

GrEAT

Green Education for Active Talents

INTELLECTUAL OUTPUT 2

TRAINING MODULES AND MATERIALS

Sustainable mobility

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CHAPTER 1: TOPIC FRAME

Historical picture

The longest part of human History is characterized by sustainable mobility: men for moving used mostly their feet or they rode horses and other animals. The existing wheels vehicles, such as carts and chariots, also worked through the animal traction. Long distances were also covered by sea, using sail boats or rowing boats.

This scenario changed completely starting from the first Industrial Revolution: technical inventions (first of all the Watt's steam engine in 1769) and innovation gave birth to the very first motorized means of transport: in 1783 the French inventor Claude de Jouffroy built the first steamship in the world. One year later this technology was applied also to the rail transport, for the design and production of a prototype of steam locomotive; after 20 years, in 1804, the first full-scale working railway steam locomotive was built in the UK by Richard Trevithick, a British engineer. Also aviation took advantage from the technical innovations of this period: the XIX century was a period of scientific debate and engineering design, then the very beginning of XX century saw the first successful experiences. The Wright brothers made the first sustained, controlled, powered heavier-than-air manned flight at Kill Devil Hill, in North Carolina, on December 17, 1903.

But the main protagonist of human mobility of our days (and main responsible for its indefensibility) is the automobile. The very beginning of automobile's history saw the existence of many options, regarding the means of propulsion: the steam-powered automobile was built by Nicholas Joseph Cugnot in 1769; in 1808 the first hydrogen powered car was designed by Francois Isaac de Rivaz; the first gasoline power combustion engine was built by Sigfrid Marcus in 1870, from which we came to the four-stroke petrol (gasoline) internal combustion engine, that still constitutes the most prevalent form of modern automotive propulsion, patented by Nikolaus Otto in 1876; in 1892 a similar four-stroke diesel engine was invented by Rudolf Diesel.

The first serial production of cars was made by the German engineer Karl Benz in 1885: he produced a petrol or gasoline powered automobile, built in several identical copies. But the first shift to the concept of car as a mass vehicle was done by Henry Ford when, in 1913, his Ford Motor company started producing its Model T, invented 5 years before, on a moving assembly line. By 1927 in USA were produced over 15 millions Ford T cars.

But the XX century mobility could have been completely different. In fact there has been a moment, between the end of XIX century and the beginning of XX century, when it really seemed that the mainstream of cars propulsion should be the electric system. The electric car was first invented by a Scottish man, Robert Anderson, between 1832 and 1839, but it needed four decades of small improvements (made by several persons around the world) to become a real mean of transport. Finally, at the end of the century, it was ready to be a rockstar: in 1899 an electric car called *Jamais Contente*, built and driven by the Belgian engineer Camille Jénatzy, first in the world overstepped the wall of 100 km/hour, reaching the speed of 108 km/hour.

The electric car was faster then its main competitors, the steam powered and the gasoline powered vehicles, but it also had other advantages: it didn't produce vibrations, noise and bad smell like the gasoline car, it didn't need physical efforts for starting (the gasoline car was actuated through a crank) and it started immediately (the steam powered car needed 45 minutes to be ready!). Also thinking about the autonomy, the electric car had the best performance, riding for 60 km before needing to charge the battery, while the chariots needed to stop every 15 km in order to let the horses rest and drink, the steam powered car stopped every 20 km for water provision and also gasoline cars needed frequent stops to put water in the refrigerating system.

So what happened? Why the electric car did not become the mainstream? There has been two crucial elements that in the end gave the victory to the gasoline powered automobiles: the condition of the streets at the beginning of XX century and the easier availability of gasoline over electricity. The quality of the streets at that time was very low, they were basically country roads full of holes, bumps and stones and it was very frequent for cars to remain stuck; in these cases it was more difficult for an electric car to be rescued,

because it was much heavier than the others. In the same way, the electric network was not widespread everywhere and also in the biggest cities it was mostly available for urban lightning and industrial purposes, so for private citizens it was not easy to recharge the batteries. In the meanwhile, the discovery of oil fields in Texas, lowered significantly the price of gasoline, at least in the USA¹.

The *coup de grace* to electric cars was given by the gasoline powered Model T of Ford, that first made possible the purchase of a car for a wide part of the population, but the deep reasons for the missed affirmation of electric car at the beginning of XX century were the lack and backwardness of infrastructures needed to support it.

Mobility and society

Car has never been simply an object, it has always been drenched with several significations, connected to sociology, psychology, history, culture and arts.

For example, at the very beginning of its diffusion, in the early '900, it represented an icon for the cultural and artistic movement of Futurism. Futurism was born in 1909, when the Italian poet Filippo Tommaso Marinetti published on the Parisian newspaper *Le Figaro* its *Manifesto of Futurism*, containing all the ideas of the new movement: the myth of war, of speed, of electricity, of the modern city, and the complete refuse of ancientness, past, history and legacy.



Image 1. Luigi Russolo, *Dinamismo dell'automobile*, Centre Pompidou, 1913.

All this represented the ideas and the feelings of a large part of the young population in Italy and in all Europe; the movement attracted especially figurative artists, such as Giacomo Balla, Umberto Boccioni, Gino Severini and Carlo Carrà. Of course one of the most inspiring objects for them was car, because it represented all together modern times, speed, technology, progress, beauty and freedom. It was described by Futurists as centaur, puffing wild beast, hungry automobile, roaring animal, shark²...

After a few years, during Nazi regime in Germany, cars were used as a propaganda tool to reduce the problem of unemployment: Hitler promoted the building of the first highways in Germany, promising to hire

¹ Nicola Nosengo, *L'estinzione dei tecnosauri, storie di tecnologie che non ce l'hanno fatta*, Sironi editore, 2003.

² <http://tecnologiaearte2013.blogspot.com/2013/05/il-futurismo-e-lautomobile.html> and http://www.repubblicaletteraria.it/Futurismo_automobile.html

over 500.000 workers, but in fact hiring maximum 120.000 persons during the peak³. But the propaganda connected to Autobahn (the German word for highway) also regarded the possibility for Germans to discover the wide territory of the Reich; to do that, Hitler needed to make cars a mass product, as Ford did in the USA: he founded the Volkswagen company, but the Second World War was close and the “car for people” factory was employed for military purposes. At the end of the war Volkswagen incredibly survived and finally started a civil production⁴.

During the second half of XX century the economic growth that made possible for quite everyone in the developed countries to buy a car, but this never became just a product with the only purpose to help people moving every day. Cinema played an important role in the building of the collective imaginary concerning cars. Let's think for example at the Aston Martin of *Agent 007 - Mission Goldfinger*, or to the Lancia Aurelia of *Il sorpasso*, arriving to the car of *Back to the future* and the Batmobile of the super hero saga of *Batman*. The movie *Herbie: the love bug* even have a car as the protagonist⁵!



Image 2. *Il sorpasso*, directed by Dino Risi, 1962.

The result was that cars became part of the Western pop culture, real status symbol capable to define the identity of their owner. Even today, watching in a critical way the cars companies advertises, we can easily find out hidden messages and meta significations connected to the product they're selling. Sometimes the message is “To be cool and trendy, enjoy your life and chill out, you have to drive this car”. Other messages are connected with gender stereotypes, machos culture and power. Other kinds of cars bring immediately imagination to the deep sense of travelling, to freedom, wide spaces and wild nature. The models thought for families immediately remind in their ads to safety, comfort, protection and to a vague idea that the car is part of the family too.

All these symbolic meanings that are part of the talk (and the sell) about cars undoubtedly have deep effects on our choices and behaviours, impacting of the real chances of being sustainable of the whole mobility sector.

