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Reflection of the sustainable urban mobility paradigm shift in teaching at three European universities

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Abstract:

Over the last few decades, the urban transport planning framework has changed significantly towards sustainable mobility planning. It brings new requirements for education of transport experts. In the paper, we discuss the future of academic education concerning these changes based on case studies of two prestigious technical faculties in Germany and Poland and a social science faculty in Czechia offering study programmes related to sustainable urban mobility planning. We applied a self-assessment questionnaire to investigate how the study programmes prepare future mobility managers and present the concept of sustainable mobility to students. Our results show that the existing study programmes do not cover all steps of sustainable urban mobility plan development. We identified a few gaps common to the technical and social science faculties, such as consensus-seeking knowledge and methods, monitoring and evaluation tools and approaches, and development of soft skills (presentation and communication skills and stakeholder involvement techniques).

Keywords:

Education about sustainable mobility; mobility manager; academic educational programmes; knowledge and competencies for mobility managers

Abstrakt:

Několik posledních desetiletí se přístup k plánování městské dopravy výrazně změnil směrem ke komplexní podpoře udržitelné mobility. Tato změna paradigmatu s sebou nese také nové požadavky na vzdělávání dopravních odborníků. V příspěvku diskutujeme budoucnost akademického vzdělávání k udržitelné městské mobilitě na základě případových studií dvou prestižních dopravních fakult z Německa a Polska a fakulty společenských věd z České republiky nabízející studijní programy související s plánováním udržitelné městské mobility. Aplikovali jsme sebehodnotící dotazník, abychom zjistili, jak studijní programy připravují budoucí manažery mobility a prezentují studentům koncept udržitelné městské mobility. Naše výsledky ukazují, že stávající studijní programy nepokrývají všechny kroky tvorby plánu udržitelné městské mobility. Identifikovali jsme také několik nedostatků společných jak pro technické, tak i společenskovědní obory, jako jsou metody hledání konsensu, nástroje a přístupy pro monitorování a hodnocení a rozvoj měkkých dovedností (prezentační a komunikační dovednosti a techniky zapojení zainteresovaných stran).

Klíčová slova:

Vzdělávání o udržitelné mobilitě; manažer mobility; akademické vzdělávací programy; znalosti a kompetence pro manažery mobility

1. Introduction

Over the last few decades, the approach to urban transport planning has changed significantly; experts even talk about a paradigm shift (see, e.g., Jordová and Brůhová Foltýnová, 2021). This change is primarily symbolised by the so-called Sustainable Urban Mobility Plans (hereinafter, SUMPs). This new approach emphasises sustainable development of transport and mobility, the close interdependence of transport with other sectors and activities in the city, and a key role of stakeholder involvement. The novelty consists in the demand side position. Transport planners should not only adjust transport infrastructure supply to the expected increase in transport demand, but they should manage the demand to sustainable and required dimensions concerning latest technological developments and turbulent conditions of the present world.

A vast body of literature deals with a paradigm shift – from conventional transport planning to new planning of sustainable mobility (Banister, 2008; May et al., 2017; Holden et al., 2020; Gil et al., 2011; Hull, 2008). However, a unified way to tackle sustainability in urban mobility is missing, and sustainable mobility features are usually described instead of it or tackled separately. Firstly, accessibility, integrated transport services and cleaner cities without negative transport impacts are the aims instead of satisfying mobility. In practical terms, this approach consists in supporting sustainable modes of transport – i.e., public, non-motorized and shared mobility – while regulating individual car and freight transport in and around the city. Secondly, reduction of transport needs, when a part of journeys can be replaced by the use of online services and online working, or users can connect several planned journeys. Quality mobility coordination using intelligent transport systems or mobile applications can also serve for journey reduction, whether in terms of timing, length or frequency, where real-time information on transport services, traffic, vacancies and load is available. Thirdly, land-use and transport planners should apply a systemic and coordinated approach: there is a popular concept of "cities of short distances", meaning that residents can find all daily destinations near their residences. Thus, the new paradigm builds on alignment of land use, environment, social issues and transport policies as the key priorities in policy integration (Hull, 2008; Emberger and May, 2017).

