DOES IT WORK ELSEWHERE? – TRANSFERABILITY OF MOBILITY RESEARCH RESULTS ACROSS NATIONAL BORDERS

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Innovative urban mobility concepts that have already been successfully tested and implemented in a certain region or culture can serve as references for other countries. The knowledge of the corresponding frameworks, boundaries, conditions, and criteria with which the desired effects can be achieved in other regions are of particular importance for the transferability and scalability of the concepts. Especially across national borders, the requirements and effects of innovative mobility concepts are difficult to compare and statements on transferability are not always supported by sufficient evidence. By analysing and evaluating the effects of different measures on specific indicators and identifying their success factors, considering country-specific differences, the suitability of proposed concepts for achieving set goals can be predicted. This article discusses methodological approaches to the comparability and transferability of mobility concepts from the European region across national borders, also having a view on Vietnam. The methodology and findings presented here are based on a research project conducted by German Aerospace Center (DLR) in cooperation with UTC University in Hanoi. A key aspect is the question what factors made these mobility concepts and measures successful in Europe, for example how acceptance was achieved and what were the effects on transport objectives, as well as on various social, urban development, and environmental objectives. Criteria that have proven to be success factors for European urban mobility concepts are used to discuss its transferability to and suitability for other regions. Thus, a basis for structuring measurement indicators will be provided for evidence-based assessments and comparisons of urban mobility concepts.

1. DOING THE RIGHT THINGS AND DOING THINGS RIGHT - HOW CAN AN INTERNATIONAL COMPARISON OF MOBILITY CONCEPTS SUCCEED?

Internationally, many noteworthy and instructive examples of mobility concepts exist that are tested and applied to initiate sustainable transport development and improve the mobility of people. These trials are particularly useful if they enjoy a high level of visibility as model examples so that other regions can learn from their experiences. However, the regions of the world and also within Europe are very diverse and it might be challenging transferring a successful mobility concept from one region to another. A comparison of the effectiveness and success of mobility concepts across regional and national borders is also sometimes difficult due to country specifics. For this reason, in the field of mobility research, evaluation methods have been developed that are reliable and robust allowing for international comparisons. When applying these methods, different challenges have to be considered, which will be described here.

A transparent international comparison of mobility concepts can help to promote environmentally friendly, socially fair, and economically efficient mobility. Providing a consistent structure and methodology for the development of mobility concepts, plans can be compared and best practices identified (ILS, 2018). Properly applied, international comparison can provide benefits and make mobility concepts comparable across systems as well as countries. However, if the principles are not applied accurately, results may be biased and subsequently misinterpreted. The results of an international comparison are only as robust as the input parameters used for it (Tan, 2023). Therefore, through a sound methodological approach, robust results can be achieved. The international comparison of mobility concepts entails some hurdles and must be carried out carefully. An international comparison of mobility concepts can lead to a global awareness of sustainable mobility by making the application transparent. This could motivate more countries to adopt similar approaches. Joint analysis based on standardized criteria can strengthen a sense of community and help define and achieve common goals. For example, different countries and cities can agree on common goals and indicators for sustainable mobility. This can promote international cooperation and the exchange of resources and expertise.

The development and implementation of an international comparison can be very complex, as there are many different interests and actors that need to be considered. This requires extensive planning and coordination. Different countries and cities have different political priorities and economic frameworks. Political support and institutional frameworks have a significant impact on the implementation of mobility concepts. These factors must be included in the comparison, as they can influence the effectiveness and sustainability of the policies. One example is a city's dependence on federal regulations and laws, as described using the example of the city of Munich in chapter 4.

Overall, international comparison can have a positive impact on sustainability and quality of life in urban areas, but requires careful planning and consideration of various factors to be successful. By considering the aspects described, an international comparison of mobility concepts can help identify best practices, promote innovation, and advance sustainable mobility worldwide. An international comparison of mobility concepts based on a Sustainable Urban Mobility Plan (SUMP) can create valuable insights and synergies (see chapter 3). Nevertheless, the different contexts and cultural circumstances need to be adequately considered in order to develop and implement tailored and effective solutions. Each city and country has its own specific challenges, circumstances, and needs. A standardized approach may not sufficiently consider individual differences, leading to less than optimal solutions in certain cases. Mobility behaviors and preferences can be culturally specific. What works well in one culture may be less effective in another culture. It is important to consider cultural differences and understand how they affect mobility behavior. Because cultural characteristics must be considered, the responsibility for doing so rests with the processors, who should have a good understanding of country-specific characteristics. When comparing different mobility concepts internationally, multifactorial dependencies need to be considered. For example, the significance of the results can depend on the spatial structure of the city, the population density and the willingness of people to change their mobility behavior. Factors such as these can influence the outcome of a determination and are sometimes difficult to separate out. Results can easily be distorted and misinterpreted by small changes in the general conditions and input. When several factors are considered or changed at the same time, it is difficult to identify a cause-effect relationship. Thus, it may occur that effects are associated with the wrong measure. In order to be able to establish comparability, a systematic approach needs to be applied in order to be able to test the effect of each factor independently.

