EV sales reach **43 million** and the stock is more than 250 million.

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The future of EVs

- **Volkswagen is betting its future on electric cars.** VW is increasing the number of **new electric models** it plans to build over the next decade from 50 to 70. The Volkswagen Group said that it now plans to build **22 million electric cars across its brands by 2028**. It said it may also get into the battery manufacturing business in Europe. The Volkswagen Group, which includes Audi, Porsche and Skoda, sold a record 10.8 million cars in 2018. But just 40,000 of those were electric vehicles, and only 60,000 or so were plug-in hybrids.
- **Evergrande**, a Chinese firm believed to be the biggest real estate company in the world, **announced a massive \$23 billion investment in the production 1 million electric cars and 50 GWh of batteries per year**. The company is known for having its hands in many different businesses in China and overseas.

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EVs....not only cars

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Slide 43/58

Electric Scooters



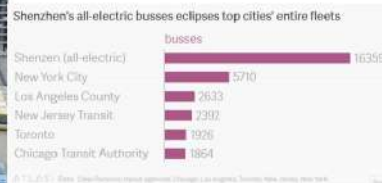
- **Producers:** Cezeta, Victory Motorcycles, Monday Motorbikes, Mahindra, Zero Motorcycles, Lightning Motorcycle, Energica Motor Company, Johammer, Evoke Motorcycles, Quanta, Electric Motorsport, Hollywood Electrics, Yo, Lito, Romai, Gogoro, Inokim, Rondine Motor, Current Motor Company, KTM and Alta Motors. Yamaha plans to enter the market shortly with at least two models.
- **Scooter sharing in molte città europee**
 - Battery swapping
- **Vendite:** China leads the world in electric scooter sales, comprising 9.4 million of the total 12 million sold worldwide in 2013. There were only 31,338 electric scooter sales outside the Asia-Pacific region including Europe.
 - Piaggio? Coming in September

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Electric Buses

Shenzhen's transport commission said on Dec. 27 2017 that it had transitioned its 16,359 buses to all-electric models. The city's 17,000 taxis are next (63% of them are already electric).



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Apr 11, 2018 Flixbus launches first long-distance electric bus route in France



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Electric Taxis

**Florence: 70
new licenses,
mandatory
BEV.**

**Next:
Bologna,
Milan**



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Urban freight distribution with electric vans

This was a privately organized research initiative at the RWTH Aachen University which later became an independent company in Aachen
In April 2016, Deutsche Post DHL Group announced that StreetScooter GmbH would be scaling up to manufacture approximately 10,000 of the Work vehicles annually, starting in 2017.



Die London Electric Vehicle Company (LEVC) zeigt ein erstes Foto ihres elektrifizierten Transporters, der Ende 2019 in den Handel kommen soll.

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Medium to long distance trucks



The Tesla Semi is an all-electric battery-powered Class 8 semi-trailer truck prototype which was unveiled on November 16, 2017 and planned for production in 2019. The company initially announced that the truck would have a 500 miles (805 km) range on a full charge and with its new batteries it would be able to run for 400 miles (640 km) after an 80% charge in 30 minutes using a solar-powered "Tesla Megacharger" charging station.

Bundesverkehrsministerium fördert umweltfreundliche Lkw
Die Höhe der Zuschüsse beträgt
12.000 Euro für E-Lkw bis 12
Tonnen und 40.000 für E-Lkw über
12 Tonnen.



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Special transport vehicles in Bern



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By the airport..



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Air transport? First Passenger Electric Aircraft to Take Off Soon

magniX and Harbour Air team up to make the first all-electric commercial airplane fleet

By Prachi Patel

Harbour Air operates 30,000 flights over 12 routes in the Pacific Northwest each year, carrying 500,000 passengers on its small seaplanes. MagniX will begin by swapping the fuel tanks and Pratt & Whitney engines on the airline's six-passenger Havilland Beaver aircraft in exchange for its 560-kilowatt (750-horsepower) electric motor and lithium-ion batteries that provide enough energy to fly about 160 kilometers (100 miles) on a single charge. That, says Harbour, is enough range for the airline's short-hop flights. Flight tests will happen later this year.



Photo: MagniX

In an important move towards all-electric aviation, startup magniX in Redmond, Washington plans to retrofit Canadian airline Harbour Air Seaplane's six-passenger Havilland Beaver aircraft with a battery-powered electric motor. The plan is to convert all the airline's airplanes in the coming years.

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International aviation?



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River, lake and maritime transport?

Corvus Energy has been selected by Norwegian ferry operator Fjord 1 to supply lithium-ion energy storage systems for 5 new all electric ferries. The new ships are being built by Havyard shipbuilders and are expected to enter service in January of 2020. Fjord 1 already has 8 electric ferries operating on four routes. In all, Corvus Energy has supplied energy storage systems for 40 short range hybrid and electric vessels worldwide.



Corvus Energy battery systems provide power to hybrid and all electric heavy industrial equipment as well as ferries and other vessels. To date, it has supplied over 200 MWh of battery storage to industry. Its battery storage systems have successfully accumulated over 2 million operating hours.

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International shipping?



55

Slide 55/58

Decarbonising transport: is it possible?

Avoid, Shift, Improve strategy

- Avoid
 - Reduce unnecessary trips (land-use, urban planning, teleconferences)
- Shift to less carbon intensive modes of transport
- Improve: technology mandate
 - Electric vehicles (car, scooters, buses, trains, vans) using electricity from renewable sources
 - Hydrogen fueled vehicles (coaches, trucks, boats) using electricity from renewable sources
 - International aviation and shipping?

Effective and efficient policies to decarbonise transport

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Thanks for your attention!

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Slide 57/58



The slide features a blue wave graphic at the bottom. On the left, the Interreg Italy - Croatia STEP-UP logo is displayed alongside the European Union flag. The central graphic is a blue semi-circle containing the text 'STEP-UP' in large white letters, followed by 'Sustainable Transport' and 'E-Planner to Upgrade the IT-HR mobility' in smaller white text. A grey teardrop icon with a white grid pattern is positioned below the semi-circle. Below the wave, the text 'STEP-UP II TRAINING SESSION' is written in bold black letters. At the bottom right, the website address 'www.italy-croatia.eu/stepup' is provided. The footer contains logos for the European Regional Development Fund, Regione Marche, Regione Emilia Romagna, Città di Lodi, Università del Piemonte Orientale, Regione Autonoma Valle d'Aosta, and Grad Dubrovnik.