Sustainable urban mobility plan development builds on participatory planning, finding comprehensive solutions and creation of so-called "good places for life". The street is no longer perceived as a road and parking space, but as a space with multifunctional uses, which performs other functions in addition to traffic (from provision of various commercial and other services to recreational and social functions, e.g., creating a space for people to meet).

There are only a few studies on changes in transport planning curricula with respect to the paradigm shift towards sustainable mobility. Krizek and Levinson (2005) argued that it is important for educators both to recognize the interdisciplinary nature of the topic of land use in transportation planning and to incorporate that interdisciplinary aspect as "an important part of planning curricula." Zhou and Schweitzer (2012), in their nationwide survey among US universities, concluded that planning programs were adapting to new content demands regarding issues such as multimodalism and public involvement and dealt with topics that had emerged as a result of the latest public policies, laws, and regulations. However, it seems that a lag existed between the state of the art in certain issues, such as security, and the state of the practice in education (ibid.). An interesting study by Wu et al. (2014) compared North American universities with English-speaking European universities regarding their commitment to education in sustainable transportation. They found that North American universities offered more sustainable transport courses than their European counterparts and that the environmental issue was emphasized and discussed far more than economic and social issues in the sustainable transport context. The five most popular topics in Europe were 'health and safety,' 'climate change,' 'transport planning,' 'noise pollution,' and 'air pollution,' while in North America they were 'transport planning,' 'health and safety,' 'waste management,' 'land use,' and 'air pollution' (Wu et al., 2014). At the European level, a more extensive application and principles of SUMP have been discussed since 2009. A major responsibility for choosing and implementing appropriate and effective measures and policies lies directly on cities, which poses a significant challenge for responsible (local) governments and institutions and academia (Brůhová Foltýnová et al., 2018).

Cities in Central and Eastern European countries are even more confronted with these changes, as they do not have a long tradition of integrated transport planning, bottom-up initiatives and barriers connected with their institutional settings (Brůhová Foltýnová et al., 2020).

Experts responsible for SUMP development and coordination are usually mobility managers. Cities therefore start creating this new position, which requires specific knowledge and competencies. The academia should reflect on the changes in transport planning and newly arising societal challenges (especially the turbulence and instability in the society worldwide) and educate experts who can manage the SUMPs (work as mobility managers) and understand the new approaches in transport planning. Mobility management and transport planning require not only good technical knowledge to design transport infrastructure and manage traffic flows, but also socio-economic and environmental knowledge related to wider societal, environmental and land-use aspects relevant to transport planning. Future mobility managers should be endowed with a range of soft skills as well. That is why three European universities (Technical University in Gdansk, Technical University in Dresden, and Jan Evangelista Purkyně University in Ústí nad Labem) – two of them technical and one social science – developed an Erasmus+ project S@mpler focused on the identification of research gaps and potential improvements regarding education towards sustainable urban planning, based on mutual exchange of knowledge and experience.

In this paper, we present important results of this project and discuss the main features of the transport planning paradigm shift and the future of academic education of transport planning experts to reflect these changes. We present examples from two prestigious technical universities and also an example of a social science faculty whose program offers courses related to mobility management.

The paper is organized as follows. Chapter 2 presents the methodological approach used in the project and this paper. Chapter 3 defines a mobility manager, his/her responsibilities, and expected knowledge and competencies. The final chapter discusses the results and concludes.