The mobility system: some data on how people and goods move

The Italian mobility system

³ <http://berlinochiamaroma.blogspot.com/2012/08/la-bugia-storica-dellautostrada-di.html>

⁴ http://www.repubblica.it/motori/sezioni/classic-cars/2015/05/11/news/hitler_e_la_volkswagen_ecco_tutta_l_incredibile_storia-113460846/

⁵ http://motori.corriere.it/motori/antepreme/cards/20-auto-piu-famose-cinema-tv/lanzia-aurelia-b24-il-sorpasso_principale.shtml

According to Isfort's 14th annual Report on mobility in Italy⁶, the total amount of movements in an average working day is progressively decreasing (-20.1% between 2008 and 2016), as the distances ridden in km (-23.9% in the same period), in strong connection with the economic crisis of these years. What is growing is the mobility rate (that's the part of people in movement), from 75.1 in 2012 to 83.6 in 2016, showing that the movements, even if shorter, are involving a bigger number of persons. Talking about the means of transport, the car has still the primacy, being used for almost 2/3 of the movements, while the different means of public transport collect 11% of movements and the active mobility (walking or cycling movements) represent 20%.

So cars are the main protagonist of mobility in Italy and their environmental impact is still very high: diesel and gasoline cars cover together over the 85% of the Italian circulating cars⁷. But the electric sector is growing: according to the selling data, in 2017 the sell of electric cars increased of +38.6% and the hybrid one +71%⁸.

Deepening the local public transport (Lpt) aspect, the most recent data⁹ say that the demand of local public transport (Lpt) in the Italian county capital cities in 2015 is decreasing: 186.8 passengers per inhabitant per year, while in 2014 it was 189.5. in the two main Italian cities we see opposite trends: -6% demand in Rome and +4.1% in Milan. On the offer side, first time in 5 years the offer of Lpt increases, from 4425 to 4503 seats-km per inhabitant. The trend is positive thanks to the improvement of underground services (+10%). About the equipments, the endowment of Ltp infrastructures on rails is constantly growing, while bus lanes and the density of Ltp stops (a measure of the accessibility of the system) are more or less the same. What is decreasing is the availability of vehicles, especially buses (from 79.4 to 75.2 every 100.000 inhabitants). But fortunately it's growing the part of ecological buses (from 22.1 to 24.6%, the main part with gas propulsion).

Having a rapid look at the transportation of goods¹⁰, in 2016 in Italy the most important means of transport remain trucks and other road vehicles; the quantities transported are shared by different means in this way:

- Road transport moved 901.5 millions of tonnes of goods;
- Railway transport moved 92.95 millions of tonnes;
- Ships moved 462 millions of tonnes;
- Air transport moved 941.000 tonnes of goods and mail.

The European mobility system

The individual road transport represented, in 2014¹¹, the 83.4% of the whole passengers transport in the European Union, while buses moved 9.1% of passengers and trains 7.6%. Between 2004 and 2014 the relative importance of the use of cars is quite stable, the bus is decreasing of almost 1% and this corresponds to an increase of 1% in the use of trains.

⁶ http://www.isfort.it/sito/pubblicazioni/Convegna/AC_2017_19_04/Rapporto_completo_2016.pdf

⁷ <http://www.ilsole24ore.com/art/motori/2018-05-09/auto-parco-circolante-italiano-invecchia-ma-diesel-continua-piacere-110714.shtml?uuid=AEWTNTIE> and <https://motori.fanpage.it/in-calco-il-mercato-auto-in-italia-a-maggio-2-8-numeri-record-per-jeep-e-alfa-romeo/>

⁸ Claudio Strano, *Cambio d'auto!*, Con n.4/18, May 2018.

⁹ <https://www.istat.it/it/archivio/202275>

¹⁰ https://www.ansa.it/documents/1523950291699_dossier.pdf

¹¹ https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Passenger_transport_statistics/it

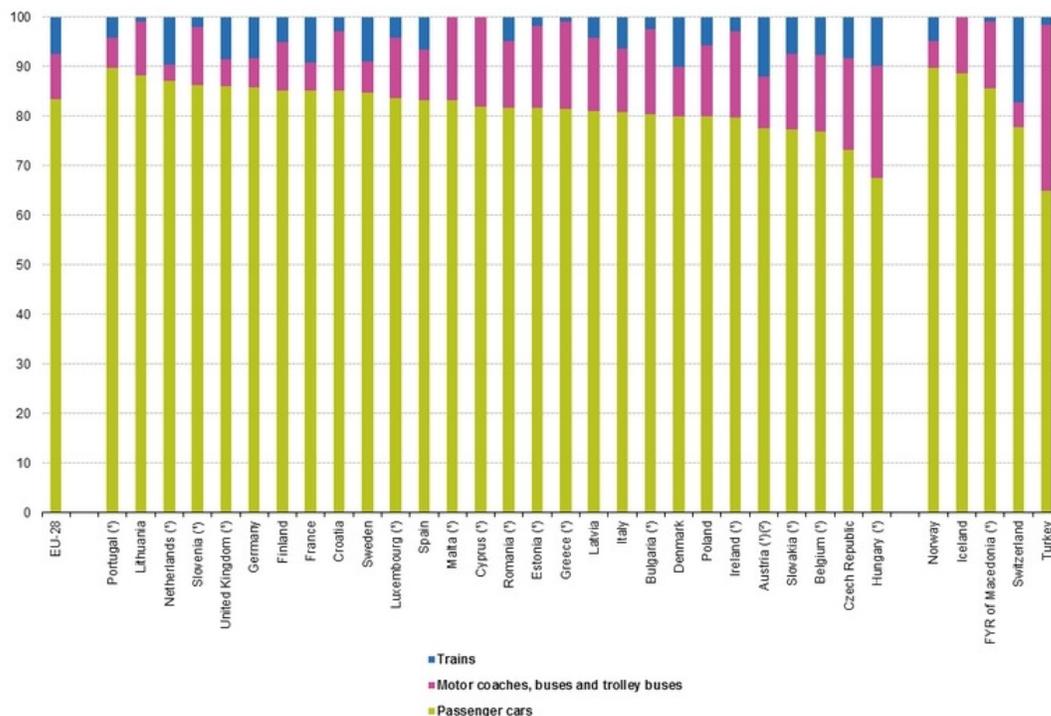


Image 3. Modal split of inland passenger transport, 2014 (percentage of total inland passenger/km); source: Eurostat.

In 2015, in the European Union it was moved 3516 billions of tonnes per km of goods, considering every means of transport. It has been an increase of +1.2% in comparison with 2014, confirming the constant positive trend after the negative peak of 2009, that indeed has not yet brought to the levels of the pre crisis period. Observing the different kind of transport, the favourite modality is still road: in 1995 the 45% of goods in Europe (including airplanes and ships), travelled on the road, increasing to 50% in 2007, to become constant at 49% in the last years.

(Un) sustainability of the current mobility: environmental, economic and social consequences

A sustainable mobility system, according to the OECD, is the one that minimizes the negative effects of mobility, being compatible with men's health and environment. This definition doesn't question the social and economic development and doesn't state the need to radically reduce the mobility of people and goods, also considering that the possibility for people to move is also a matter of social equity. The sustainable mobility is the one that reduces the greenhouse gases and the air pollution under some limits, that promotes the use of renewable energy sources, that minimizes the use of soil, that makes roads safer and more livable also decreasing acoustic pollution, that guarantees to everybody the same opportunities of movement.