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2.5.3 ICT tool in use at the Port of Trieste: the Port Community System Sinfomar [Valentina Boschian]



Slide 1/27



Slide 2/27

Dott. Ing. Valentina Boschian, Ph.D.



- I am working at the Port Network Authority of the Eastern Adriatic Sea – Port of Trieste, in the Digital Port Area.
- Since 2008, my expertise is focused on consultancy activities related to the analysis of ICT impact on new business cases, mainly in the field of transport and logistics. After obtaining a degree in Management Engineering and a PhD in Computer Science Engineering, I worked as a project manager in several international research projects. I am also expert in business model innovation.

Main skills: Analysis and modelling of processes; Assessment analysis (based on KPIs definition); Management of complex systems with analytical models; Analysis of business scenarios, Use Case identification and User Requirement definition; Project management, ICT applications in logistics and transportation management.

EDUCATION

- Dottorato (Ph.D.) in Information Technology Engineering, University of Trieste (2012)
- Degree in Management Engineering and Integrated Logistics (graduation with first class honours, "110/110 e lode"), University of Trieste (2008)
- Degree in Management Engineering (graduation with first class honours, "110/110 e lode"), University of Trieste (2003)

3

Slide 3/27

Agenda

- Importance of ICT tools in Ports
- Definition of Port Community System - PCS
- Sinfomar: the PCS of the Port of Trieste
- Main modules and components of Sinfomar
- Next steps and further developments

4

Slide 4/27

Agenda

- **Importance of ICT tools in Ports**
- Definition of Port Community System - PCS
- Sinfomar: the PCS of the Port of Trieste
- Main modules and components of Sinfomar
- Next steps and further developments

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Slide 5/27

The Importance of ICT tools in Ports

- The European Commission defines the **Port Authority** as the entity which has as its objective under national law or regulation, the **administration and management of the port infrastructures and the coordination and control of the activities of the different operators present in the port.**
- However we can find **different types of port authorities** depending on their size, the kind of traffic they manage, their political, social and geographical environment, what is their main objective, the way they approach their functions and the role and strategies they adopt, their governance model, ...
- In Italy: law n.84/94 (D.lgs.169/2016) – art.4 Port Classification

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Slide 6/27

The Importance of ICT tools in Ports

- **Information and communications technology (ICT)** tools have an **important role** in the governance and efficiency in the flow of goods at ports. A key element in the application of ICTs in ports is the interconnection of different actors of the supply chain that makes possible a better information flow.
- Recent developments in international trade and transport have led to an **increased use of ICT in ports**.
- **ICT solutions are playing an increasing role** in the design and implementation of trade and transport facilitation measures. These applications can reduce waiting times at border crossings and at ports, secure processing of data, simplify formalities, and provide timely information to transport operators.

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Slide 7/27

Agenda

- Importance of ICT tools in Ports
- **Definition of Port Community System - PCS**
- Sinfomar: the PCS of the Port of Trieste
- Main modules and components of Sinfomar
- Next steps and further developments

8

Slide 8/27

What is a PCS?

- Its development starts in the '70s and' 80s in Germany, France and Great Britain.
 - It is an electronic open platform connecting multiple ICT based networks/systems operated by different seaport organisations.
 - Its main objective is the optimization and harmonization of all port logistic processes through a 'single window system' concept.
- ➔ The system components are designed to enable a single data submission.

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PCS definition



The **Port Community System (PCS)** is a **neutral and open electronic platform** enabling intelligent and secure exchange of information between public and private stakeholders in order to improve the competitive position of the sea and air ports.

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Slide 10/27

Agenda


- Importance of ICT tools in Ports
- Definition of Port Community System - PCS
- **Sinfomar: the PCS of the Port of Trieste**
- Main modules and components of Sinfomar
- Next steps and further developments

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Reasons for implementing the PCS Sinfomar

- As key nodes in international transport chains providing access to global markets, ports are more and more under constant competitive pressure to face the challenge of changes in the economic, institutional, regulatory and operational domains.
- EU and international port freight transport main protagonists recognize the deployment of web-based ICT solutions as key drivers to optimize the overall logistics processes providing operators, both from public and private sectors, with a reliable, effective and efficient real time information management system.

 In 2014, within a co-financed EU TEN-T Programme project named ITS Adriatic Multiport Gateway, the Authority launched the implementation of a dedicated ICT platform reaching the definition of the PCS Sinfomar.

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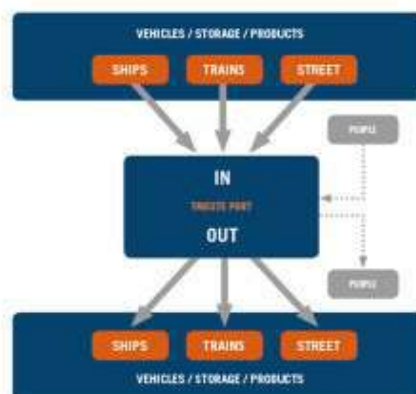
Main stakeholders involved



Slide 13/27

The Overall System Architecture Framework

- Focus on intelligent and secure exchange of information between both private and public organizations with the primary goal to create the most favourable conditions to constantly improve the competitiveness of the Port Authority



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Slide 14/27

Main Modules

1. Pre-Arrival/Departure Notifications
2. Ships
3. Cargo
4. Vehicle
5. Trains
6. Statistics/Analysis
7. People
8. Maritime Health Authority
9. Dangerous Goods
10. Taxes on Loading/Unloading
11. External Free Zone Terminal-Area

17

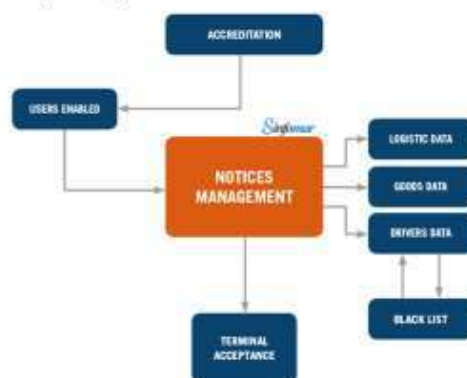
Slide 17/27

Pre-Arrival/Departure Notification

Key Features

It elaborates up to 63 different basic data concerning logistics, Customs and security requirements. Specific types of processed data are related to:

- The arrival and departure of vehicles/containers
- The detailed specification of transported cargo
- The relevant data on ship crew / haulers



Slide 18/27

The Ship Module

Key Features

- It collects all ship data and relevant information on cargo / logistic units to be loaded or unloaded.
- It elaborates all data needed for the “ship formalities” and related to Customs procedure requirements.