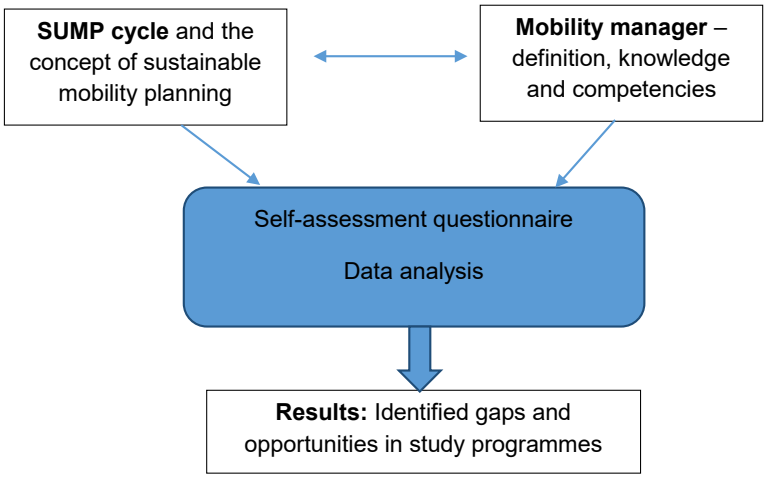
2. Methodology

We used a self-assessment questionnaire to investigate how study programmes prepare future mobility managers, reflect on sustainable urban mobility planning and present it to students. At the same time, we tried to reflect real-world users' needs: we formulated a definition of the mobility manager based on a literature review taking into account the students' capability to deal with complex transport problems (based on the experience of experts from the S@mpler project team). Finally, we consulted the proposed definition with experts from other universities and cities during a S@mpler project multiplier event on 9 November 2022[1] in Ústí nad Labem.

We evaluated the potential of education programmes to address sustainable mobility planning at the three universities. Our methodological approach is based on the SUMP planning cycle and how individual phases of the cycle are reflected in study programmes at the universities. First, the target group was identified and described: mobility managers. Then, we assessed the structure of mobility study programmes concerning the SUMP planning requirements and identified shortcomings in teaching materials. Finally, we tried to evaluate the capability of each university to better respond to both global and local challenges related to sustainable urban transport teaching.

[1] At this hybrid event, we had 9 participants physically from the project universities and then another 25 representatives from other universities and cities online.

Diagram 1: Methodological approach



Data were collected from about 13 study programmes at four universities in September 2020; there were bachelor as well as master programmes. We included the following study programmes in our analysis:

Technical University in Gdansk (hereinafter, TUG):
- Transport (Bachelor)
- Transport (Master)

Technical University in Dresden (hereinafter, TUD):
- T. econ.; Transportation Economics (Bachelor)
- T. econ. 1; Transportation Economics (Master)
- T. eng.; Transport Engineering (Bachelor)
- T. eng. 1; Transport Engineering, specialisation in traffic planning and traffic engineering (Master)
- T. eng. 2; Transport Engineering, specialisation in planning and operation of electrical transport systems (Master)
- T. eng. 3; Transport Engineering, specialisation in railway systems (Master)
- T. eng. 4; Transport Engineering, specialisation in traffic telematics (Master)
- T. eng. 5; Transport Engineering, specialisation in traffic system technology and logistics (Master)

Jan Evangelista Purkyně University in Ústí nad Labem (hereinafter, UJEP):
- Economy and Management (Master)
- Regional Development and Public Administration (Master)

More information about the programmes involved in our analysis is provided in Table 1. The BSc Transportation course at TUG accounts for seven semesters. After the fifth semester, students choose between two specialisations: Transport systems or Transport infrastructure. After six semesters, Transport systems specialisation (relevant to this study) is further divided into four profiles: Traffic engineering, Logistics and transport management, Maintenance of road and airport infrastructure and Maintenance of rail infrastructure. The MSc course takes three semesters and is divided into Transport systems and Transport infrastructure facultative specialisations.