Mobility needs to turn sustainable because transports, that lower distances and consent the economy to work, have relevant negative effects on the planet and on people's lives, such as:

- the increase of atmospheric and acoustic pollution;
- a significant contribution to climate change, mostly caused by CO2 emissions;
- the consumption of non-renewal fossil fuels;
- negative effects on health (respiratory diseases, hearing problems...)
- accidents due to traffic;

- the lack of public spaces, occupied by cars (moving or parked).

The main reasons that brought to this negative situation are macrosystemic and belong to different areas, but in the end connected:

- the economic globalization, that makes people travel every day for work and goods being shipped also very far away from the place of production ;
- the new life styles that consent people to travel for vacation and generally to move every day for study or just for fun;
- the organization of the cities, that are less compact, because in the last three decades there has been a growing spread of the urban functions, obliging citizens to move more frequently to reach their place of interest (offices, big malls, cinemas, sport plants, cultural centres...); this phenomenon is called urban sprawl.

Even if it seems that these causes are too big to be faced by citizens, we saw that the negative effects of the current mobility are very concrete. And, something often not considered, there are also important economic impacts, both affecting private pocket and public expenditure. Several studies assigned an economic value to the negative effects of the contemporary mobility, in order to understand that there is no convenience at all to stick with this system. Among the calculated costs we can find: the social costs produced by car accidents (besides the car damages, we also have to consider O.R interventions, hospital recoveries, administrative costs, missed productivity...); the costs connected to sedentary, that is the main responsible of several diseases; the incremented costs of goods that need a long travel to reach the sale's market; the costs to buy and maintain a car; the cost of the time loss connected to the every day travels, often made slower by traffic.

We'll see in the next chapters what are the possible solutions to switch to a sustainable mobility, but now we need to report the main culprit: cars and other individual road vehicles. There are two data that make the situation clearer: the average fill factor for cars and the average load factor for freight transport. The fill factor in Italy is 1.2, that means that 100 cars transport 120 persons; the Italian load factor is 50% for trucks (that means that normally a truck on the road is half empty) and 25% for vans.

These two numbers are the evidence that the change of behaviours is a first, necessary and very significant step to the transition to sustainable mobility.

CHAPTER 2: REFERENCE LAW

Principles and European legislation

At European level, transport of goods is regulated by the European directives 2006/38/EC, 2008/68/EC (which includes and replaces the old 94/55/EC, 96/49/EC, 96/35/EC, 2000/18/EC, 2005/263/EC directives) and 2009/33/EC.

Dir 2006/38/EC regulates the transport of goods and requires tolls to be calibrated on the polluting potential of the load carried and on the time of use of infrastructures.

Directive 2008/68/EC draws common rules for the inland transport of dangerous goods by road, rail or inland waterway and covers aspects such as loading and unloading and transport of dangerous goods to and from another mode of transport.

Directive 2009/33/EC aims to contribute to the reach of European targets for energy efficiency and the reduction of carbon gas emissions in the transport sector. Another goal of the Directive is to promote and develop a market for clean and energy-efficient vehicles. Moreover, the Commission promotes the exchange of best practices and knowledge between member States.

Concerning the public transport procurement, public authorities and operators must take into account the impact of public vehicles during their operational lifetime in terms of environmental impact and energy consumption.

Transports of people, especially at a urban level, find a regulatory framework in *the Action Plan for urban mobility* (Communication from the Commission to the European Parliament COM(2009) 490). This action plan contains twenty actions, which aim to stimulate cities to develop urban policies that will help to reach the European goals of pollution reduction and of creation of a sustainable and efficient transports system. The actions address the following issues:

- Improved information, to help making travel easier
- Passengers rights: the Commission will work with stakeholders to develop a set of voluntary commitments on passengers rights in urban transport
- Better planning of urban transport systems, with focus on integrated and efficient models. An instrument for urban planning are the Sustainable Urban Mobility Plans (SUMP), promoted by cities in each member State.
- The support for research for greener vehicles and more sustainable transports
- Sharing experiences and best practices between member States and relevant local actors
- A coherent funding system, which will consider present and future funding necessities for the promotion of policies for sustainable mobility.

Italian legislation

Italian regulations for sustainable mobility find their basis in two acts: the *Decreto "Mobilità sostenibile nelle aree urbane"* ("Sustainable mobility in urban areas" act), issued in 1998, and the "*Decreto 4 agosto 2017*" (decree 08/04/2017) which transposes the Action plan for urban mobility and promotes the adoption of SUMP for Italian cities

The 1998 act, following the results of the negotiations for the Kyoto protocol, aims to the reduction of carbon gas emissions in urban areas. The actions included in the act are addressed to both private and public sectors: those subjects shall adopt sustainable mobility plans for their employees and shall introduce the figure of *mobility manager* that is responsible for the elaboration and implementation of these plans.

The 2017 decree is, instead, focused on the promotion of a broader concept of sustainable mobility, which includes the reduction of carbon gas emissions, but concerns also other problems, such as traffic congestion in urban areas and promotion of modes of transport other than fuel-based vehicles. To achieve higher level of sustainability, each metropolitan city, "area vasta" and cities with more than 100.000 inhabitants shall adopt a Sustainable Urban Mobility Plan, a medium-long term strategy (10 years) that aims to achieve "higher level of environmental, social and economic sustainability". SUMP are developed in a framework of collaboration between local, national and European actors.

A monitoring tool for sustainable mobility is the project GIMS, promoted by the Ministry of Environment and the *Associazione dei Comuni Italiani* (Association of Italian municipalities). Aim of the project is the monitoring sustainable mobility actions promoted in Italian cities and financed by Sustainable Mobility Funds through a reliable on-line platform.

Spanish legislation

The legal frame for sustainable mobility in Spain is mainly composed by:

- Law 34/2007, of air quality and protection of the atmosphere. Its purpose is to establish the bases on prevention, monitoring and reduction of air pollution in order to avoid and when this is not possible, reduce the damage that may result for the people, the environment and other assets of any nature.

This law indicates the realization of plans with integration of urban mobility plans, which, where appropriate, may incorporate the company transport plans agreed by collective bargaining, with a view to promoting modes of transport less. The development of a Sustainable Mobility Law is proposed in the following terms: The Government, in developing the urgent measures to adopt against climate change, will elaborate a sustainable mobility law that will include, within the framework of the established social dialogue, the obligation of the implementation of company transport plans that reduce the use of cars in the transport of their workers, encourage other less polluting modes of transport and contribute to reducing the number and impact of these trips.

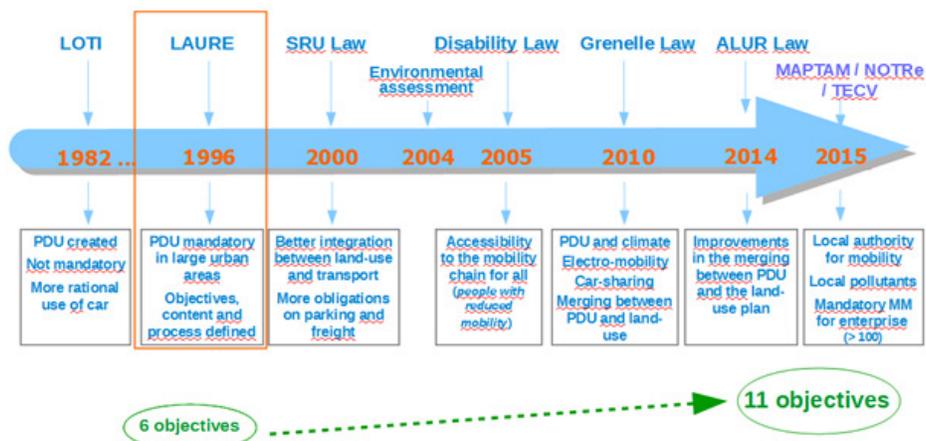
- Law 2/2011, Sustainable Economy Article 103. Elaboration of transport plans in companies. The competent administrations shall also promote the development of business transport plans, with a view to reducing the use of cars and promoting less polluting ways of transporting workers. Special attention will be paid to work centres of public or private ownership whose characteristics so advise by size of the template, activity, processes or location.
- RD-Law 6/2010, on measures to boost economic recovery and employment. Exemption in taxation of the amounts paid by the companies for travel between the residence and the work centre in public transport.

