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Editorial

Case studies on transport policy

MULTIMODAL, SUSTAINABLE AND RESILIENT SOLUTIONS FOR MOBILITY AND TRANSPORT – SIDT 2022

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Transportation systems play an essential role in achieving the main sustainability targets, fostering an efficient usage and distribution of social, economic and environmental resources. Strategic transport policy and optimized transport services may reduce congestion and environmental pollution, increase inclusiveness and reduce the social imbalance.

It cannot be ignored that the health crisis, due to the COVID-19 pandemic significantly affected transportation needs and users' behavior. As a result of social distancing, passengers transport demand showed a reduced attractiveness of crowded transport services; in contrast, freight transport demand experienced an increase in e-commerce, leading to the rapid growth of deliveries. This situation showed that it is necessary to enhance the capability of the transport system to react to disruptive events and adapt the service to demand fluctuations.

The development of multimodal and integrated transport solutions is key to improving transportation systems' efficiency, effectiveness, and sustainability. Besides, collaborative approaches to disruption management and synchronized transport services involving different operators may reduce negative impacts on users, such as delays and service downtimes.

In Italy, there is an official categorization of academic groups based on their main disciplines: one of these groups, within the Engineering area, is entitled "Transport Systems", and it includes transport planning, together with all the related policies and analyses. Every two years, the academics belonging to this group meet together to share their scientific and technical results during a scientific seminar; the most recent one took place at the University of Genoa in June 2022. This special Issue has been developed by selecting six of the forty-nine papers presented at the Genoa scientific seminar, which were considered relevant as far as Case Studies on Transport Policy are concerned.

The main issues dealt with in this Seminar can be summarised as pertaining to the latest research conducted in the field of sustainability and resilience challenges associated with the development of transportation systems. Particular attention is devoted to multimodal approaches for the integrated management of transport services. The Special Issue includes studies related to analytical and simulative models, optimization approaches, and novel applications further to improve current policies and practices for transport network management.

Baldassa et al. in "Telework and MaaS adoption in a post-pandemic scenario. Evidence from municipal employees of Padua, Italy" analyze which factors influence users to adopt teleworking in a post-pandemic scenario and the relationship between willingness to telework and the propensity to join a MaaS system. An

ordered logit model and a mixed logit model were developed to achieve the two goals, respectively. These models were calibrated and validated using data collected from questionnaires administered to Padua Municipality employees between October 2020 and January 2021. As expected, the employees most inclined toward teleworking are those who seek more flexibility and are unable to commute by private means. In addition, results show that employees who expressed the preference to telework more in the future are less likely to adopt MaaS, suggesting that the increased popularity of teleworking due to the pandemic may have a negative effect on the uptake of MaaS.

Orsini et al. in "Before-after safety analysis of a shared space implementation" propose an advanced methodology, based on surrogate safety measures and Extreme Value Theory, to assess road safety before and after the implementation of a shared space. The aim is to produce a crash risk estimation in different scenarios, obtaining a quantitative and comprehensive indicator useful to practitioners for evaluating the safety of urban design solutions. A real-world case study illustrates the proposed procedure. Video data were collected on two separate days, before and after a shared space implementation, and were semi-automatically processed to extract road users' trajectories. Analysis of traffic volumes, trajectories, speeds and yield ratios allowed to understand the spatial behavior of road users in the two scenarios. Traffic conflicts, identified with an innovative surrogate measure of safety called "time to avoided collision point" (TTAC), were then used to estimate a Lomax distribution and, therefore, to model the probabilistic relationship between conflicts and crashes, eventually retrieving a crash risk estimate. Results show that the analyzed shared space significantly reduce the risk of crashes, and these findings are consistent with the observed changes in users speed and spatial behavior.