Table 1: Overview of the involved programmes

	Specialisation	**Description of the study programme**	**Graduates work for**	**Number of courses**
Gdansk, Bc.	Transport	7 semesters/4 years 214 ECTS (144 mandatory, 68 voluntary)	public authorities, public transport operators, private sector	64
Gdansk, Master	Transport	3 semesters/ 2 years 90 ECTS (50 mandatory, 40 voluntary)	public authorities, public transport operators, private sector	25
TUD, Bc., T. eng.	Transport engineering	6 semesters/3 years 117 ECTS	public authorities, public transport operators, private sector, non-profit organization, academic sphere	15
TUD, Master, T. eng. 1	Traffic planning and traffic engineering	4 semesters/2 years 183 ECTS (158 ECTS mandatory, 25 ECTS voluntary)	public authorities, public transport operators, private sector, non-profit organization, academic sphere	23
TUD, Master, T. eng. 2	Planning and operation of electrical transport systems	4 semesters/2 years 183 ECTS (163 ECTS mandatory, 20 ECTS voluntary)	public authorities, public transport operators, private sector, non-profit organization, academic sphere	15
TUD, Master, T. eng. 3	Railway systems	4 semesters/2 years 183 ECTS (163 ECTS mandatory, 20 ECTS voluntary)	public authorities, public transport operators, private sector, non-profit organization, academic sphere	17
TUD, Master, T. eng. 4	Traffic telematics	4 semesters/2 years 183 ECTS (163 ECTS mandatory, 20 ECTS voluntary)	public authorities, public transport operators, private sector, non-profit organization, academic sphere	19
TUD, Master, T. eng. 5	Traffic system technology and logistics	4 semesters/2 years 183 ECTS (163 ECTS mandatory, 20 ECTS voluntary)	public authorities, public transport operators, private sector, non-profit organization, academic sphere	26
TUD, Bc., T. econ.	Transportation Economics	6 semesters/3 years 180 ECTS	public authorities, public transport operators, private sector, NGOs, academic sphere	90
TUD, Master, T. econ.	Transportation Economics	4 semesters/2 years 120 ECTS	public authorities, public transport operators, private sector, non-profit organization, academic sphere	70
UJEP, Master, Economy	Economy	4 semesters/2 years 120 ECTS	public authorities, private sector, non-profit organization	22
UJEP, Master, Reg. Dev.	Regional Development	4 semesters/2 years 120 ECTS	public authorities, public transport operators, private sector, non-profit organization, academic sphere	23

The questionnaire included questions on the study programmes (lengths, credits, courses, skills, programme structure, etc.), and their relevance for sustainable urban mobility planning. Precisely, we evaluated how each study programme corresponds with all steps of the SUMP cycle (for a definition of the SUMP cycle, see, e.g., Rupprecht et al., 2019).

3. Definition of Mobility Managers

To be able to analyse and further shape the study programmes, we needed to specify what knowledge and competencies our graduates should have. We therefore defined the position of mobility manager (MM), its role at different institutions and the required knowledge and competencies. We distinguished three levels of MM requirements – advanced, intermediate and basic:

- a MM at the **advanced level** is involved in comprehensive transport and mobility planning at a city/region level using policy and planning documents to implement changes;
- a MM at the **intermediate level** focuses on particular areas (urban planning, city logistics, data provision), but understands his/her place in a broader context of comprehensive sustainable urban mobility planning; and
- a MM at the **basic level** is responsible for personal mobility planning at the company/institution level, capable of explaining how individual decisions may influence community travel patterns and mobility situations.

There are connections among all these levels. Developing a strategic mobility document requires an understanding of what influences commuters' decisions and what barriers obstruct more sustainable travel patterns. Having good sectoral knowledge may be a stepping stone to strategic mobility planning.

A mobility manager can be employed by:

- cities and regions,
- public institutions,
- large and medium-sized companies or facilities (e.g., health centres),
- transport providers,
- tourist destinations,
- large/ medium-sized companies (company fleet manager/mobility manager responsible for personal mobility of employees and business trips).

3.1 Expected responsibilities and activities of MMs

Depending on the scope and the employer/customer, in cooperation with a mobility team, partners and stakeholders, the mobility manager will be responsible for managing the following outputs:

- coordination and management of sustainable urban mobility plans,
- company travel plans,
- school mobility plans,
- hospital travel plans,
- institutional mobility plans (for public authorities, banks, etc.),
- cooperation on inputs or contribution to relevant analyses/policy planning/documents, such as parking policies, ridesharing schemes, bicycle master plans, etc.,
- meetings with stakeholders, working groups and the public,
- communication and presentation of plans via official and promotional channels (implementation or assistance),

- supervision of work and task management towards implementation of goals set by mobility plans,
- evaluation of performance and costs of projects planned by mobility plans.

At graduation, a mobility manager (MM) should have the following knowledge and competencies connected directly with the MM position; these are provided usually by master programmes.

3.2 MM's knowledge

The mobility manager should have a comprehensive knowledge of different disciplines. His/her knowledge should be practically oriented, and s/he should be able to "translate" information from technical and modelling outputs for politicians and the public. We identified eight topics which the mobility managers' knowledge should cover. They are as follows (including the level of knowledge, as specified above in the text):

1. Transport and mobility planning (advanced level):

The MM should know about demand management, i.e., determinants of travel behaviour including requirements of persons with disabilities, elderly adults, transitioning youth, low-income individuals and other vulnerable populations. They should be able to address community transportation challenges (environmental, social, spatial and economic aspects of transport) and understand the available IT and smart measures and their employment in the transport sector. Using this knowledge, they should be able to develop such transport/mobility solutions that address unique community challenges. The knowledge should also include the methodology for evaluation of transport measures (impacts, processes) and knowledge of the planning process (state, regional, local planning), strategic planning and public administration.