French legislation

Plan de déplacements urbains (PDU), a French kind of Sustainable Urban Mobility Plan (SUMP) was created by the French framework Law on internal transport (Loti – loi d’orientation sur les transports intérieurs) in 1982. In spite of a number of voluntary schemes in the 1980s and 1990s, it was only developed and broadened in 1996, when the French air quality Act (Laure – loi sur l’air et l’utilisation rationnelle de l’énergie) made it compulsory for urban areas of more than 100,000 inhabitants and defined the procedure to produce a PDU.

As a general planning tool for mobility across an urban area, the PDU defines the organisational principles for transport and parking for both people and goods, and covers all modes of transport. PDUs were strengthened by several laws passed between 2000 and 2010, until the recent 2014 urban planning law (ALUR). Thus PDUs can be considered as an ‘almost-SUMP’ since 1996. They coordinate sector-specific policies on alternative modes of transport to the car, the road network and parking and also incorporate several interconnected issues, such as environmental protection, integrating urban policies and mobility, access to transport for all and road safety.

20 years of PDU legal framework



As well as its role in planning, the PDU is also a scheduling tool insofar as it prioritises and sets out how measures contained within it will be financed ; the measures laid down in the PDU also have to be taken into account in local urban development plans and in the actions and decisions taken under the police powers of the mayor and road network managers. Finally, the PDU is developed using a partnership-based process and involves a range of institutional stakeholders and key players in civil society during its production and subsequent evaluation. The aim is to create a mobility plan designed to serve the interests of residents and local activities.

So the PDU today faces many challenges which it must take up if it is to strengthen its contribution to the integration of urban and transport policies, and more generally to an improved quality of life in French cities.

CHAPTER 3: MAIN POLICY INSTRUMENTS

European policy on sustainable mobility aims to tackle two main issues: urban traffic congestion and carbon emissions: congestion, air pollution, noise and road safety are common problems in European cities, and have a significant impact in social development, inclusion and accessibility for subjects with reduced mobility. On the other side, curbing mobility is not an option.

In order to propose solution to those issues and to create a common European transport system, in 2011 European Union proposed a white paper on transport *called Roadmap to a Single European Transport Area – Towards a competitive and resource efficient transport system*, where four key goals are proposed. By 2050 the European Union aims to:

- Have no more conventionally-fuelled cars in cities.
- Reach the 40% in use of sustainable low carbon fuels in aviation and at least 40% cut in shipping emissions.
- Reach a 50% shift of medium distance intercity passenger and freight journeys from road to rail and waterborne transport.
- Obtain a 60% cut in transport emissions by the middle of the century.

One of the most relevant problem for urban areas mobility in the last decades is represented by congestion, which leads to another set of problems.

Congestion in urban areas is a complex phenomenon, which can be looked from different points of view, in particular its impact on social and economic environment, its role on car-ownership, public transport systems, parking availability, goods delivery and, in general, on accessibility.

In December 2013, the Commission adopted the Urban Mobility Package, containing proposals for relevant action at local, Member State and EU level.

The main assumption of this document is that urban mobility is mainly a responsibility of the most relevant actors at the local level, which are encouraged to propose innovative and integrated strategies for sustainable models of urban mobility. The normative tools for achieve those goals are set out in the Sustainable Urban Mobility Plans (SUMP), promoted by local actors. The Urban Mobility Package also reflects the important role that Member States play in providing the right framework conditions for local actions and for actions integrated at the European Level.

Moreover, a set of actions are proposed for the reduction of the greenhouse gasses emissions. Those actions point at the development of new technologies for public and private transports and new concepts for mobility infrastructures, both material and immaterial (such as sharing mobility tools), that are fundamental for the development of sustainable mobility frameworks.

A particular attention is given, in the Urban Mobility Package, on logistics, planning and innovation in urban areas, with some examples of best practices and new models of urban logistic. Those examples, related both to people and goods mobility, concern urban logistic demand, in terms of increased efficiency and sustainability

Sharing mobility is a powerful tool for the reduction of congestion in urban areas and for the promotion of a sustainable mobility, both from urban congestion and environmental point of view. A study by International Transport Forum, based on results obtained for the cities of Lisbon, Helsinki and Auckland, shows that sharing mobility, considered as an ecosystem is a powerful instrument for sustainable mobility and does not substitutes, but supports the public transport system in reducing traffic and congestion.

An efficient sharing mobility system requires a smart use of set of innovative tools and infrastructures. Some examples of infrastructures deeply connected with smart mobility policies are park and rides that link different means of transport, efficient train lines, widespread, cycle lanes and a capillary and efficient public transport system.

Concerning urban planning, access limitations to congested areas, smart *pedestrianization* policies, intelligent parking rules and the presence of technologies that can facilitate the access to transports different from oil-based vehicles can play a significant role in decongestion of urban areas and in promotion of the soft mobility based on cycling and walking.

In terms of “immaterial” infrastructures, tools such as Intelligent Transport System for traffic management in urban areas, apps for services such as car sharing, car-pooling and bike sharing, and smart public transport pricing policies can become innovative and powerful instruments for a smarter and more sustainable urban environment. This bunch of policies and tools go under the name of *Maas* system, acronym of Mobility as a service: a human centred approach that takes advantage of ICT and other technologies for the implementation of a smart mobility.

In Italy, sharing mobility is a consistent and growing sector, as shown by data of the 2015-2017 period, when the sharing mobility ecosystem registered a 17% increase, with 357 different services. The highest share of sharing mobility in Italy is represented by bike sharing (76%), followed by car sharing (10%), car pooling (3%) and other services.

In Spain an important mobility policy is represented by the National strategy for sustainable mobility. Ministry of Development and Ministry of the Environment and Rural and Marine Affairs. The Spanish Sustainable Mobility Strategy contains action proposals that can be adopted by administrations, companies, social agents, institutions and citizens in general, to promote the necessary change in the current model of mobility, making it more efficient and sustainable, contributing to the reduction of its impacts, such as the reduction of greenhouse gases and other pollutants contributing to the fight against climate change. And introduce Mobility plans for companies and industrial or business parks, Mobility plans in educational, commercial and leisure centers,... Another Spanish policy tool for the promotion of sustainable mobility is the Energy Savings and Efficiency Plan 2011-2020. Here, the Measure 2 of the transport sector framework promotes Workers Transportation Plans (PTT). The main objective of this measure is to act on the mobility between home-work to achieve important changes in the modal split, with a greater participation of the most efficient means of transport, to the detriment of the use of the private vehicle with low occupation, and encourage the use of non-fossil energy-consuming modes, such as walking and cycling.

The ADEME (French Environment and Energy Management Agency) built a very interesting question schedule, to analyze the projects of infrastructures taking into consideration the challenges of sustainable development. This national agency creates many tools to apply sustainable development, and this question schedule is one example of what they do. Their objective is to create a similar tool for the design, the construction and the exploitation of the infrastructures than those which exists in the building with standards HQE. The question schedule is structured around 6 principal sets of themes. The most important questions are the following:

- Concerning the total coherence of the project: How the project serves the quality of local town planning, avoids the effects of cut, and is part of the landscape? What is the local socio-economic impact of the project? How the equipment is integrated into the existing transport network? Which

are the perverse effects of the project (generated traffic, solution or not)? Have all the possible alternatives or improvements been studied?