The application of an international comparison is designed for long-term implementation. It often takes many years to achieve the desired goals (WBCSD Mobility, 2016). As a result, it may be difficult to keep decision-makers, politicians, and the population motivated in the long term. Mobility projects require political support (WBCSD Mobility, 2016). New mobility plans and measures may also not be accepted by parts of the population and interest groups (Tan, 2023). Especially, if they affect previously established habits or involve uncomfortable changes. This can lead to dissatisfaction and resistance to change.

Implementing sustainable mobility solutions often requires significant investments in infrastructure and public transport. This can be a financial burden for the city or municipality. Here, too, resentment can arise on various sides. Even though an international comparison is designed for long-term development, mobility concepts and their evaluation and comparison should be adaptable to changing needs and challenges. It is important to evaluate the flexibility and adaptability of the different approaches to see how well they can perform in the long term.

The use of international comparison guidelines enables the definition of standardized criteria for assessing the sustainability of mobility concepts. This allows countries to present their progress in implementing sustainable transport solutions more transparently. This can also trigger an exchange of experience across borders and allow cities and countries to learn from each other and share best practices. In this way, innovative ideas and solutions can be disseminated and adapted to regional or national contexts (ILS, 2018). Clear and comparable targets as well as common indicators are crucial to evaluate the progress and success of mobility concepts. Uniform metrics make it possible to objectively compare the effectiveness of different approaches. Any comparative calculation relies on reliable, robust, and quantifiable input. No matter how well thought out and conclusive a calculation formula is - if input parameters are missing or inaccurate, the result will not provide robust information. International comparison often requires extensive data collection and analysis (Tan, 2023). However, the availability and quality of data may be limited in some countries, which can affect analysis and comparability. Ideally, mainly clearly quantifiable input parameters should be used. The question of definitions and consistent interpretations should also be clarified in advance, as otherwise different counting methods, for example, may lead to different results.

This illustration of experiences with preconditions and hurdles when working with evaluation methods for comparing mobility concepts shows that a prior examination of (region-typical) framework conditions is necessary. A clean and robust scientific investigation requires that interpretations and definitions are valid and that output data are available with a high degree of quality and comparable granularity. A clear and generally admitted research question and a consensus on objectives are important challenges when comparing across regional and national borders. These are some of the challenges to be considered when analyzing and evaluating mobility concepts. Based on this, methods for developing and evaluating mobility concepts will be described and analyzed in the next chapter, with regard to their effectiveness. Special attention is paid to sustainable urban mobility plan (SUMP). In addition, an overview is given of mobility concepts that have been implemented in real life and that have been developed by applying certain methods. This provides an essential basis for doing the right things and doing things right.

2. STATE OF THE ART – HOW TO EVALUATE MOBILITY

Integrated mobility concepts are projects that take a cross-modal and interdisciplinary approach (e.g., transport services, technology / digitization, infrastructure, environment, building and planning law, financial policy, and public relations). A relatively new approach is to focus on people and the targeted influencing of their mobility behaviour (mobility management). The term Sustainable Urban Mobility Plan (SUMP) was established for integrated mobility concepts. The aim of the concepts is to provide a medium-term strategy for municipalities to design environmentally compatible mobility through appropriate measures and thus improve the quality of the environment and the quality of life (Fuchs, 2021). For the evaluation of such complex concepts or decisions about appropriate measures under uncertainty (due to lack of availability of information or uncertainty about future trends), a variety of procedures are described in the literature.

Decision-making procedures are based on the establishment of a structured goal-setting framework according to the relevant issue. The overarching goals for mobility concepts result mainly from strategies and higher-level planning. For example, on a global level, these are the Sustainable Development Goals (United Nations, 2016), on EU-level, the Sustainable and Smart Mobility Strategy (European Commission, 2020), on a national level, the National Development Plan for Electric Mobility of the German Federal Government (Bundesregierung, 2009), and urban development and sectoral plans, such as climate protection plan and local transport plan (Arndt, Drews, 2019). Also, guiding principles and objectives are influenced by local conditions, social norms, and diverse interest groups. Strategic goals include traffic avoidance (e.g., reducing the number of trips and distances), modal shift (e.g., from passenger cars to public transport and bicycles, increasing occupancy rates), compliant traffic management (e.g., emissions, traffic safety, land use), and achieving conservation goals (e.g., climate protection goal, Vision Zero, see Gertz, 2020).

Quality requirements on defined objectives are: specific, measurable, achievable, relevant and time-bound (SMART) as well as complete, non-redundant (i.e., no double counting) and hierarchically ordered (Liedtke, 2020). The analysis and handling of conflicting goals are also of particular relevance. Incompatible objectives (trade-offs) of actors (e.g., public transport operators, police), road users (e.g., pedestrians, cyclists, public transport, private motorized transport) and those affected (e.g., residents, businesses) as well as environmentally sensitive areas must be identified and weighted according to the intensity of their effects and the frequency of their occurrence. Conflicting goals are dependent on many factors, in particular the economic structure (e.g., expected effects of the mobility transition on the automotive industry) and vary greatly across regions (see Beuermann et al., 2020; Grahl, 2014; Fornauf, 2015).