Coppola et al. in "Multicriteria Life-Cycle Assessment of bus fleet renewal: A methodology with a case study from Italy" focuses on both the economic and ecological transition of local public transit (LPT) bus fleets. A methodology based on a Life-Cycle Assessment (LCA) approach of both costs and environmental impacts is proposed to identify suitable pathways for the renewal of the existing buses: these are compared using a multicriteria decision matrix. The application to the Italian basin of the provinces of Como, Lecco and Varese (with about 860 operating buses almost all equipped with diesel engines) has allowed to validate the approach for both the urban and the ex-urban context. In the urban context, the study has shown that the full-electric scenario has the lowest environmental impact since zero tailpipe emissions and greenhouse gases (GHG) are lower than all the other scenarios. For the ex-urban service, characterized by medium and long-distance routes, a "full-electric" scenario is not yet feasible, considering that long-range BEBs having sufficient battery autonomy to guarantee efficient operations on medium-long distance routes are not yet widely marketed. Liquefied natural gas-powered buses could be a suitable solution in these contexts; however, it was found that they have even worse environmental performances compared to diesel buses (+14% GHG emissions and more than doubled direct emissions). Hybrid electric vehicles would be an option for decarbonising ex-urban LPT, but the costs of the transition in such a direction should be considered with care.

Colombaroni et al. in "Meta-heuristic aggregate calibration of transport models exploiting data collected in mobility" present a general methodology for the aggregate calibration of transport system models that exploits data collected in mobility jointly with other data sources within a multi-step optimization procedure based on metaheuristic algorithms. The methodology is applied to two real large-scale case studies in two different contexts. The first concerns the aggregate calibration updating a national strategic 4-step demand model in a big European Country; the second deals with the calibration of link and node performance functions implemented in a traffic network model of a town of around 3 million inhabitants. The results demonstrate the effectiveness of the aggregate calibration methodology in significantly improving earlier models' estimations. The results also highlight that the errors are in the same order of magnitude as the intrinsic variation of the data collected in the field.

Ventura et al. in "Monitoring vehicles with permits and that are illegally overweight on bridges using Weigh-In-Motion (WIM) devices: A case study from Brescia" present a real-world case study adopted a data set of 14,800+ overweight vehicles in heavily industrialized northern Italy based on two-months of raw data from WIM devices to: (i) investigate the probability density function on the main characteristics of overweight vehicles, and (ii) to provide Road Authorities (RAs) with a Multiple Linear Regression (MLR) model to predict overweight vehicles' GVM in a more cost-effective way than placing WIM systems on each road segment with bridges. Probability density functions revealed the existence of different vehicle typologies, including lorries with permits and that are illegally overweight, whereas inferential analysis showed MLR's high performance in predicting vehicles' GVM. Minimum axle distance and total axle number had greater positive effects on the predicted GVM respectively. Conversely, by increasing vehicles' width and length, a reduction in GVM was predicted. These findings could help support practitioners, RAs, and governments to implement rational and less resource consuming administration policies for their bridge assets.

Longo et al. in "Logistics chain responsiveness to war impacts: A case study in North Adriatic Region" present an analysis to assess the effects of the Russian-Ukraine conflict outbreak on the sea-road intermodal service linking the Ukrainian port of Mariupol with some metal companies in the Italian region of Friuli Venezia Giulia. As a matter of fact, oceanic vessel services replaced the former sea relation, thus leading to greater loads, lower frequency and effects in terms of port of calls and on the inland segment by road – train – barges, which caused extra-costs to the operators and harmed the whole supply chain. A methodology combining process modelling by means of Business Process Model and Notation (BPMN) and quantitative analysis allowed to identify process bottlenecks and examine infrastructural and financial consequences for each considered transport modal. The main conclusions, along with a quantification of the impacts at the economic, environmental and societal levels, highlighted as main priorities the development of suitable infrastructural networks consistent with the new service, the need of incentive schemes and to invest in professional training.



Alice Consilvio is a Researcher of Transportation Engineering at the Department of Mechanical, Energy Management and Transportation Engineering of the University of Genoa (Italy). She is a member of the coordination team of the ERASMUS + project STAFFER, "Skill Training Alliance For the Future European Rail system", the first Blueprint for Sectoral Cooperation on Skills dedicated to rail supply and transport industries. She is Deputy Chair of the international Master of Science Course in Safety Engineering for Transport, Logistics, and Production at the University of Genoa. Her main research interests include modelling, control, and optimization of transportation systems, with particular reference to rail transport systems and services. She has been involved in several funded Horizon 2020 and Shift2Rail European projects since 2014.



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