- Concerning the limitation of the harmful effects and environmental quality: How the project generates a reduction of noise? How the project integrates the control of energy and consumption? In what the project reduces the pollution of water, air, and ground? Does the project respect the natural spaces and the biodiversity? Which is the degree of reversibility of the project? How the total management of the project integrates the principles of environmental management?
- Concerning the quality of service and management: Which are the services offered to the users? How the dialog is optimized? We saw in what the great projects of transport are concerned with sustainable development and which actions could be started to build sustainable infrastructures. However the design, the construction and the exploitation of the infrastructures concern today two types of actors: the public actor and the private actor. Which roles have these two actors? How they take part in the application of sustainable development in transports projects and which actions did they start?

In Croatia, sustainable transport development only began its existence with emphasis on establishing adequate infrastructure and development of intelligent transport systems (ITS). Urban transport is responsible for about a quarter of CO₂ emissions from transport. The gradual phasing out of 'conventionally-fuelled' vehicles from the urban environment is a major contribution to significant reduction of oil dependence, greenhouse gas emissions and local air and noise pollution. Fully Electric Vehicles (FEV), for public and private transport, can contribute significantly to the lowering of the current pollution levels. However, the FEV use is currently facing several weaknesses which are delaying its wider deployment, mainly related to overall limited efficiency and limited driving range. Energy Institute Hrvoje Požar and Croatian Telecom, two organizations from Croatia, are involved in project MOBINCITY which is mostly funded from EU funds. A general aim of this project is to expand the use of electric cars. MOBINCITY aims at the optimization of FEV autonomy range and the increase in energy efficiency thanks to the development of a complete ICT-based integrated system able to interact between driver, vehicle and transport and energy infrastructures, taking advantage of the information provided from these sources in order to optimize both energy charging and discharging processes (trip planning and routing).

CHAPTER 4: THE JOB MARKET

Talking about sustainable mobility, it is very difficult defining boundaries of the referring job market. This because part of the sustainable mobility system is still inside the traditional system, for example quite every producer of cars makes both fuel-powered vehicles and other more sustainable ones and often the same engineers work at both projects. The same happens in the IT companies, where important apps and technologies for smart and sustainable mobility are a big slice of the market, but it frequently happens that the same project managers and developers work also for other kind of IT products.

Another aspect to consider is that sustainable mobility is a cross-over topic, a specific way of looking at the mobility issues; so an environmental communication expert can design and realize a campaign to promote sustainable mobility, as well as a logistics manager can consider sustainability one of the basic values of its action (or not).

Anyway, in order to have an idea of the growth of sustainable mobility sector, we can see some data about electric-powered vehicles, that's a sector now leading the green mobility revolution.



According to a study of Navigant Research, the world market of electrical mobility in 2025 will represent a value of 62 billion dollars, against the 25.6 billions of 2016¹². A very dynamic and

¹²[https://www.navigantresearch.com/press-releases/2018/06/19/mobilit-sostenibile-un-mercato-che-varra-oltre-62-miliardi-di-dollari-nel-](https://www.navigantresearch.com/press-releases/2018/06/19/mobilit-sostenibile-un-mercato-che-varra-oltre-62-miliardi-di-dollari-nel-2025)

growing part of this sector is the one of e-bikes. In 2017 the sales of e-bikes in European Union increased of 21%, also thanks to a real explosion of some national market, such as the French (+50%, but there were public incentives to the purchase), the Italian (+25%) and the German one (+19%)¹³. This huge amount of electrical bikes sold is also very positive for the job market: many e-bikes producers are small to medium size European companies. For example, in Italy there are almost 800 small companies that produce e-bikes or components for them and, in 2017, the occupation in this sector increased of +28.5%¹⁴, while the e-bikes produced in Italy in 2017 are 35.000 (in 2016 they were 23.600)¹⁵.

CHAPTER 5: PROFESSIONALS

Mobility manager

Activity description

The mobility manager is the responsible for the mobility of a private company or of a whole territory; in this second case the employer is a Region, a County or a Municipality.

The company's mobility manager has the job to verify the mean of transport used by the employees for their travels home-work and to find alternatives to the use of private cars. The objective is the reduction of private cars used by the employees, trying to promote solutions with a lower environmental impact, such as car pooling, car sharing, bike sharing, dedicated buses... his job aims at reducing traffic, air pollution and greenhouse gas emissions, increasing energy savings and social relationships.

The instrument used for organizing the sustainable movements of the colleagues is the *Plan of house-work movements*.

The territorial mobility manager instead is nominated by a local administration and has the job to arrange all the interventions about mobility in a wide territory, working in a network with all the subjects interested in mobility, such as local public transport companies, public offices and structures and all the company's mobility managers working in that specific territory.

The main phases of the mobility manager's job are:

1. the creation of a network of relationships ; the mobility manager needs to know the territory and the colleagues, in order to investigate how they move, and also the subjects locally interested in the mobility sector, as for example the public transport company.
2. the creation of tools; in this phase the mobility manager writes the *Plan of house – work movements*, in which are listed the possible alternatives to the use of private cars; there will be already existing opportunities but also ad hoc designed solutions, such as buses from the train station to the company, the organization of car pooling among colleagues that live close to each other...
3. the offer of services; at the end of the planning phase the mobility manager disseminates the contents of the Plan, in order to allow the colleagues to experiment the proposed solutions and, in the end, change their mobility behaviours to something more sustainable.

¹³ <https://bike4trade.sport-press.it/2018/04/19/ue-mercato-ebike-in-crescita-nel-2017/>

¹⁴ <https://www.wavel.it/mercato-biciclette-elettriche/>

¹⁵ http://www.ansa.it/sito/notizie/economia/2018/05/16/mercato-bici-cresceboom-elettriche19_b2ccf394-edbc-41f6-88ad-ac2f697bf38b.html

Competences

The main competences required by a mobility manager are communication skills, interpersonal skills (in order to dialogue both with colleagues and external stakeholders), knowledge of logistics and marketing.

The mobility manager also have to be a good organizer, someone who knows very well the local contest and is capable to use informative systems.

Reference job market and economical treatment

The green economy sector is constantly growing and professionals connected to mobility processes are required. But the existence and success of a mobility manager is strictly connected to the sensitivity and the culture of the single company: where the top levels believe in the effectiveness of a mobility policy, the mobility manager can have a concrete role inside the company (and a dedicated budget), where not the mobility manager risks to be a marginal player. Also the economical treatment depends on this distinction, starting from 1.500 euro a month up to 4.000.

Course of study

The mobility manager is an interdisciplinary professional, so the degree can be both humanistic or technical, but it is necessary to frequent a specialization master or training, because there is a wide range of competences needed.

Networks

An important network in Italy is the Italian association of the mobility managers, that is committed to empower this professional, increase the competences and, more generally, spread the culture of sustainable mobility.

Summary

The mobility manager is the responsible for the mobility of a private company or of a whole territory; in this second case the employer is a Region, a County or a Municipality. The company's mobility manager has the job to verify the mean of transport used by the employees for their travels home-work and to find alternatives to the use of private cars. The territorial mobility manager instead is nominated by a local administration and has the job to arrange all the interventions about mobility in a wide territory.

To know more

www.euromobility.org

Transport and traffic engineer

Activity description

The transport and traffic engineer organizes the offer and demand of transport, both of people and goods. He/she studies the road traffic, proposes and designs infrastructures and takes also care of railways and airports. Part of the job is to make possible the efficient and safe movement of people and goods, also considering the environmental aspects of mobility.