A low number or intensity of conflicting goals results in higher acceptance of the concepts. Acceptance is essential for the effectiveness of a mobility concept. High rates of compliance (measurable effect of an order or recommendation), which means behavioural changes in connection with the mobility concept, are also influenced by many other factors, such as human factors (e.g., age, preferences), perceived quality of transport connections, conditions of transport use and user costs (Boltze et al., 2014). Participation processes can be used to identify goals and factors to improve acceptance prior to the implementation of mobility concepts. Various participation methods and their suitability with regard to various criteria are presented for example in (Ritzi, Kassner, 2019; Nanz, Fritzsche, 2012; Rowe, Frewer, 2013).

Based on the generated goal-setting framework, together with citizens, relevant evaluation criteria are defined and indicators for the operationalization of the targets are selected to allow the determination of achievement rates: Measurable attributes as well as the objective (maximization or minimization) are assigned to indicators (Geldermann, Lerche, 2014). Quality requirements for indicators are: direct, operational, comprehensible, all-embracing and unambiguous (Liedtke et al., 2020).

In the evaluation process, a fundamental distinction must be made between impact assessment and actual evaluation: First, a quantitative (as far as reasonable) assessment of all relevant future effects of different measures or technologies of the mobility concept on the evaluation criteria (indicators) is carried out. For impact assessment, various methods can be used (Fornauf, 2015): For example, SWOT analysis belong to qualitative methods (subjective). However, examining measures and bundles of measures using modelling (prognosis methods) and simulation lead to relatively objective and verifiable results. In most studies, either the effects of individual measures or bundles of measures are examined and predicted, mostly limited to a few indicators. Examples are simulation studies on the effects of shared mobility on the future transport system using several indicators from the transport and service domain in Gothenburg (Lorig et al., 2023) as well as the investigation of scenario-based displacement effects and environmental effects of new mobility concepts (Schürmann, 2019). In addition, the effects of measures can be predicted using standardized calculation templates and formulas (e.g. in BMDV, 2016). However, no interactions are considered here, as it is the case with modelling, and the transferability or application of standardized formulas to different regions is discussed controversially. Also, comparisons can be used for impact assessment. Here, the results of effects of measures from comparable concepts are used. However, this method provides only unreliable and inaccurate results, as different concepts are not completely identical due to different framework conditions, objectives and measures. Therefore, comparisons should only be used for very similar concepts. Stakeholder surveys can be conducted to assess the effects of criteria, which should be included, but would be difficult if not impossible to measure (e.g., personal well-being or social contacts).

The quality of the results depends on the survey method and the evaluation procedure. For a description of impact assessment methods, see also (Liedtke et al., 2020; Fornauf, 2015). The impact assessment results serve as input data for the subsequent evaluation by standardized evaluation methods. According to Viergutz & Scheier (2019), the impacts are assessed by simulating different scenarios. Subsequently, an evaluation is carried out using suitable evaluation methods.

In (Liedtke et al., 2020), economic evaluation methods for scientifically neutral and comprehensible decision-making are presented. The core is the structured weighing of options between different objectives of a goal-setting. According to this, multi-criteria assessment methods / multiple-criteria decision analysis (MCDA) are suitable for economic evaluation of technology innovations (e.g., introduction of electromobility). These are methods without complete monetarization of the indicators, such as utility analysis and cost-effectiveness analysis. They are used in particular for multi-criteria decisions under uncertainty by comparative evaluation of alternative scenarios using relevant indicators (e.g., Hedel et al., 2007; Geldermann, Lerche, 2014). Indicators for the evaluation of traffic policy measures (e.g., introduction of locally set speed limits) can be monetized. Therefore, in addition to multi-actor multi-criteria analysis (MAMCA) involving stakeholders and utility analysis, further economic methods such as benefit-cost analyses can be applied.

Assessments of transport concepts in Germany, Europe and worldwide are mostly based on benefit-cost analysis as central assessment procedure, such as the Federal Transport Infrastructure Plan for upgrading and new construction projects for roads, rail and waterways (BMDV, 2016). In some cases, additional procedures are added to consider more non-monetizable indicators, such as multi-criteria impact analyses, environmental risk analyses, and spatial effectiveness analyses. In case of the NISTRA Assessment Methodology - Sustainability Indicators for Road Infrastructure Projects (ASTRA, 2023), two other methods are integrated into an overall assessment procedure in addition to benefit-cost analysis. This unification leads to a better comparability of the assessment results (Fornauf, 2015). Further overview of methods of decision procedures for applications in the assessment of mobility concepts with regard to sustainable development are presented in (Schuh, 2001), spatial planning in (Scholles, 2018) transport planning in (FGSV, 2010) and national and international assessment procedures in (Adams, 2008). In addition, index methods are used for the quantification and normative assessment of complex issues that cannot be measured directly. Here, several individual variables are reduced to a dimensionless key figure, the index, in a rule-based manner in order to create a planning instrument through operationalization.