Slide 19/27

Cargo Module

Key Features

It allows:

- the management of the entry and exit of cargo from/to the port areas by ship, train or road with the digitalization of the Rail Cargo Manifest and the Pre-Arrival/Departure Declaration Module procedures;
- the digitalization of the loading and unloading operations related to the Entry Summary Declaration (ENS) and export declarations (MRN);
- automatic calculation of the precise amount of duties/taxes related to maritime accounting.



Slide 20/27

Vehicles

Key Features

- It allows the identification and tracking of the vehicle landed or embarked by ship or the train / vehicle that enters or leaves the port area.
- It also allows the tracking of any type of cargo/containers carried by a vehicle, including the identification of the type of goods.



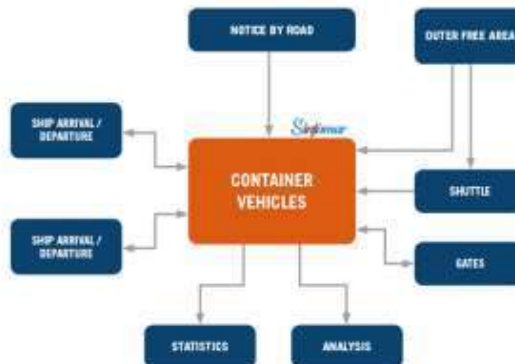
➤ Integrated with the Pre-Arrival/Departure Module

Slide 21/27

Trains 1/2

Key features

- It allows the management of trains arriving or departing from the Port.
- It uses standards as: ILU codes for rolling stock, BIC for containers, UIC for wagons.



➤ Integrated with the other modules involved in railway traffic for the train entry and exit control operations

Slide 22/27

Trains 2/2

Key features

It allows to generate a CH30 document (the Customs Agency required list for the formal declaration for train entering / leaving the port) in a single format, agreed with the private operators and the Customs Agency.

INTELLIGENCE SYSTEMS

INTELLIGENCE SYSTEMS

INTELLIGENCE SYSTEMS

Pos.	Descrizione	Descrizione	Descrizione	Descrizione	Descrizione	Descrizione	Descrizione	Descrizione	Descrizione	Descrizione
01
02
03
04
05
06
07
08
09
10

Stampato il 11/05/2024 alle ore 14:00 - pagina 2 di 2



Autorità di Gestione del Porto di Trieste



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Agenda

- Importance of ICT tools in Ports
- Definition of Port Community System - PCS
- Sinfomar: the PCS of the Port of Trieste
- Main modules and components of Sinfomar
- **Next steps and further developments**

2
4

Slide 24/27

Perspectives on further developments

Several further developments and pilot activities are planned for the next future, e.g.:

- Interoperability with the Port of Monfalcone, as well as other logistic centres and inland terminals of the Friuli Venezia Giulia Region – i.e. Cervignano, Gorizia and Pordenone;
- Interoperability with core regional industrial zones of Friuli Venezia Giulia Region;
- Interoperability with other core transportation nodes in Italy and abroad;
- Evaluation and testing processes related to the 'blockchain' in collaboration with strategic international PCS platforms.

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Thank you for your kind attention!

Valentina Boschian

valentina.boschian@gmail.com



REGIONE MARCHE



Engage for Italy Foreign



Ministry of Foreign Affairs



Ministry of Economic Development



Ministry of Infrastructure and Transport



Chief Clerk



Ministry of Economic Development



Slide 26/27



STEP-UP

Sustainable Transport

E-Planner to Upgrade

the IT-HR mobility



STEP-UP TRAINING SESSIONS

www.italy-croatia.eta/stepup

European Regional Development Fund



2.5.4 How to use GTFS [Giorgia Fanesi]



How to use GTFS

STEP-UP | Marche Region
Second training session

European Regional Development Fund

Slide 1/16

Outline

- The importance of Mobility Data
- What is a GTFS file
- GTFS structure
- How to create a GTFS
- Google validator
- How to find a GTFS file

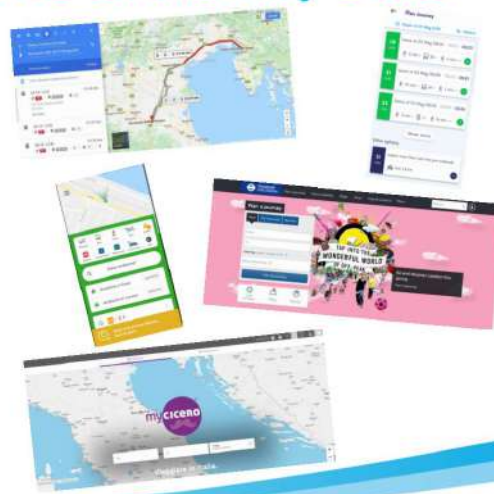


2

Slide 2/16

The importance of Mobility Data

Mobility Data to feed
travel planner
systems



The importance of Mobility Data

[Directive 2003/98/EC of the European Parliament and of the Council of 17 November 2003](#)

The re-use of public sector information

[Directive 2013/37/EU of the European Parliament and of the Council of 26 June 2013](#)

amending Directive 2003/98/EC on the re-use of public sector information Text with EEA relevance. The new European directive amends the previous one (directive PSI – Public Sector Information) in order to facilitate the re-use of European public administrations data.

In particular, the directive obliges administrations to make their data available, for both commercial and non-commercial purposes, in compliance with the legislation on personal data protection.

[Directive \(EU\) 2019/1024 of the European Parliament and of the Council of 20 June 2019](#)

on open data and the re-use of public sector information

After its adoption in 2003 and the significant revision in 2013, the Directive has now been relaunched taking into account the profound technological and social changes that have taken place over the past five years, contemplating, at the same time the reference legislation on data management.