This professional can have many specializations, depending on the sector and the kind of company is working for. Also the work's processes are different according to the sector of work: some engineers are more involved in research, some others are focused on the integration of mobility issues in the urban planning, or again on the organization and management of the studied solutions.

Competences

The main skills for this professional are:

- knowledge of the legislative frame about private and public transport;
- knowledge of the fundamental elements of the transport systems and of the criteria for the design of infrastructures
- ability to design a real time information system for the users of the mobility system
- ability to manage in the best way infrastructures and services of road, railway, air or sea transport, through the most advanced methodologies and technologies
- ability to design intermodal interactions, with the aim of diminishing pollution and road traffic
- ability to evaluate possible safety problems and to solve them.

Reference job market and economical treatment

There are several occupational possibilities, both as free lance and employee. In this second case, the work places can be engineering societies, professional studies, building companies but also public bodies, local administrations and the big companies that manage important infrastructures (e.g. highways, ports, railways...). Also universities and big research centres can offer jobs for transport and traffic engineers.

This wide range of opportunities is connected to the fact that the professional has many practical applications, in different contexts and with different roles and functions. So we can say the transport engineer is maybe one of the careers with more professional outlets in the sustainable mobility sector.

As a consequence of this big flexibility, also the economical treatment can vary in a wide range, according to the organization and the role covered.

Course of study

In order to choose this career it is necessary one of the following university degrees:

- civil engineering degree
- mechanical engineering degree
- transportation engineering degree
- management engineering degree (some specializations).

Networks

An important network is the Italian association for traffic and transport engineering. The web site is rich of news, researches and downloadable studies.

Summary

The transport and traffic engineer organizes the offer and demand of transport, both of people and goods. He/she studies the road traffic, proposes and designs infrastructures and takes also care of railways and airports. Part of the job is to make possible the efficient and safe movement of people and goods, also considering the environmental aspects of mobility. There are several occupational possibilities, both as free lance and employee. In this second case, the work places can be engineering societies, professional studies, building companies but also public bodies, local administrations and the big companies that manage important infrastructures (e.g. highways, ports, railways...). Also universities and big research centres can offer jobs for transport and traffic engineers.

To know more

<http://aiit.it/>

Economist of transports

Activity description

The economist of transports studies and analyzes the relationship between the transport system and its socio-economic environment. In particular he/she evaluates the economical convenience of the mobility projects, estimating the management costs and the number of users (the demand of transport).

This professional can have tasks in different organizational areas, taking care of the analysis, design and evaluation of systems of transport, logistics or infrastructures. The working area is very wide, because it covers all different transportation modalities. The professional can also orient public administrations defining sustainable and effective mobility policies.

Competences

The economist of transports has many and transversal knowledge: economy, legislation, mathematics, statistics and specific topics about transports, logistics and telecommunications.

The expert in economy of transports knows also the characteristics of the transportation systems from the economical, political and planning points of view and he/she is able to quantify the costs.

Another important skill concerns the use of software for the logistics simulation.

Reference job market and economical treatment

There are several job opportunities, as a free lance or as an employee of many subjects:

- consultancy societies

- big professional studies
- transportation companies
- big firms in the logistics sector
- research centres
- entrepreneur's associations.

The job market is quite hospitable for this kind of professional, because of the wide range of opportunities. Of course the specialization is very welcomed.

The economical treatment depends on the level of responsibility of the employee, that can also be a top management one.

Course of study

To do this job it is necessary a university degree in economy, with a specialization in logistics and transportation. It is also very useful the frequency of a dedicated master or a stage in a company.

Networks

An interesting network is the Italian society of the economists of transports (SIET).

Summary

The economist of transports studies and analyzes the relationship between the transport system and its socio-economic environment. In particular he/she evaluates the economical convenience of the mobility projects, estimating the management costs and the number of users (the demand of transport). The economist of transports has many and transversal knowledge: economy, legislation, mathematics, statistics and specific topics about transports, logistics and telecommunications.

To know more

www.sietitalia.org

Director of port terminal

Activity description

The job of director of port terminal is to manage and coordinate all the activities inside the port: boarding, landing, storage of goods... letting clients satisfied by the quality of the service.

For moving goods it is necessary to have particular tools and also the storage has specific needs: for example food needs wide refrigerated spaces, while liquids need big boxes made by resistant materials and other goods cannot mix with anything else and so they need special separate spaces. An important service managed by the port is also the movement of these goods the come and leave by sea, so there has to be

available a big space for the containers and the presence of a railway station inside the port is highly recommended.

The director of port terminal is a management professional that both runs the activities of the port and keeps relationships with the president and the board of the port. In the end, he/she has a relevant role in the enhancement of water modalities of transport, as alternative or integrative system to road transport.

Competences

The skills needed concern organization, logistics aspects and also business activities; specific knowledge needed concern the documentation about transport and movement of goods, the port operations and services, the customs law.

Other competences required are the typical of a manager, such as problem solving, relational skills, fairness and communication skills.

It is also very useful to know some foreign languages, because frequently the clients are foreign companies.

Reference job market and economical treatment

The job market is wide because this professional is a managerial one, so the experience can be spent in many companies and sectors. The economical treatment is high, starting from 60-70.000 euro a year.

Course of study

There is not a mandatory training path for this job, but it is recommended a university degree in law, political sciences, economy or engineering, choosing the specialty dedicated to the management of public or private companies. Also very useful can be a post degree master dedicated to management of transport and logistics sector.

Networks

The most important networks are the Italian association of terminals, the Italian association of logistics and the Italian association of ports.

Summary

The job of director of port terminal is to manage and coordinate all the activities inside the port: boarding, landing, storage of goods... letting clients satisfied by the quality of the service. The skills needed concern organization, logistics aspects and also business activities; specific knowledge needed concern the documentation about transport and movement of goods, the port operations and services, the customs law. Other competences required are the typical of a manager, such as problem solving, relational skills, fairness and communication skills.

To know more

www.assiterminal.it

www.assologistica.it

www.assoporti.it

Logistic manager

Activity description

The logistic manager takes care of the management and circulation of goods and supplies. This professional is present in many companies, belonging to any kind of productive sector. He/she arranges the storage and distribution of raw materials and finished products.

A possible specialization is the one of City logistics manager, who has the job to rationalize and optimize the activities of collection and distribution of goods in a urban area, in order to contribute to reduce traffic and air pollution.

The work process is different according to the type and dimension of the firm, but mainly the logistic manager deals with these activities:

- the settlement of procedures of purchase and arrival of the materials and procedures of transportation and distribution of products
- the settlement of the technical aspects and tools for transport and arrival of materials
- the development of the technological tools that manage the storage and check savings and economical efficiency of the procedures
- the definition of contracts with the transportation companies and of deals with customs.

Competences

The logistic manager has a technical training, some years of experience in a lower level of logistics processes, knowledge of the informative systems, knowledge of the mobility system of its area of work, good level of English language and several personal skills:

- negotiation abilities and problem solving attitude
- leadership skills
- project management skills.

Reference job market and economical treatment

This professional mostly works in private companies (mainly industrial and commercial ones), but also in specialized consulting societies and in public administrations.

The logistics is a very dynamic sector, also thanks to a constant evolution of processes and to frequent organizational innovations, from the enlargement of the markets to new consumption behaviours.

The economical treatment vary according to the type and dimension of the firm and, mostly to the responsibilities of the mobility manager. The range can be between 35.00 and 60.000 euro a year, also depending on the experience.

Course of study

The study background of logistic managers is various: university degrees in economy, law, engineering, political sciences or architecture can all be a good starting point for this profession. The training can be completed with a master or a specialization course.