Various methods are used to construct an index. The selected methods and indicators influence the value of information of the index (Rammert, 2021). The index can serve as an instrument for temporal and spatial comparisons as well as the identification of small-scale development potentials based on clearly structured criteria and methodological procedures. Depending on the topics, different evaluation criteria and indicators are used and weighted individually. For example, in the field of sustainable mobility, indices were developed for individual modes of transport, such as Walkability Index (Sedlmeir, G, 2022; Krambeck, Sha, 2006) or Bikeability Index (Schmid-Querg et al., 2021) or the accessibility of public transport for mobility-impaired persons (Repetto et al. 2022). The indicators of the ADAC Mobility Index (ADAC, 2023) and the Federal State Index Mobility and Environment (Allianz pro Schiene, 2020) focus on the transport sector and its impacts in Germany. The Smart City Index (Bitkom e.V.,

2022) for major German cities is more comprehensive. Indicators are considered of the areas of energy and environment, mobility, and society. The Mobility Readiness Index (Brown et al., 2022) incorporates metrics of public transport, new forms of mobility and the degree of digitalization for various cities in Ireland. A review of urban mobility indices in (Costa et al., 2017) shows that the methods and solutions applied are mostly adapted to local conditions and urban situations. Other indices are used for global comparison of sustainable mobility of cities. For example, in the Urban Mobility Readiness Index (Thibault et al., 2023) social and infrastructural parameters as well as market attractiveness and system efficiency of the transport sector are considered. The Deloitte City Mobility Index (Dixon et al., 2017) includes aspects besides transport, such as urban and economic aspects and customer satisfaction.

The Urban Mobility Index (Cebr, 2017) comprises selected indicators from the transport, environmental, and economic domains, and the Sustainable Cities Mobility Index (ARCADIS, 2022) incorporates environmental, social, and economic factors. For a structured comparison of urban mobility, the United Nations (2022) has developed the Sustainable Urban Transport Index (SUTI), adapted to the Sustainable Development Goals (United Nations, 2016) and the relevant challenges of the Asia-Pacific region. The Sustainable Mobility Index (NaMIx) was developed by (Heldt et al., 2023) to evaluate the potential for sustainable mobility, especially for small-scale areas such as locations and neighborhoods. In terms of content, it covers the areas: Suitability for walking and cycling, accessibility of public transport as well as availability of sharing services, local supply, health care and education.

The spatial distribution, in particular the imbalances of the potentials for sustainable mobility are clarified by using cartographic representations for the Munich study area. This enables the identification of unfavorable locations and the targeted selection of improvement measures (Heldt, Yosmaoglu, 2023). (Rammert, 2021) provides an overview of the scientific requirements for an integrated mobility index. In addition to the consideration of comprehensive interdisciplinary indicators such as from transport and spatial planning, geography, environmental sciences, sociology and psychology, the qualitative requirements for the indicator set and the methodology of the index construction as well as the great importance of public participation and the inclusion of indicators of subjective perception in mobility planning are described. The importance of subjective perception can be seen, for example, in the case of bicycle lanes without physical separation from motor vehicle traffic. A high level of perceived traffic insecurity can result in limited objective opportunities for cyclists (von Stülpnagel, 2022). A comprehensive human-centered mobility index that meets the scientific requirements was developed as integrated planning tool for mobility (Rammert, 2022). Overall, an evaluation of the quality of integrated mobility concepts seems to be difficult. The integration of mobility management, namely, affecting people's mobility behaviour in integrated mobility concepts, complicates scientific analysis and evaluation of mobility measures (Rammert, 2017). Established scientific evaluation methods are not adequately applicable due to this complexity (Rammert, 2022).

A lack of data makes it challenging to predict the effectiveness of measures sufficiently. Some indicators are also generally difficult to measure. Also, the planned changes in mobility behaviour and their effects are largely dependent on the acceptance of the affected population, the public sector and investors. Therefore, acceptance should be considered and analysed during the entire process. Furthermore, the local framework conditions may be highly variable, so that comparisons are difficult and spatially differentiated considerations are necessary. Understanding the basics of established assessment and evaluation procedures is considered essential, as individual components, for example, methods for creating structured goal-setting, acceptance analyses, impact assessment and components of evaluation procedures can be applied in a holistic scientifically based evaluation of mobility concepts.

Hardly any holistic guidelines and formal methods exist in mobility research. As integrated methods, the Mobility Index of (Rammert, 2022) as a contribution to the development of standards and procedures for mobility-related planning instruments, the SUMP guidelines as a standard for the development and implementation of Sustainable Urban Mobility Plans (Rupprecht Consult, 2020), and the sustainable urban mobility indicators (SUMI) for the standardized evaluation of the effects of mobility concepts in European cities (Braun et al., 2020) can be mentioned here.

3. GUIDELINES FOR IMPLEMENTING MOBILITY CONCEPTS AND INDICATORS: SUMP AND SUMI

When talking about the implementation, comparability and success of sustainable mobility concepts in Europe you will come across the terms SUMP and SUMI. While SUMP is a guideline and methodology for planning, installing, running, and evaluating a sustainable urban mobility concept, SUMI provides indicators to describe characteristics such as emission of pollutants, social aspects such as accessibility to public transport for all or traffic safety. It is used to observe their development while implementing changes and to compare to cities similar in size and general situation.

So, SUMP provides a methodology for planning and installing and SUMI a methodology for assessing the effectiveness of the SUMPs.