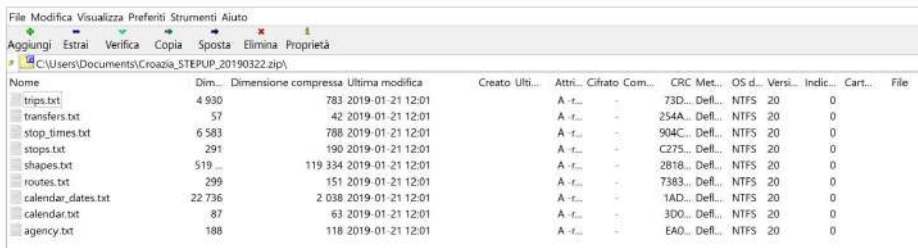
What is GTFS file

The General Transit Feed Specification (GTFS) defines a common format for public transportation schedules and associated geographic information. GTFS "feeds" allow public transit agencies to publish their transit data in a format that can be consumed by a wide variety of software applications.

<https://developers.google.com/transit/gtfs/reference/>
<https://developers.google.com/transit/gtfs/>

GTFS Structure

A GTFS feed is composed of a series of text files collected in a ZIP file. Each file models a particular aspect of transit information: stops, routes, trips, and other schedule data.



Nome	Dim...	Dimensione compressa	Ultima modifica	Creato Ulti...	Attri...	Cifrato	Com...	CRC	Met...	OS d...	Versi...	Indic...	Cart...	File
trips.txt	4 930	783	2019-01-21 12:01		A -r...	-		73D...	DefL...	NTFS	20	0		
transfers.txt	57	42	2019-01-21 12:01		A -r...	-		254A...	DefL...	NTFS	20	0		
stop_times.txt	6 583	788	2019-01-21 12:01		A -r...	-		904C...	DefL...	NTFS	20	0		
stops.txt	291	190	2019-01-21 12:01		A -r...	-		C275...	DefL...	NTFS	20	0		
shapes.txt	519 ...	119 334	2019-01-21 12:01		A -r...	-		2818...	DefL...	NTFS	20	0		
routes.txt	299	151	2019-01-21 12:01		A -r...	-		7383...	DefL...	NTFS	20	0		
calendar_dates.txt	22 736	2 038	2019-01-21 12:01		A -r...	-		1AD...	DefL...	NTFS	20	0		
calendar.txt	87	63	2019-01-21 12:01		A -r...	-		3D0...	DefL...	NTFS	20	0		
agency.txt	188	118	2019-01-21 12:01		A -r...	-		EA0...	DefL...	NTFS	20	0		

GTFS Structure

- Agency:** One or more transit agencies that provide the data in this feed.
- Stops:** Individual locations where vehicles pick up or drop off passengers.
- Routes:** Transit routes. A route is a group of trips that are displayed to riders as a single service.
- Trips:** Trips for each route. A trip is a sequence of two or more stops that occurs at specific time.
- Stop_times:** Times of vehicle arrivals at and departures from individual stops for each trip.
- Calendar:** Defines service dates when service is available for particular routes. Uses a weekly schedule.
- Calendar dates:** Defines exceptions for the services defined in the calendar.txt. If calendar_dates.txt includes ALL dates of service, this file may be specified instead of calendar.txt.
- Shapes:** Rules for drawing lines on a map to represent a transit organization's routes.



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GTFS Structure – Agency_id

File Agency.txt

agency_id	agency_name	agency_url	agency_timezone	agency_lang	agency_phone	agency_fare_url
xxx	vettore xxx	https://www.mycicero.it/	Europe/Rome	it	NULL	NULL
yyy	vettore yyy	https://www.mycicero.it/	Europe/Rome	it	NULL	NULL

File Routes.txt

route_id	agency_id	route_short_name	route_long_name	route_type	route_color	route_text_color	route_desc	route_url
51xxx			S1Zadar-Ancona	4F2160B	14DFEC	NULL	NULL	
53xxx			S3Split-Ancona	4F2160B	14DFEC	NULL	NULL	
53_1	xxx		S3Starigrad-Split-Ancona	4F2160B	14DFEC	NULL	NULL	
D001	yyy	SNAV	Ancona-Split	4F2160B	14DFEC	NULL	NULL	



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GTFS Structure – Route_id

File Routes.txt

route_id	agency_id	route_short_name	route_long_name	route_type	route_color	route_text_color	route_desc	route_url
51xxx			51Zadar-Ancona	4	F21608	14DFEC	NULL	NULL
53xxx			53Split-Ancona	4	F21608	14DFEC	NULL	NULL
53_1	xxx		Stari Grad-Split-					
53_1	xxx		53Ancona	4	F21608	14DFEC	NULL	NULL
5001	yyy	SNAV	Ancona-Split	4	F21608	14DFEC	NULL	NULL

File Trips.txt

route_id	service_id	trip_id	trip_headsign	direction_id	block_id	shape_id	trip_short_name	trip_type	wheelchair_accessible	bikes_allowed
51	ZAJ400G02019010120191231STEPUP	64	Zadar - Luka	1	NULL	ZZZZ5100012	008	NULL	NULL	NULL
51	ZAJ400VE2019010120191231STEPUP	65	Zadar - Luka	1	NULL	ZZZZ5100012	008	NULL	NULL	NULL
51	ZAJ400SA2019010120191231STEPUP	66	Zadar - Luka	1	NULL	ZZZZ5100012	008	NULL	NULL	NULL
51	ZAJ400D02019010120191231STEPUP	67	Zadar - Luka	1	NULL	ZZZZ5100012	008	NULL	NULL	NULL
53	00S005V02019122620191226STEPUP	7	Split - Luka	1	NULL	ZZZZ5300012	7	NULL	NULL	NULL
53	0000B0D02019010120191231STEPUP	8	Ancona - Porto	0	NULL	ZZZZ5300011	8	NULL	NULL	NULL
53_1	000C00L02019010120191231STEPUP	19	Split - Luka	1	NULL	ZZ53_100022	19	NULL	NULL	NULL
53_1	000C00M02019010120191231STEPUP	20	Split - Luka	1	NULL	ZZ53_100022	20	NULL	NULL	NULL
53_1	000C00SA2019010120191231STEPUP	21	Split - Luka	1	NULL	ZZ53_100022	21	NULL	NULL	NULL
53_1	000C00VE2019010120191231STEPUP	22	Stari Grad - Luka	1	NULL	ZZ53_100012	22	NULL	NULL	NULL
5001	SNAVLM02019010120191231STEPUP	31	Split - Luka	0	NULL	ZZ000100011	1001	NULL	NULL	NULL
5001	SNARMAG02019010120191231STEPUP	32	Ancona - Porto	1	NULL	ZZ000100012	1002	NULL	NULL	NULL
5001	SNA3MAG52019010120191231STEPUP	33	Ancona - Porto	1	NULL	ZZ000100012	1003	NULL	NULL	NULL