2. Mobility management, mobility plans, SUMPs (advanced):

The MM should be familiar with integrated sustainable mobility planning, the SUMP cycle, various mobility plans and their structure and preparation, creation of visions, and setting of targets and development paths.

3. Urban planning (relationships between land-use and transport planning) (intermediate)
4. Transport logistics and freight (intermediate)
5. Data analysis (intermediate):

Data analysis skills are a necessary knowledge of the MM, including basics of statistics; data collection, especially quantitative (design of transport surveys, measuring and analysis of data on road transport, etc.); transport modelling and simulation – esp. macroscopic approaches and models; traffic demand forecasting; and ideally also knowledge of GIS.

6. Introduction to economics, management of transport services (intermediate):

Intermediate knowledge of economy and management, including business model development and economy of public transport services.

7. Stakeholder involvement tools (intermediate)
8. Promotion and publicity (intermediate)

3.3 MM's competencies

Besides knowledge of various disciplines, the mobility manager should have soft competencies in several areas. We identified the following areas of competencies improving study programmes:

I. IT and computer skills (intermediate)

II. **Project management (advanced)**
   a. Process improvements
   b. Creative work in collaboration with stakeholders
   c. Funding sources
   d. Grant application writing and reporting

III. **Communication and leadership skills (intermediate)**
   a. Negotiation skills
   b. Presentation skills

4. Results of education programme analysis

It is not easy to compare the programmes in all their aspects because there are differences in the organisation of study programmes between countries. Also, the fact that we include bachelor as well as master programmes does not simplify the comparison regarding, e.g., the length of study or the number of ECTS credits needed. Nonetheless, other aspects are comparable well.

After the end of their studies, most of the graduates of the analysed programmes work for public authorities, public transport operators or the private sector; staying in the academic sphere is also quite common. The least frequent potential employers for the graduates are various non-profit organisations (see Table 2).

Table 2: Prospective employers of graduates of study programmes

	public authorities	public transport operators	private sector	non-profit organization	academic sphere
Gdansk, Bc.	√	√	√		
Gdansk, Master	√	√	√		
TUD, Bc., T. eng.	√	√	√	√	√
TUD, Master, T. eng. 1	√	√	√	√	√
TUD, Master, T. eng. 2	√	√	√		√
TUD, Master, T. eng. 3	√	√	√		√
TUD, Master, T. eng. 4	√	√	√		√
TUD, Master, T. eng. 5	√	√	√		√
TUD, Bc., T. econ.	√	√	√	√	√
TUD, Master, T. econ.	√	√	√	√	√
UJEP, Master, Economy	√		√	√	
UJEP, Master, Reg. dev.	√	√	√	√	√

The results summarized in Table 3 show that the various soft skills are a significant part of the curricula even in more technically oriented study programmes, which are the majority of transportation programmes (the UJEP is an exception because it does not have any programme oriented solely on transport). However, the extent to which soft skills are taught depends a lot on the particular faculty. We can see significant differences between the technical university in Dresden and in Gdańsk.

Table 3: Soft skills taught in study programmes

	communication and presentation	participation	management and marketing	team work	IT + software	law	other
Gdansk, Bc.					√		basics of psychological behaviour
Gdansk, Master			√	√	√		sociology
TUD, Bc., T. eng.	√	√	√	√	√	√	
TUD, Master, T. eng. 1	√	√	√	√	√	√	
TUD, Master, T. eng. 2	√	√	√	√	√	√	
TUD, Master, T. eng. 3	√	√	√	√	√	√	
TUD, Master, T. eng. 4	√	√	√	√	√	√	
TUD, Master, T. eng. 5	√	√	√	√	√	√	
TUD, Bc., T. econ.	√	√	√	√	√		
TUD, Master, T. econ.	√		√	√			
UJEP, Master, Economy	√		√	√		√	
UJEP, Master, Reg. dev.	√		√	√	√	√	