3.1 SUMP – Sustainable Urban Mobility Plans

SUMP is a guideline for planning and installing new mobility plans for better quality of live in a municipality. It builds on tried-and-tested planning approaches and pays particular attention to the principles of cooperation, participation and evaluation. The first version was published at the end of 2013 and developed by mobility planners and morbidly experts from all over Europe initialized by the European Commission. The guidelines were updated in 2018 based on results of several workshops and conferences. More than 300 European traffic and urban planners, political decision-makers and researchers contributed to it. The core of SUMP are eight principles and four phases for launching sustainable mobility plans.

These principles are:

- Plan for sustainable mobility in the entire ‘functional city”
- Define a long-term vision and clear implementation plan
- Cooperate across institutional boundaries
- Develop all transport modes in an integrated manner

- Involve citizens and stakeholders
- Arrange for monitoring and evaluation
- Assess current and future performance
- Assure quality

And the phases of SUMP are:
- Phase 1 “Preparation and Analysis”
- Phase 2 “Strategy Development”
- Phase 3 “Planning of Measures”
- Phase 4 “Implementing and monitoring”

SUMP is not a theoretical construct, it has been used for many years by many authorities across Europe to install new mobility concepts. Initiated by the European Commission, already 10 awards for “Sustainable Urban Mobility Planning have already been presented to cities in France, Slovenia, UK, Spain, Greece, Belgium, Germany, Netherlands, Austria, Sweden, Hungary, Italy, Romania, Switzerland, Poland, Lithuania, Serbia, Finland, …, see (EUROPEANMOBILITYWEEK 2023).

3.2 SUMI – Sustainable Urban Mobility Indicators

SUMI (2017-2020) was developed as an indicator system for European cities to describe the sustainability of urban transport systems. The indicator system is based on the "SMP2.0 Sustainable Mobility Indicators" developed by the World Business Council for Sustainable Development (WBCSD). A group of almost 50 pilot cities has voluntarily filled in and submitted a total of 473 indicator spreadsheets. These formed the initial basis for the database underlying the benchmarking tool SUMI.

The core indicators are:
- Affordability of public transport for the poorest group
- Accessibility for mobility-impaired groups
- Air pollutant emissions
- Noise hindrance
- Road deaths
- Access to mobility services
- Emissions of greenhouse gases
- Congestion and delays
- Energy efficiency
- Opportunity for active mobility
- Multimodal integration
- Satisfaction with public transport
- Traffic safety active modes

Additionally, non-core indicators, such as quality of public spaces, urban functional diversity, commuting travel time, mobility space usage, and security, were also defined. For detailed information see (Sustainable Urban Mobility Indicators, 2020).

Sustainable urban mobility indicators are a useful tool for cities and urban areas to identify the strengths and weaknesses of their mobility system and to focus on areas for improvement.

4. SOME GOOG EXAMPLES IN EUROPE

We want to have a look on some sustainable mobility plans in Europe. SUMP and SUMI are not theoretical frameworks. They are used for new developments as well as for re-planning (e.g. Berlin-Tegel - the development of the former airport into a sustainable residential neighborhood (Hoffmann-Leichter, 2020) or the project Model City 2030 in Munich (Foerster, Bernögger, 2018; Dunkel, 2019).
Other mobility concepts focus on car-free or car-reduced city centers or neighborhoods. Barcelona is the pioneer of superblocks (superilla). This innovative approach generates traffic-calmed zones by closing off connecting roads for car traffic between several blocks of houses. Evaluation studies show positive results, such as the simulation study on health effects - quantitative health impact assessment (HIA) (Mueller, N. et al., 2020). The successful implementation of superblocks needs strong political support, interdisciplinary collaboration of transportation planners with urban planners and architects, professional and consistent design with high-quality style, a structured implementation strategy as well as best practices and lessons learnt of recent implementations. Temporary measures are implemented in advance with extensive public participation and communication, especially near daycare centers and schools. Permanent redesign is realized once broad public acceptance was achieved (Bauer, U., Stein, T., 2023). An extensive investigation of the potential of superblocks in different cities worldwide for the identification of possible locations, the estimation of feasibility and possible effects is presented in (Eggimann, S., 2022). The modelling is done using publicly available data. The analysis procedure can also be applied to other cities. Other concepts of traffic calming were implemented in "Ottensen macht Platz" in Hamburg-Ottensen (TUHH, 2021), Gent-Circulation Plan (Mehler, F., 2019), London-Low Traffic Neighborhoods (Thomas, A., Aldred, R., 2023), Berlin-Friedrichstrasse (Windmüller, D. et al., 2022), Oslo (Høynes, R.c., Kolltveit, L.W., 2019). Some of them are described more detailed later in this chapter The evaluation of impacts is mostly done through surveys, measurements and comparative observation based on criteria. Overall, most of the results showed a positive trend. Significant decreases in emissions and traffic noise, improvements in subjective safety and quality of stay as well as beneficial effects on the local economy (retail, restaurants) were achieved. Referring to this, further results can also be found in a meta-study on traffic calming in German and European cities (Bauer, U. et al., 2023).It confirms the phenomenon of "traffic evaporation". That means, that traffic calming does not lead to a spatial shift in the exact amount of traffic, but rather to an overall reduction in the car traffic volume. A shift to walking and cycling is observed. In fact, it is difficult to prove whether the effects recorded during monitoring occurred due to the mobility concept , as it is not possible to precisely differentiate the long-term spatial and temporal effects of the planned changes in mobility behavior.