GTFS Structure – Service_id

File Trips.txt

route_id	service_id	trip_id	trip_headsign	direction_id	block_id	shape_id	trip_short_name	trip_type	wheelchair_accessible	bikes_allowed
51	ZAJ400VE2019010120191231STEPUP	64	Zadar - Luka	1	NULL	ZZZZ5100012	008	NULL	NULL	NULL
51	ZAJ400SA2019010120191231STEPUP	66	Zadar - Luka	1	NULL	ZZZZ5100012	008	NULL	NULL	NULL

File Calendar Dates.txt

service_id	date	exception_type
ZAJ400VE2019010120191231STEPUP	20190726	0
ZAJ400VE2019010120191231STEPUP	20190802	0
ZAJ400VE2019010120191231STEPUP	20190809	0
ZAJ400VE2019010120191231STEPUP	20190816	0
ZAJ400VE2019010120191231STEPUP	20190823	0
ZAJ400SA2019010120191231STEPUP	20190727	1
ZAJ400SA2019010120191231STEPUP	20190803	1
ZAJ400SA2019010120191231STEPUP	20190810	1
ZAJ400SA2019010120191231STEPUP	20190817	1
ZAJ400SA2019010120191231STEPUP	20190824	1

File Calendar.txt

service_id	Monday	Tuesday	Thursday	Wednesday	Friday	Saturday	Sunday	start_date	end_date
ZAJ400VE2019010120191231STEPUP	1	1	1	1	1	1	0	20190130	20190830

GTFS Structure – Trip_id

File Trips.txt

route_id	service_id	trip_id	trip_headsign	direction_id	block_id	shape_id	trip_short_name	trip_type	wheelchair_accessible	bikes_allowed
51ZA400VE2019010120191231STEPUP		64	Zadar - Luka	1	NULL	ZZZ25100012	z008	NULL	NULL	NULL
51ZA400SA2019010120191231STEPUP		66	Zadar - Luka	1	NULL	ZZZ25100012	z008	NULL	NULL	NULL

File Stop_times.txt

trip_id	arrival_time	departure_time	stop_id	stop_sequence	stop_headsign	pickup_type	drop_off_type	shape_dist_traveled	shape_dist_timepoint	arrival_time_seconds	departure_time_seconds	stop_headsigns
64	22.00.00	22.00.00	P_AN	1	Zadar - Luka	0	0	0	NULL	NULL	NULL	NULL
64	31.00.00	31.00.00	L_ZA	2	Ancona - Porto	0	0	0	NULL	NULL	NULL	NULL
66	16.00.00	16.00.00	P_AN	1	Zadar - Luka	0	0	0	NULL	NULL	NULL	NULL
66	22.00.00	22.00.00	L_ZA	2	Ancona - Porto	0	0	0	NULL	NULL	NULL	NULL



GTFS Structure – Shape_id

File Trips.txt

route_id	service_id	trip_id	trip_headsign	direction_id	block_id	shape_id	trip_short_name	trip_type	wheelchair_accessible	bikes_allowed
51ZA400VE2019010120191231STEPUP		64	Zadar - Luka	1	NULL	ZZZ25100012	z008	NULL	NULL	NULL

File Shapes.txt

shape_id	shape_pt_lat	shape_pt_lon	shape_pt_sequence	shape_dist_traveled
ZZZ25100012	43.622258	13.508942	1	
ZZZ25100012	43.622380	13.509070	2	
ZZZ25100012	43.622260	13.509290	3	



How to create a GTFS file

To create a GTFS file there are several proprietary and open tools.

Steps to generate a GTFS:

- 1 Creation of **Agency** file
- 2 Definition of lines and creation of **routes** file (the lines is associated to the agency)
- 3 Creation of **stops** file based on the bus stops
- 4 Creation of **trips** file → trips are linked to the routes
- 5 As the routes are created, it is necessary to create the **calendar** (calendar.txt or calendar dates)
- 6 Creation of **Stop_times** file → association routes, timetables and stops
- 7 Creation of **shapes** file (optional) → to sketch the trip, it is important to enter latitude and longitude to each shape

Google validator

Before loading the zip file, GTFS feeds should be validated in order to catch errors.
On internet it is possible to find several validation tools.

GTFS validation results for feed:
C:\GTFS\STEPUP_20190322.zip
FeedValidator extension used: None

Agencies: [jadrolinija](#), [SNAV](#)
Routes: 4
Stops: 4
Trips: 67
Shapes: 8
Effective: January 02, 2019 to December 30, 2019

During the upcoming service dates Thu Jul 04 to Sun Sep 01:
Average trips per date: 3
Most trips on a date: 6, on 2 service dates (Sat Aug 03, Sat Aug 10)
Least trips on a date: 2, on 11 service dates (Fri Jul 05, Sun Jul 07, Mon Jul 08, ...)

feed validated successfully

Generated by [FeedValidator](#) version 1.2.15 on July 04, 2019 at 10:21 AM ora legale Europa occidentale.

Found these problems:
36 errors 872 warnings

- 19 Invalid Values 1 Expiration Date
- 24 Missing Values 182 Stop Time Values
- 677 Too Fast Trips
- 12 Too Many Consecutive Stop Times With Same Times

Errors:

Invalid Value

- Invalid value 230003 in field agency_id
Route uses an unknown agency_id
in line 36 of routes.txt

route_id	agency_id	route_short_name	route_long_name	route_type	route_color	route_text_color
100001	230001	100001	100001-100001-100001	2	FFFFFF	000000

- Invalid value 230003 in field agency_id
Route uses an unknown agency_id
in line 37 of routes.txt

route_id	agency_id	route_short_name	route_long_name	route_type	route_color	route_text_color
100002	230001	100002	100002-100002-100002	2	FFFFFF	000000

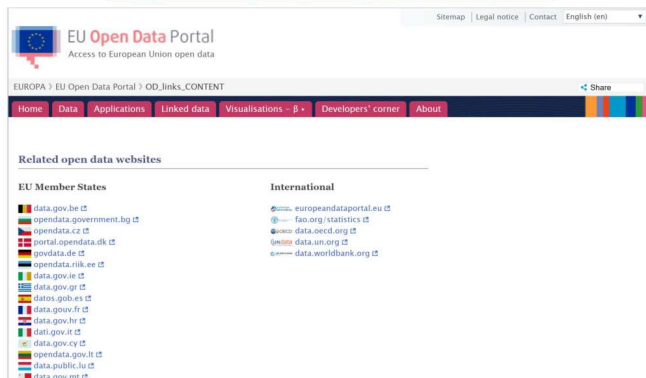
- Invalid value 100003 in field route_id
in line 279 of trips.txt

route_id	service_id	trip_id	trip_headsign	trip_short_name	direction_id	block_id	shape_id
100001	100001	100001	Sarmon (Actonville)		1	100001	100001001

How to find a GTFS file


EU Open Data Portal offers a list of Related open data website (including GTFS file)

http://data.europa.eu/euodp/it/open_data_portals




Thank you for your attention!