At TUG, transportation studies as a coherent educational offer emerged from previous transportation engineering, road construction, and rail engineering courses offered by the faculty. Hence, there was a strong focus on practical engineering aspects, project work, and technical problem solving, all driven by the direct employment market demand and job opportunities for graduates. Therefore, less attention has been paid to soft skills. If taught, they were introduced as a part of selected courses on the basis of the involved lecturer's own initiative. Recently, TUG has revised the programme to reflect broader spectrum of skills in the curricula, responding to increasing demand for flexibility and adaptability of the graduates' competencies. This includes more visibility of soft skills and reorientation of selected courses towards a more holistic approach.

4.1 Topics of the SUMP cycle covered by study programmes

The next step was to investigate which phases of the SUMP cycle are covered by the study programmes. For each programme, we evaluated whether the topic is wholly, partly or not at all covered in the curricula. Table 4 shows the situation when combining all the bachelor and master programmes. In general, all the steps of the SUMP cycle are at least partly covered by at least one study programme; all the SUMP cycle steps except "8. Agree on actions and responsibilities" and "11. Monitor, adapt and communicate" are covered fully by at least one programme. The best-covered steps are "4. Build and jointly assess scenarios" and "6. Set targets and indicators".

The individual universities differ in the attention paid to the SUMP cycle steps. The TUG and UJEP cover fewer steps of the SUMP cycle. It is important to highlight that the two programmes at the TUG concur because they are bachelor and master programmes, and it makes sense to start some topics during the bachelor and then go deeper into the knowledge during the follow-up master studies.

Table 4: Topics of SUMP cycle covered by study programmes

	Gdansk, Bc.	Gdansk, Master	TUD, Bc., T. eng.	TUD, Master, T. eng. 1	TUD, Master, T. eng.	TUD, Bc., T. econ.	TUD, Master, T. econ.	UJEP, Master,	UJEP, Master, Reg.
1. Set up working structure									
2. Determine planning framework									
3. Analyse mobility situation									
4. Build and jointly assess scenarios									
5. Develop vision and strategy with stakeholders									
6. Set targets and indicators									
7. Select measures packages with stakeholders									
8. Agree actions and responsibilities									
9. Prepare for adoption and financing									
10. Manage implementation									
11. Monitor, adapt and communicate									
12. Review and learn lessons									

Note: Green = well included in the study programme; Orange = partly included in the study programme; Red = missing in the study programme

4.2 Knowledge and competencies covered by study programmes

Besides understanding the SUMP cycle, the mobility manager needs other knowledge and competencies (see Chapter 3). The following table compares all the programmes regarding the knowledge and competencies they include. We can state that all the necessary knowledge and competencies are covered by at least two programmes. The topic "Planning processes" is included in all the study programmes, and "Community transportation challenges", "Travel behaviour", "Transport/mobility solutions", "Land-use and transport planning" and "Data analysis" are part of more than 80% of the programmes.

Table 5: Overview of knowledge and competencies taught

Knowledge and competencies	Gdansk, Bc.	Gdansk, Master	TUD, Bc., T. eng.	TUD, Master, T. eng.	TUD, Master, T. eng.	TUD, Master, T. eng.	TUD, Master, T. eng.	TUD, Master, T. eng.	TUD, Master, T.	TUD, Bc., T. econ.	UJEP, Master, Economy	UJEP, Master, Reg. Dev.
Community transportation challenges (environmental, social, spatial and economic aspects of transport)												
Role and employment of IT and smart measures in transport												
Travel behaviour and unique transportation challenges faced by specific groups of travellers												
Development of transport/mobility solutions that address unique community challenges												
Evaluation of transport measures (esp. CBA and MCA)												
Planning processes in general, strategic planning and decision-making processes at different public administration levels												
Relationships between land-use and transport planning												
Transport logistics and freight												
Mobility management												
Data analysis												
Transport modelling and simulation												
GIS												
Computer skills												
Transport economics and management of transport services												
Stakeholder involvement tools												
Promotion, campaigning and publicity												
Project management												
Communication and leadership skills												

Note: Green = well included in the study programme; Orange = partly included in the study programme; Red = missing in the study programme