A successfully implemented concept is the "Car-free Livability Programme 2019". Its target area is the inner city of Oslo, Norway. Less than 1,000 people live in this 1.3

km² area, but more than 100,000 people commute here every day. The City of Oslo wanted to increasing the attractiveness of the city center, promote alternative uses of public space, increase in urban quality of life, and contribute to reduce urban CO2 emissions.

The **specific goals** were:

- Reduce car traffic in Oslo by 20% by 2019 and by 33% by 2030 (base year: 2015)
- Prioritizing pedestrian, bicycle and public transport over car traffic. Bicycle traffic is expected to make up 25% of all traffic by 2025
- Improving the quality of public space in the city center for a more vibrant, greener and more inclusive city
- Reallocation and redistribution of public (street) space in favor of pedestrians and cyclists; Opportunities for social activities through new recreation areas; More urban greenery.
- Establishment of a complete cycle path network from east to west and north to south

Therefore, they restricted surface parking and public street parking lots were put to alternative use. Trees were planted, planters and street furniture were placed to create new residential areas. Some streets were blocked for car traffic and other streets turn into one-way-streets. The cycle and footpath network were extended and shared spaces created. The city population, local shops, NGOs and other companies were actively involved in the redesign of the area. Surveys were administered to evaluate effects before and after the implementation of measures.
Oslo's approach of re-planning the inner city follows the SUMP principals (see Chapter 3) with the exception that the SUMP focused mainly on the inner city and not the entire city. This (partially still running) project is successful because the satisfaction with the measures among road users as well as city officials and local business people is high. The measures resulted in slight shifts towards environmentally friendly mobility. Through-traffic is kept out of the project area as far as possible, resulting in a reduction in traffic volume and the city center is now much more animated, especially by pedestrians. Some numbers:

- In 2019 compared to 2017, 14% more people were on the streets and 43% more people observed in public spaces for leisure purposes.
- Compared to 1990, an increase in road safety, especially for pedestrians and cyclists, was observed. While 18 fatal crashes involving pedestrians and cyclists were recorded in 1990, no fatalities occurred in 2019.
- Greenhouse gas emissions from city-owned vehicles decreased by 40% in 2019 compared to 2018. Compared to 2012, emissions fell by 53%. In addition, new car and light truck registrations in Oslo show an increasing proportion of electric vehicles (not including hybrid drives)

Evaluation also uncovered unexpected, unintentionally results. For example, the model shift of visitors of the city changed to more active modes and public transport, but no changes concerning car use among the commuters were observed although parking spaces in the roads were removed. Surveys found out that one possible reason might be the increasing provision of private parking spaces close to the workplace by local companies. Information about "Car-free Livability Programme 2019" was taken from (Umweltbundesamt, 2021; Oslo kommune, 2023).

The concept of car-less or car-reduced inner cities are not really new implementations of the last years. One of the early pioneers is the City of Groningen (230,000 inhabitants) in the Netherlands. It focused on the principle of human-centered planning already in the 1970s. The most remarkable fact is that the City of Groningen planned a car-friendly city but because of demonstrations and a combatant in cities traffic and urban planning authority, the project was cancelled and instead public transport was improved and the so-called active transport modes were given priority. Until today it is one of the most bicycle-friendly city (energieleben.at, 2017).

Another example is Pontevedra in Spain: In 1999, Pontevedra banned motor vehicles from its historic center, creating a 300,000 m² (0.3 km²) pedestrian zone. The other districts around have a reduced speed limit of 30 km/h. For people coming from outside, cheap parking houses are provided at the main access roads. The car-free city center is a barrier-free city whose quality of life has received several awards. While on these streets, 30 people died in traffic crashes between 1996 and 2006, only three have died in the subsequent 10 years, and none since 2009. CO2 emissions are down 70%, and, while other towns in the region are shrinking, central Pontevedra has gained 12,000 new inhabitants (Burgen, 2018).

Because the authors of this paper live in Germany, we want to look at Germany: Nearly all bigger cities are working towards CO2 reduction, but not all have a real SUMP. With regard to the principles of SUMP, the project „ freiRaum Ottensen – The car reduced quarter" deserves special mention. „freiRaum" means "free space" and Ottensen is a very lively district in Hamburg. The aim is not just to reduce car traffic but also to make the streets more livable and greener and create more space for other use than car traffic. The transformation is scheduled for completion in 2024. The process is accompanied by regular participation of citizens, the establishment of an advisory board as well as the scientific monitoring. Some measures were first tested for a few days and afterwards evaluated, see (TUHH, 2021). A scientific evaluation of the project "Ottensen macht Platz" (means "Ottesen creates space") shows that an overwhelming majority of the residents and traders surveyed, agree to a continuation of the measures. The project is a good example for applying the SUMP principles of "involving citizens and stakeholders" and "arrange for monitoring and evaluation". Also, the project works on nearly all SUMI indicators except those concerning public transport because the district is close to the big train station Hamburg-Altona and well connected by a bus system. Information about the project can be found at (Freie und Hansestadt Hamburg, 2023).