Networks

Two important networks are the Italian association of logistics and supply chain management and the Italian society of professors of transports; the second one also organizes courses for City logistic managers.

Summary

The logistic manager takes care of the management and circulation of goods and supplies. This professional is present in many companies, belonging to any kind of productive sector. He/she arranges the storage and distribution of raw materials and finished products. The logistics is a very dynamic sector, also thanks to a constant evolution of processes and to frequent organizational innovations, from the enlargement of the markets to new consumption behaviours.

To know more

www.ailog.it

www.sidt.org

CHAPTER 6: CASE STUDIES

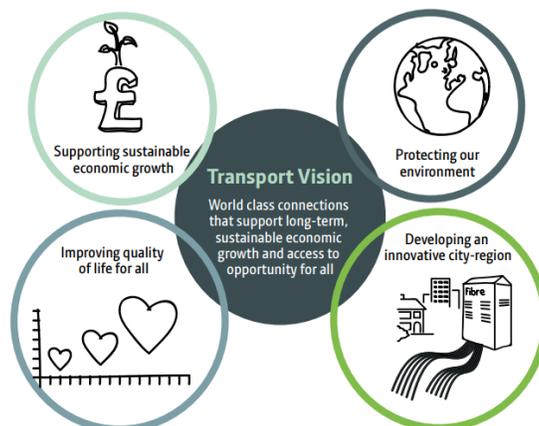
2040 Great Manchester transport strategy – the Greater Manchester Area SUMP

The metropolitan city of Greater Manchester covers an area of about 1.277 km² and comprises 10 metropolitan boroughs: Bolton, Bury, Oldham, Rochdale, Stockport, Tameside, Trafford, Wigan, and the cities of Manchester and Salford. The total inhabitants are almost 2.700.000.

The metropolitan area of Greater Manchester is experiencing a period of growth, both economic and demographic (+1.5 million inhabitants in 2040), and the actual transport system is saturated and, then, unfit to offer solutions and responses to the upcoming needs and expectations of Manchester's inhabitants and productive sector, concentrated in the advanced services sector.

In order to tackle these new challenges, Transport for Greater Manchester (TfGM), on behalf of the Greater Manchester Combined Authority (GMCA) and the Greater Manchester Local Enterprises Partnership (GMLEP) developed a long-term strategic plan, called *2040 Great Manchester transport strategy*. This plan

aims to support and promote a sustainable economic growth and is based on four key elements: economic sustainability, social sustainability, environmental sustainability and innovation: transport sustainability and SUMP are considered as drivers of economic growth.



The measures SUMP of Manchester area are not focused on individual modes of transport, but aim to create an integrated, sustainable, and well coordinated transport system that supports a wide range of different travel needs, concerning residents, businesses and visitors. Concerning short-distance transports, neighbourhood and cities have to be more bike-friendly and walk-friendly and these means of transport have to be incentivized

Medium range transport improvement is based on empowering and rationalization of the bus services and, at the same time, on the regeneration of public transport stations. Aim of this measures are the creation of more efficient connections between greater and smaller centres.

In the SUMP are presented seven core principles that must be considered in an innovative transport system. Transport have to be:

- Integrated – allowing customers to move seamlessly between modes and services
- Inclusive – providing accessible and affordable transport
- Healthy – promoting walking and cycling for local trips
- Environmentally responsible – delivering lower emissions, better quality environment
- Reliable – giving customers confidence in journey times
- Safe and secure – reducing road accidents and deaths
- Well maintained and resilient – being able to withstand unexpected events and weather conditions

The Greater Manchester transport strategy faces the upcoming challenges from different perspectives. Different, but integrated, actions are planned for the short term and the long term, as different instruments are intended either for the transport system of the Greater Manchester Area or for improving connections between Greater Manchester and other parts of the UK.

Concerning the short-term strategy, actions are planned for highways, in order to improve reliability and access across the wider city region and to the motorway network. Another objective of the Strategy is to guarantee and improve access to key employment, education and training locations across the wider city region particularly by public transport and cycling.

Other measures concern the improvement of bus and rail passenger, implementing high-grade waiting facilities and travel information services.

Town centre and regional centre access measures will be implemented in order to improve access to public transport gateways and provide better walking and cycling environments in town/city centres. Moreover, neighbourhood connectivity schemes focused on improving walking and cycling access to local rail stations, Metrolink stops and local bus hubs from the local communities.

A key action of the *2040 Greater Manchester Transport Strategy* is the *Made to Move* project, that presents 15 steps for transforming the Manchester area in a more walking- and bike-friendly context. In *Made to Move* strategy is presented a cost-opportunity analysis of a shift toward a more bike and walking friendly transport system: considering all of the costs related to the inefficiency of the actual transport system (congestion, air quality and casualties), the “cost of doing nothing” is 3.75£ billion. Moreover, investments in solutions that encourage the physical activity have a 550% multiplier: for each pound invested, 5.5£ are obtained.

As a more “strategic” approach, will be pursued a devolution of powers and funding by exploring radical new opportunities to reform our bus services, and improve the way in which we manage our major roads and rail stations.

On the long term, the Manchester authorities are currently working with the ten district councils to develop a series of modal and spatial sub-strategies. These will set Greater Manchester’s future transport investment plans in more detail.

2040 Greater Manchester Transport Strategy presents measures related both to short-range and long-range transport systems.

At a local level, a strong focus is given to the role of neighbourhoods, which have a huge influence on quality of life and on social tissue of communities. People want to feel connected – to shops, parks, schools, their place of work and to one another. Local streets should be ‘places’, rather than just through routes for traffic.

Creating attractive living environments also plays a role in the economy, by attracting and retaining the diverse labour market that is needed to support economic growth.

For all of those reasons, an efficient transport system must rely on communities: encouraging people to use their cars less and walk and cycle more for shorter journeys, to help reduce congestion, pollution and accidents.

Objective of the strategy is to improve transport between and within metropolitan area’s towns by road, public transport, bike and on foot, to develop the economy of city centres, that can receive huge benefits from regenerated central, easy to get to and pleasant to walk around and spend time in areas. Buses will play a particularly important role in connecting towns: bus services will be improved and made them simpler and more attractive to use. The Strategy also focuses on how can more people and goods can be moved into and around the regional centre (Manchester city centre and adjacent parts of Salford and Trafford).

In order to empower the public transport system and to make it more attractive, Additional Metrolink services will take advantage of the new Second City Crossing and bus services will be upgraded. This will reduce congestion in the city centres.

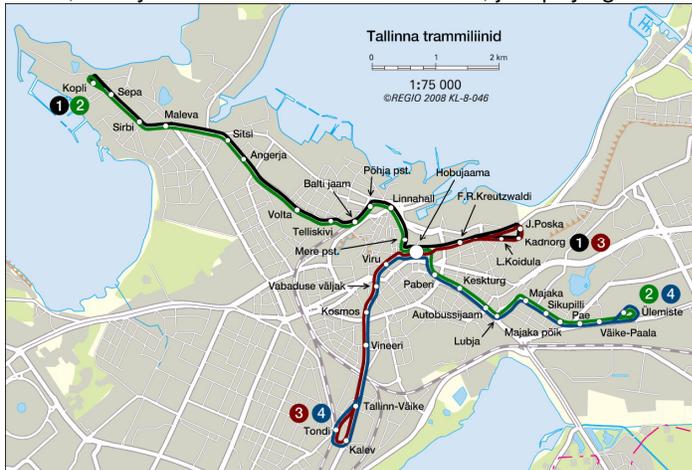
Concerning long-range movements, transport links to other cities across the UK are critical to the long-term success of a transport system strategy. Many of our current inter-city road and rail networks are heavily congested and unreliable. Coupled with this are slow journey times. A transformation and an improvement toward a more efficient transport between Greater Manchester area and other UK cities would deliver significant economic and social benefits, not just for Greater Manchester, but right across the north of the country.