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2.5.5 MaaS Business Models [Andrea Molinaro]



Slide 1/25



Slide 2/25

MaaS Business Models

- The Business Model
- The role of Design Thinking
- Business Model Canvas application
- Mobility as a Service Business Models

BUSINESS MODEL DEFINITION

A **business model** describes the rationale of how an **organization** creates, delivers, and captures **value**, in economic, social, cultural or other contexts

Organization is an entity comprising multiple people, such as a company, an institution or an association, that has a particular purpose.

Value proposition is the set of products and services that create value for a specific customer segment, and more and more.....

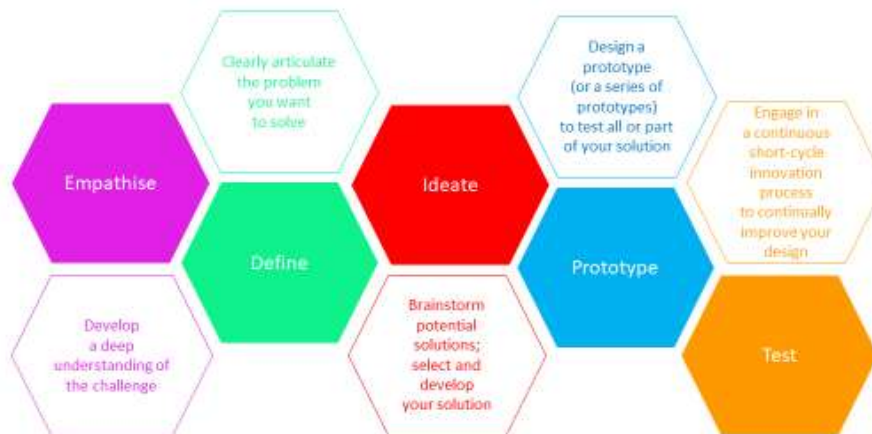
DESIGN THINKING

The Design Thinking is an approach centered on people, based on integration of **analytical capacity** with **creative attitudes**, to define and solve complex problems:

It can be used to identify customer needs, create new products/services and develop innovative business models, imagining future scenarios and analyzing market experiences.

Design Thinking has the goal to involve consumers, designers and business managers in a **integrated innovation process**.

DESIGN THINKING STAGES



BUSINESS MODEL CANVAS

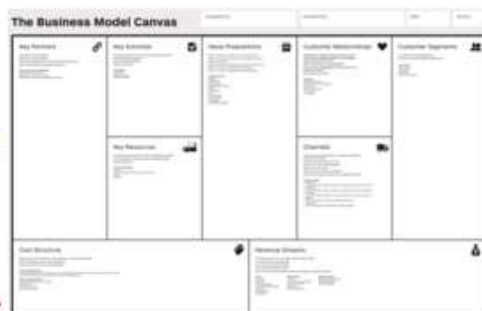
Business Model Canvas is a strategic management and lean startup template for *developing new or documenting existing business models*.

It is a visual board with elements describing a firm's or product's value proposition, infrastructure, customers, and strategic resources.

It is a very useful tool to guide brainstorming processes and develop new ideas.

The business model canvas was created by **Alexander Osterwalder** in 2008 and it is used in all over the world.

WHAT DO WE NEED ?



<p>KEY PARTNERS</p> <p>Who are our key partners? Who are our key suppliers? What key resources do we get from partners? What key activities do partners do?</p>	<p>KEY ACTIVITIES</p> <p>What key activities are required for:</p> <ul style="list-style-type: none"> • produce the value offered to customers? • reach our markets (distribution)? • establish and manage customer relations? • generate revenue streams? 	<p>VALUE PROPOSITION</p> <p>What customer problem do I contribute to solving and / or what needs are met? What set of products and services do I offer to each customer segment? How I stand out in the market, how I am perceived and what is real value/benefit transferred to the customer?</p>	<p>CUSTOMER RELATIONSHIPS</p> <p>What kind of relationship do you expect to establish with us each segment of customers? Which is more functional? How much does this type of relationship cost and how does integrate with the other elements of our BM?</p>	<p>CUSTOMER SEGMENTS</p> <p>For whom we are creating value? Who are our most important customers?</p>
	<p>KEY RESOURCES</p> <p>What key resources are needed for:</p> <ul style="list-style-type: none"> • produce the value offered to customers? • reach our markets (distribution)? • establish and manage customer relations? • generate revenue streams? 		<p>CHANNELS</p> <p>Through which channels do customers want to be reached? How are channels integrated with customer habits? Which channels are more efficient? (performing / cheaper)? How is the service product distributed?</p>	
<p>COST STRUCTURE</p> <p>What are the most important costs of our business model? What are the most expensive key resources? What are the most expensive key activities?</p>		<p>REVENUE STREAMS</p> <p>What value are customers really willing to pay for? How do they pay or how would they prefer to pay? How much they have to pay and how the revenue stream contributes to revenues general (how much do they impact)?</p>		

Slide 11/25

BUSINESS MODEL CANVAS: CUSTOMER SEGMENTS

For whom we are creating value?
Who are our most important customer?

Divide and classify customers into distinct groups by:

- needs / interests that require a separate offer
- how they are achieved (distribution channels)
- type of relationship established
- associated profitability
- willingness to pay for different aspects of the offer



STUDIO PELOSO
BUSINESS & INNOVAZIONE

Slide 12/25

BUSINESS MODEL CANVAS: VALUE PROPOSITION

What customer problem do I contribute solving and / or what needs are met?