The Munich City Council approved a draft of a new overall strategy for mobility and transport in June 2021 named "Mobility Strategy 2035". The guiding principle is to assure the quality of life and general welfare. With regard to road traffic, a new key indicator for future planning was defined: "space efficiency". The less space required per trip for a person or a good, the more people and goods can be transported on the same space. Other indicators used for decision-making are traffic safety, travel time, environmental compatibility, social justice, economic efficiency, crisis stability, location

attractiveness, and quality of service. The next concrete sub-target is that by 2025 at least 80 percent of traffic should be covered by zero-emission motor vehicles, local public transport, and walking and cycling. Traffic needs to be climate-neutral by 2035. Further goals result from 19 sub-strategie, see (Landeshauptstadt München 2023). This strategy is part of the project “Perspektive München”. This urban development concept is the central steering instrument for shaping the future of the city. It is updated on an ongoing basis. A central goal of the update is also the integration of the UN's global sustainability goals, Agenda 2030,see (United Nations, 2016).
The government of Munich complains that it is dependent on approval from the Freistaat (Federal state Bavaria) or the federal German government for some measures and control in their city (Landeshauptstadt München Mobilitätsreferat, 2023). This applies to parking fees, for example. Especially being allowed to decide where to install a 30 km/h speed limit is a current issue in Germany. The first amendments to the Road Traffic Act are currently being drafted: In the future, municipalities can decide cars can drive and how fast.
This legal problem also shows that not only the horizontal cooperation between the local authorities must be given, but also the vertical cooperation should be ensured. And concerning the question whether a sustainable mobility plan can be transferred to elsewhere, the target region should have a similar range of legal freedom to decide.

5. APPROACHES IN VIETNAM

Most of the content of this paper was done for the project “For_Mobilty”, a German-Vietnamese research project with the partners Institute-of-Transportation-Systems of the DLR and the Institute of Transport Planning and Management of University of Transport and Communication in Hanoi. The goal is to compare of the implementation of mobility concepts and their transferability between Germany and Vietnam. The challenges and goals are the identical: Greenhouse gas neutral mobility and livable cities. The Vietnamese government set up clear defined goals: Net zero GHG emissions by 2050 with indermediate steps like 2025: 100% of urban buses to be replaced shall be electric or green energy units
The capital Hanoi, like other cities in Vietnam, is mainly built in the form of high population concentration in the central area (urban core). In Hanoi, population densities are very high in the districts of Hoan Kiem (366 people/ha), Dong Da (422 people/ha), Hai Ba Trung (376 people/ha), Ba Dinh (277 people/ha), but low in peripheral areas such as Ba Vi, Thach That, Ung Hoa, and My Duc districts. After opening up the economy, Hanoi's population began to sharply increase (mostly with immigration rate) along with economic growth and mechanization. The outer areas have been eye-witnessed with the rapid increase and at the same time the population density in the cramped urban core starts to increase slowly or gradually. This fact has been going on for the past decade and is becoming increasingly evident in Hanoi. The big challenge for Hanoi in the current urbanization process is that the inner-city area has no land fund for development and is subject to regulations on development control such as building density, high floors, population, etc. Many previously built areas have cramped living environment, many facilities are in disrepair and urban services are poor. Therefore, Hanoi must have more effective options and mechanisms that can encourage upgrading of existing urban areas and development in new areas.

However, so far, each construction project is being conceived as independent works, not yet connected to the public transport system, which means it will be an increase in motor traffic and it goes against the nature of a compact city. To achieve sustainable growth, cities around the world are looking at integrating land use and transportation planning. TOD is also one of the results of that effort. TOD (transit-oriented development) can be defined as “a multi-sectoral planning and design strategy to ensure the development of a compact, multi-functional, multi-purpose, multi-income city/urban area that is pedestrian and non-motorized vehicles friendly, and to develop a compact urban area, suitable for the areas around the public transport station”. From its basic characteristics, the TOD concept strengthens the promotion of public transport and non-motorized transport, and socially inclusive economic development is distributed equitably, creating urban space. Safe for all users. Through a review of lessons learned on the selection of TOD criteria, combined with an analysis of TOD planning principles and objectives, and an assessment of existing plans in Hanoi, the Vietnamese research team of the project For_Mobility proposes a criteria system for regional construction planning according to TOD concept. The use of the above preliminary set of criteria for regional construction planning according to the TOD model will face some difficulties and limitations because some criteria do not have enough statistical data to evaluate due to the fact that Hanoi has not promulgate a set of basic directives to serve the construction management of the TOD area. Therefore, a multi-criteria analysis method has been used to select a set of criteria suitable with the development conditions of Hanoi different areas. The result for evaluating criteria is density, land-use, accessibility, design, public transportation development, parking use. According to the summary of the World Bank, the two criteria density and land use criteria are two typical criteria in the design and management of conventional construction planning, while the design and accessibility criteria are two characteristics. characteristics of construction planning according to TOD model (World Bank, 2019) . The study used a set of indicators to evaluate the effectiveness of the TOD concept in a typical area (a planned metro station). Comparing to the SUMI indicators, it can be said that the evaluation results mainly focus on improving the accessibility of passengers to the public transit system in general (not paying attention to the poorest group, impaired groups), access to mobility services, congestion and delay, opportunity for active mobility, multimodal integration.