Greater Manchester’s connections to global business and tourism opportunities also have to be considered.. Manchester Airport and the Enterprise Zone, along with the Atlantic Gateway corridor from Port of Liverpool to Manchester along the Manchester Ship Canal, all offer exciting opportunities to create better transport links to the rest of the world for moving goods and people.

Estonia, the largest free public transport area in the world

Since July 1st, 2018 Estonia became the largest free public transit zone in the world, following the example of its capital city, Tallinn.

At first it was Tallinn¹⁶, we said: in 2012 the mayor Edgar Savisaar asked his citizens with a referendum what about to make local public transport free and he obtained a large support, with a two-thirds majority in favour. Then, at the beginning of 2013, the dream became true and the residents of Tallinn can travel on buses, trams, trolley buses and local trains for free, just paying once 2 euro for a special “green card”.



From the economic point of view this can happen because of the Estonian fiscal system, where the municipality gets a €1,000 share of each citizen's income tax every year; that's why free travel is only available for the registered Tallinn citizens. Everyone else has to pay, just like before. This had a positive consequence for the income of the city, thanks to the increase of registrations of people that already lived in Tallinn but was still resident elsewhere. In the first three years of the project there were 25,000 new residents, for a profit of 20 millions euro. This big economic success of the operation brought also some tensions with the rest of the country,

because these resources were drained mostly from the rural (and more poor) areas of Estonia.

The social aspects are a central objective of the project: the city's local authority says the move “safeguards social cohesion of local communities by granting equal mobility opportunities to all social strata”. And, in fact, public transport use increased strongly among the old and the young, and those on a very low income, as well as those out of employment and education.

On the other hand, the results from the environmental point of view are not so positive. In 2014, a year into the experiment, the use of public transport had increased by 14%. However, car use only declined by 5%. In fact, it was walkers who hopped on buses, as the number of trips made on foot dropped by a staggering 40%. In order to have strong environmental results, it could be useful some collateral measures to discourage the use of private cars, such as an increase in the parking prices or some new restrictions to the circulation in specific parts of the city.

Anyway, despite the shadows, it's now five years that the public transport of Tallinn is free and the citizens are satisfied by the system. So this bold experiment became a model for many cities in Europe and around the world: it's frequent the request of information coming from municipalities that are facing serious problems of traffic and pollution. But Tallinn was also the inspiration (or maybe one of the causes) of the big National plan¹⁷ that recently made Estonia the largest free public transit zone in the world.

Not all the Estonian public transports have become free, the plan regards only the rural bus routes (not the railway nor the local public transport of other cities except Tallinn) and it's only for Estonian citizens. But it still remains a big and revolutionary act, that consents to travel with no costs from one side to the opposite of Estonia.

But why is Estonia going so big on free transit now? At its root, this is a form of fiscal redistribution. Rural Estonians, who comprise 32.5 percent of the country's total population, are generally older and less affluent than their urban counterparts; younger country-born Estonians have increasingly moved to cities and to other countries. The rural parts of this former Soviet state, which joined the E.U. in 2003, thus rely heavily on decent functioning public buses. Making this system free to use for all might help slow this rural population drain.

¹⁶ <https://www.theguardian.com/cities/2016/oct/11/tallinn-experiment-estonia-public-transport-free-cities>

¹⁷ <https://www.citylab.com/transportation/2018/05/estonia-will-roll-out-free-public-transit-nationwide/560648/>

And what about the economical sustainability of the plan? The rural bus routes that have just gone free are already subsidized to up to 80 percent of cost as it is. Making them entirely fare-less should only cost around €12.9 million more—not a vast amount for even a small country such as Estonia; meanwhile getting rid of ticket sales and inspections will mean to eliminate some overhead.

CHAPTER 7: LABORATORIES

Laboratory: school mobility management

The idea

The school community involves a huge amount of people that every day move from their houses to the school, coming from a wide territory. All these persons travelling have an impact on traffic, pollution and streets safety. As in a big company, these movements are designed and managed individually, creating inefficiency in the whole community. So a group of students can “play” at the mobility manager, trying concretely to reduce these inefficiencies and obtain positive consequences for the school community.

The mobility manager experience can be very interesting (and also very challenging!) for students, making them understand practically how many difficulties are there to switch from traditional to sustainable mobility.

Learning objectives

The main objectives of the laboratory are:

- to understand the complexity of the mobility issues;
- to know the sustainable mobility system of their own territory;
- to develop skills of problem solving;
- to help reducing the environmental impact of the school community;
- to promote sustainable behaviours.

Who is the target

The whole school community: students, teachers, school janitors and administrative employees.

Work tracks and realization

The students involved in the laboratory work in groups; each group takes care of one specific school community (students of first grade / teachers / employees...), starting with filling in the questionnaire of the house to school movements (it is easy to find on line a fac simile, they're a very standardized procedure).

After the collection, they have to analyze the data and, from those, the local mobility system (public transport network, local railways, car sharing companies, bike sharing opportunities, bicycle lanes...).

After this analysis every group comes up with a bunch of solutions to increase the sustainability of the every day movements. But, they'll surely won't find a good solution for everybody, so they'll have to present the "difficult cases" in a plenary with the other groups and search for shared solutions: maybe a teacher who goes to school alone by car lives in the same village of an administrative employee that also goes alone to school by car...

Then, at the end of the confrontation, the students involved in the laboratory will write a *Plan for the home to school mobility*, where they present the results of the questionnaires, the analysis of the mobility system and the proposals for making the home to school mobility more efficient and sustainable. Part of the proposals can also involve the principle of the school as a promoter of policies that have to be driven by the municipality: for example the students could ask the mayor a new bike sharing station in front of their school.

The last action of the laboratory consists in dissemination of the Plan's proposals, also with specific meetings with the persons that could enjoy tailor made solutions (e.g. that teacher who lives near that administrative employee we were talking above).

Laboratory: sustainable mobility contest

The idea

The promotion of sustainable behaviours among students and the greening of a school mobility system can also be treated like a game, in order to start from the fun part for making a permanent and effective change in young students every day life.

Some municipalities promote challenges on the use of bikes for the every day movements of citizens, obtaining several results as the decrease of traffic, less air pollution and the promotion of a healthier life style. These results can be even stronger if on young people, for which it's central the self experience in order to change behaviours, practically understand a problem and embrace possible solutions.

Learning objectives

The main objectives of the laboratory are:

- promotion of sustainable mobility at school;
- capability to involve and sensitize the other students;
- capability to design and realize a communication campaign and a contest.

Who is the target

The school's students.

Work tracks and realization

The group participating to the laboratory starts becoming acquainted with the main issues about mobility and its lack of sustainability. Then they have the job to design and realize a sensitization campaign about sustainable mobility at school, using creativity and the tools of guerrilla marketing, in order to hit the imagination of other students.

After this, they define the rules of a contest where each class of the school will take part. It will take place during one spring month (for example May), when each student that goes to school by bike obtains a point for its class (2 points for students who use helmets) for each ride he/she does. The class with more points at the end of the contest wins a prize, according to the principle (some technological devices? A class trip?).

Then the project management group inform all the school of the contest and, during the chosen month, checks every morning who is coming to school by bike, in order to fairly assign the points.

At the end of the contest there is a ceremony for the delivery of the prize and a sort of sustainable mobility party for all the school.

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