What set of products and services do I offer to each customer segment?

How I stand out in the market, how I am perceived and what is real value / benefit transferred to the customer?

Describe what the company sells and what is the value for customers in terms of value offered by the company:

- the needs met
- problems solved
- the benefits offered divided into classes and connected to customers

VALUE PROPOSITION

The elements to consider into the value proposition are not only the **products** and **services**. It is essential also to consider other valuable elements:

- **Making innovation.** To create a new value giving to customers something that was not there before
- **Make a product/service accessible.** It allows Customer Segments that previously could not use a product/service to access it (think, for example, of Ryanair's low-cost flights)
- **Improve a product or service,** by adding relevant features or modifying the current ones to make them more functional to a specific need.
- **Decrease the price** for a product/service. Solving a specific problem, starting from the study of the real and urgent needs of customers
- Use **the brand/status** to convey an identity and create a **community**
- Improve **the design** and **the performance** of a product
- Make the products **more convenient** and **easier to use**
- **Reduce the risks** related to a product/service

These methods allow the company to transfer not only the intrinsic value of the product/service but, above all, **the intangible values** that can be associated with it.

BUSINESS MODEL CANVAS: CHANNELS

Through which channels do customers want to be reached?

How are channels integrated with customer habits?

How are the different channels integrated together?

Which channels are more efficient (performing / cheaper)?

How is the service product distributed?

Describe how the value offered reaches the customer in the phases of communication, distribution and sales in terms of:

- types of channels used
- functions performed by the channels
- overall shopping experience

BUSINESS MODEL CANVAS: COSTUMER RELATIONSHIP

What kind of relationship do you expect to establish with us each segment of customers? Which is more functional?

How much does this type of relationship cost and how does it integrate with the other elements of our BM?

Describe how the company acquires and manages customers in terms of:

- customer experience
- construction and delivery of the corporate image
- effectiveness

BUSINESS MODEL CANVAS: REVENUE STREAMS

What value are they really willing to pay customers for?

How do they pay or how would they prefer to pay?

How much they have to pay and how the revenue stream contributes to revenues general (how much do they impact)?

Describe the mechanism adopted for the price definition and the revenues generated by the different types of customers, also divided by value category offered and based on:

- how they pay
- what they pay for

BUSINESS MODEL CANVAS: KEY RESOURCES

What key resources are needed for:

- *produce the value offered to customers?*
- *reach our markets (distribution)?*
- *establish and manage customer relations?*
- *generate revenue streams?*

Describe and list the key resources necessary for the operation of the model business in relation to the value offered to customers

BUSINESS MODEL CANVAS: KEY ACTIVITIES

What key activities are required for:

- *produce the value offered to customers?*
- *reach our markets (distribution)?*
- *establish and manage customer relations?*
- *generate revenue streams?*

Describe and list the key activities necessary for the operation of the model business in relation to the value offered to customers

BUSINESS MODEL CANVAS: KEY PARTNERS

Who are our key partners?

Who are our key suppliers?

What key resources do we get from partners?

What key activities do partners do?

Describe with which external parties the company wants to work by defining in particular:

- reasons
- modality
- the key assets or resources acquired

BUSINESS MODEL CANVAS: COST STRUCTURE

What are the most important costs of our business model?

What are the most expensive key resources?

What are the most expensive key activities?

Describe if the model is based on costs or value and define the list of fixed and variable costs incurred for key resources, key activities and partners

MOBILITY AS A SERVICE

Definition

MaaS is the integration of various forms of transport modes
into a single mobility service accessible on demand.

It provides a **new way of thinking in terms of how the delivery**
and consumption of transport or mobility:

the key concept behind Mobility as a Service (MaaS)

is to **put the users at the core of transport services,**

offering them **tailor made mobility solutions based on their individual needs.**

MaaS IS A MULTI-SIDE PLATFORM PATTERN

- Multi-sided platforms bring together **two or more distinct but interdependent customer groups**.
- These platforms are a value for a group of customers only if the other group of customers is also present.
- The platform creates value by **facilitating interactions between different groups**.
- The value of a multi-sided platform grows when it attracts more users, a phenomenon known as the **network effect**

KEY PARTNERS	KEY ACTIVITIES	VALUE PROPOSITIONS	COSTUMER RELATIONSHIPS	COSTUMER SEGMENTS
<p>National and transnational public Authorities and Policy Makers</p> <p>Mobility and accommodation providers</p> <p>Event and entertainment service agency</p> <p>Tourist operators</p>	<p>Platform Efficiency</p> <p>ADV and web marketing</p> <p>Contract negotiations</p> <p>Continuous implementation of new services providers</p> <p>Resource and develop of ITs</p>	<p>Web platform that integrate End users and Service Providers</p> <p>New way of thinking for traveling</p> <p>Tailor made mobility solutions based on their individual needs</p> <p>Way to promote:</p> <ul style="list-style-type: none"> - multi-modal mobility - sustainable transport - security <p>BIG DATA and SMALL DATA as strategic assets</p> <p>What is the most relevant information? What's specific users need? What advantages can be created? Are there any ancillary services we can offer?</p>	<p>Automatic platform system</p> <p>Help Desk</p> <p>Customer care office</p> <p>CRM system and strategy</p>	<p>Multi-sided market</p> <p>End users:</p> <ul style="list-style-type: none"> - Private user - Commuter - Companies - Tourist - ... <p>Service provider:</p> <ul style="list-style-type: none"> - Mobility - Event organizers - Accommodation - Rental companies - Tourist agency - ... <p>B2B, B2C, B2B2C</p> <p>Who are the end users? And the intermediate users? Who can take advantage of the platform? What are their needs? What are their problems? For those who can represent an opportunity?</p>
<p>COST STRUCTURE</p> <p>Platform management and development</p> <p>Territory and commercial referents</p> <p>ADV and Web Marketing</p>		<p>REVENUE STREAMS</p> <p>Self on commissions</p> <p>Service advertisement</p> <p>Fixed contracts with end users and service providers</p> <p>BIG DATA and SMALL DATA market</p>		

Contacts

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3. II Training Session: 24 July 2019

The second Training Session was broadcast on-line via the Go To Meeting software, the main computer was the one of the organizer of the session (namely the University of Trieste) and was placed in Trieste. The guests had been invited by UNITS and by the project partners.