5. Discussion and Conclusion

In our survey, we focused on the study programmes of two technical (transportation) faculties and a social science faculty with the ambition to educate future mobility managers and sustainable urban mobility planners. These new positions reflect the paradigm shift towards sustainable mobility planning and the widespread use of the Sustainable Urban Mobility Plan (SUMP) as the main strategic document in transport at the local level in the European cities. Mobility managers should combine a technical and social science background with soft skills and competencies enabling coordination of the implementation of SUMPs. Thus, these experts can come from both technical and social and

humanities backgrounds. There are fewer programs evaluated at UJEP's Faculty of Social and Economic Studies; more relevant programs are provided at the technical (transportation) faculties. However, it seems — based on the definition of the mobility manager—that graduates from social sciences can also gain enough knowledge and competencies to be employed as mobility managers.

Our results show that none of the analysed academic study programmes covers all steps of the SUMP cycle. Logically, the technical education programmes differ from the ones of social sciences. The technical universities have an advantage above all in steps 1 to 7 of the SUMP cycle, focused on the analytical part of the process, while the social science faculty dominates in steps 9 and 10, focused on preparation for adoption, financing and implementation of the SUMP. However, there are topics not fully covered by most of the programmes. More attention paid to action planning and consensus-seeking methods, monitoring and evaluation tools and approaches, and soft skill development would be beneficial. Furthermore, an ability to combine knowledge and skills should be stressed more in the education programmes, which could help graduate students formulate information concisely and present it to different audiences (even under time pressure).

The position of mobility manager requires good communication (presentation) and management skills – mobility managers are expected to communicate with different and specific target groups, including various experts in the municipality, representatives of NGOs, companies and public transport providers. Mobility managers should be able to set up coordination of commuting and trips for other purposes (car-pooling schemes, public transport offers – such as negotiation of specific contracts, new parking policy and clean company fleets, among others). The same applies to other target groups and trip generators (hospitals, schools, etc.); each has its specific features, and mobility managers will have to choose and apply appropriate methods for communication and involvement. Including innovative courses focused on stakeholder involvement in the education programmes for mobility managers would be valuable as well.

There remains a challenge to improve educational materials for students, but also for lifelong education of experts, provide them with methodological support for specific expertise, sets of good practice examples (from cities successful in implementation of SUMP actions, results of EU/national projects on sustainable urban mobility), and international consensus on the best practice. We should ensure that the education materials reflect the latest development and innovations (including smart technologies, latest logistic schemes, land use issues linked to transport design, MaaS – users at the centre, etc.).

Interdisciplinarity should be at the heart of MM education. They should understand aspects such as sustainable development, environmental protection, health, energy, social issues, safety and security, wherever there are synergies with mobility planning (actions and targets especially at the national level). We can let students exercise a cross-sectoral approach to open up their view of the context and background of mobility policies.

Cooperation with experts/researchers who bring different perspectives and can compare situations from various angles (such as the contribution of research to practice in specific issues or scientific reviews of sustainable transport concepts, supported by evidence, etc.) and the possibility of students consulting works developed during study with them can enrich the education process. Furthermore, authors (Zhou and Schweizer, 2012; Hambleton, 2006) agree that an international perspective can help programs improve their strategic planning and rethink their role in an increasingly globalized world.

Not only new views and a variety of opinions and experience are necessary for high-quality professional education. Innovative teaching methods, e.g., simulation of decision-making processes in cities, should be applied, as well as systematic monitoring and evaluation of transport measures and projects. It should provide students with and demonstrate existing tools with analytical, transport policy auditing and evaluation methods (e.g., MaX, QUEST, BYPAD tools). Our research suggests that different teaching methods are used at all analysed universities. This finding is in concordance with Wu et al. (2014), who found that European university professors seemed more likely to use multiple

teaching methods to conduct courses, e.g., 38.5% combined both lectures and seminars, in comparison with North American universities.

We have reflected these results in other project activities. Above all, we have developed new teaching materials in cooperation among universities from three different European countries to strengthen particularly those topics that are not sufficiently reflected yet and tested them during classes and teaching. They are freely available on the S@mpler project website. They can be used not only teaching students of full-time programmes but also for lifelong education of practitioners.

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