3.1 Agenda

Below the final agenda proposed:



STEP-UP Second Training Sessions **NEW SCENARIOS ON MULTIMODAL MOBILITY** **INFOMOBILITY FOR SUSTAINABLE PASSENGERS' FLOW BETWEEN ITALY AND CROATIA**

Webinar

- 10:30 – 11:00** **The role of Mobility as a Service**
Daniela Vasari, Project manager, solution designer in ITS projects and International cooperation, Pluservice, Technical Assistance of Marche Region (STEP-UP project Lead Partner)
- 11:00 – 11:30** **The economics of electric vehicles**
Romeo Danielis, Department of Economics, Business, Mathematics and Statistics, University of Trieste
- 11:30 – 12:00** **ICT tool in use at the Port of Trieste: the Port Community System Sinfomar**
Valentina Boschian, Port Network Authority of the Eastern Adriatic Sea
- 12:30 – 13:00** **How to use GTFS**
Giorgia Fanesi, Software analyst and project manager, Pluservice, Technical Assistance of Marche Region (STEP-UP project Lead Partner)
- 13:00 – 13:30** **MaaS Business Models**
Andrea Molinaro, Consultant at Studio Peloso & Associati - expert in design thinking, business organization and subsidized finance

YouTube channel: **Project Step-Up**

link to Web Page: www.step-up.training

e-mail: info@step-up.training

link to questionnaire: <https://step-up.training/questionnaire/>

3.2 Attendance I Training Session

Persone

ORGANIZZATORI DELLA RIUNIONE

 UNITS 

PARTECIPANTI ALLA RIUNIONE

 **alberto**

 Agenzia per lo Sviluppo S...

 Bartolomeo Silvestri (POL...

 Carlo Giansante (POLIBA)

 DANIELA VASARI

 Finproject

 Giambattista Fiume

 Giorgia Fanesi

 Matteo Castellucci

 Sergio Ruggieri[POLIBA]

 Vanja

3.3 Dissemination II Training Session

3.3.1 Publication on University of Trieste official website

The screenshot shows the official website of the University of Trieste. At the top left is the university's logo and name: "UNIVERSITÀ DEGLI STUDI DI TRIESTE". To the right is a search bar with the text "Cerca...". Below this is a dark blue navigation bar with the following menu items: "Futuri Studenti", "Studenti", "Laureati", "Ricerca", "Impresa", and "Ateneo".

The main content area features a news article titled "Interreg EU 'STEP-UP' Project". The event date is listed as "Data evento: Da 24/07/2019 A 24/07/2019". Below the title are social media sharing icons for Facebook, Twitter, Google+, and LinkedIn, and a "Stampa" (Print) icon.

On the left side of the page, there is a vertical menu with the following categories: "NOTIZIE", "EVENTI" (highlighted in a light brown box), "AVVISI", and "VIDEO".

The main image of the article is a promotional graphic for the "STEP-UP" project. It features the "Interreg Italy - Croatia STEP-UP" logo and the European Union flag. The graphic includes the text: "STEP-UP Sustainable Transport E-Planner to Upgrade the IT-HR mobility". Below the graphic, the text "STEP-UP II TRAINING SESSION" is displayed. At the bottom of the graphic, it says "Interreg EU 'STEP-UP' Project" and provides the website "www.italy-croatia.eu/stepup".

Mercoledì 24 luglio 2019 alle 10:30 (durata approssimativa: tre ore).

Cattura rettangolare

Programma:

- **Valentina Boschian**, Port Network Authority of the Eastern Adriatic Sea: *"ICT tool in use at the Port of Trieste: the Port Community System Sinfomar"*;
- **Daniela Vasari**, Pluservice, Technical Assistance of Marche Region (STEP-UP project Lead Partner): *"The role of Mobility as a Service"*;
- **Romeo Danielis**, Department of Economics, Business, Mathematics and Statistics, University of Trieste (STEP-UP Project Partner): *"The economics of electric vehicles"*;
- **Giorgia Fanesi**, Pluservice, Technical Assistance of Marche Region (STEP-UP project Lead Partner): *"How to use GTFIS"*;
- **Andrea Molinaro**, Studio Peloso & Associati: *"MaaS Business Models"*.

Per tutti coloro che desiderano seguire la conferenza ed intervenire con domande è possibile partecipare attraverso il seguente link:

<https://global.gotomeeting.com/join/159804069>

STEP-UP II Training Session, Wed, Jul 24, 2019 10:30 AM - 1:30 PM CEST

Access Code: 159-804-069

You can also dial in using your phone.

United States: +1 (669) 224-3412

New to GoToMeeting? Get the app now and be ready when your first meeting starts:

<https://global.gotomeeting.com/install/159804069>

4. II Training Session: Questionnaire

For the second training session a questionnaire previously designed has been shared through a link. The questionnaire was published on STEP-UP Web Page. The results obtained from the first training session questionnaire gave a useful feedback in regards of the organization of the next sessions.

Follows the list of questions proposed to the audience of the second Training Session. For each question the audience was asked to express a preference according to the given assessment grid.

We take the opportunity to illustrate how the answers given with the online questionnaire are displayed. We illustrate this on the occasion of the second training session as it is the only one of the three for which the distribution of the paper questionnaires has not been foreseen.

Before proceeding with the images related to the graphics of the answers, we report the complete list of questions and the relative evaluation grid proposed.

		Assessment grid				
		Not at all	Not quite	Neutral	Much	Very much
1	TOPICS					
1.1	The topics were relevant to me					
1.2	I was familiar with the proposed topics					
1.3	The topics offered a good overview on issues related to Passengers' flow					
2	SPEECHES					
2.1	The material used for the presentations was coherent and clear					
2.2	I would find it useful to have the presentations material available for future consultation					
2.3	The presentations were coherent with the title and the topic					
2.4	The presentations met my expectations					
3	CONFERENCE					
3.1	The conference contributed to deepen my knowledge on the topics:					
3.1.1	Multimodality					
3.1.2	European projects on mobility					
3.1.3	New scenarios on mobility (Maas, Electro-mobility...)					
3.1.4	Info-mobility					
3.1.5	Sustainable Tourism					
3.1.6	ICT Tools for Tourism					
3.1.7	E-Planning Platforms					
3.1.8	Other					
3.2	I think these topics should be more disseminated					
3.3	After the conference my knowledge on the covered topics has improved					
3.4	I am involved in these topics (e.g. in daily life/at work)					
3.5	The conference has been well organised					