6. CONCLUSION

Difficulties in transferring individual measures of sustainable mobility concepts from one region to another can be different legal framework conditions, but also given urban structures or living conditions. In general, however, a development can be observed in Europe and worldwide: The goal of mobility concepts is not only a sustainable traffic, but also people-friendly and liveable cities. The examples have shown that interdepartmental cooperation (transport, construction, environment, energy, law) in horizontal and vertical hierarchies is absolutely necessary. The successful projects mentioned are all characterized by participatory elements and continuous monitoring and evaluation.

BIBLIOGRAPHY

Adams D., Larkham P. J., (Re)planning the Metropolis: Process and product in the Post-War London, University of Westminster, 2010

ADAC e.V. (editor), Der ADAC Mobilitätsindex. Entwicklung nachhaltiger Mobilität in Deutschland. München, 2023

Adams, C., Bewertungsverfahren für verschiedene intermodale Straßenverkehrsmaßnahmen. Dissertation, Technische Universität Berlin, 2008

Allianz pro Schiene e.V. (editor), Bundesländerindex Mobilität und Umwelt 2020/21. 2020

ARCADIS (editor), Arcadis Sustainable City Index 2022. Prosperity beyond profit. 5th edition, 14.06.2022

Albtal-Verkehrs-Gesellschaft mbH (AVG) (editor), Stadtbahn verbindet Stadt und Region. Eine Idee aus Karlsruhe setzt sich durch. Das Karlsruher Modell. Karlsruhe, 2020

Bauer, U., Stein, T., Mobilitätswende als umfassendes städtisches Transformationsprojekt. Difu-Nachrichten, 14.04.2023

Bauer, U., Bettge, S., Stein, T., Verkehrsberuhigung: Entlastung statt Kollaps! Maßnahmen und ihre Wirkungen in deutschen und europäischen Städten. Deutsches Institut für Urbanistik (Difu), Difu Policy Papers 2, 2023

Bitkom e.V. (editor), Smart City Index 2022. Studie zur Digitalisierung deutscher Großstädte. Hinweise zur Methodik. Berlin, 2022, https://www.bitkom.org/sites/main/files/2022-09/Methodenuebersicht-SmartCityIndex-2022.pdf, access 21.08.2023

Boltze, M., Sturm, P., Breser, C., Laube, R., Spacek, P., Stötzle, W., Klaas-Wissing, T., Hegner, R., Nutzen der Verkehrsinformation für die Verkehrssicherheit (Benefit of Traffic Information for Traffic Safety). In: Bericht zum Forschungsprojekt SVI 2007/017 auf Antrag der Vereinigung Schweizerischer Verkehrsingenieure und Verkehrsexperten (SVI), S. 109, Zürich, 2014

Braun, M., Böhler, S., Aifadopoulou, G., Supporting and monitoring SUMPs. The SUMI indicator set and SUMP Self-Assessment. Polis annual conference, 02.12.2020

Brown, c., McGreal, D., Reut-Gelbart, M., Mobility Readiness index. Mobility 2030 series, KPMG in Ireland, 2022

Beuermann, C., Wang-Helmreich, H., Obergassel, W., Rundum Nachhaltig. Synergien und Zielkonflikte von Klimazielen und den SDGs. Wuppertal Institut, Friedrich Ebert Stiftung, Berlin, 2020

Bundesamt für Straßen (ASTRA), Handbuch NISTRA 2022. Schweizerische Eidgenossenschaft, Eidgenössisches Department für Umwelt, Verkehr, Energie und Kommunikation UVEK, Basel, 2023

Bundesregierung (editor), Nationaler Entwicklungsplan Elektromobilität der Bundesregierung. 2009

Bundesministerium für Verkehr und digitale Infrastruktur (BMDV) (editor), Bundesverkehrswegeplan 2030. Berlin, 2016

Burgen, S., 'For me, this is paradise': life in the Spanish city that banned cars, The Guardian, https://www.theguardian.com/cities/2018/sep/18/paradise-life-spanish-city-banned-cars-pontevedra, 18th September 2018

Cebr (editor), Urban Mobility Index. April 2017, https://www.qualcomm.com/content/dam/qcomm-martech/dm-assets/documents/urban_mobility_index_report.pdf, access 21.08.2023

Costa, P.B., Morais Neto, G.C., Bertolde, A.I., Urban Mobility Indexes: A Brief Review of the Literature. In: Transportation Research Procedia 25:3649-3659, DOI: 10.1016/j.trpro.2017.05.330, 2017

Dixon, S., Irshad, H., Pankratz, D., Bornstein, J., The Deloitte City Mobility Index. Gauging global readiness for the future of mobility. Deloitte Insights, 2017

Dunkel, G., Vom Verkehrsentwicklungsplan zum Mobilitätsplan für München und Vorstellung des Projekts „Modellstadt 2030“, Landeshauptstadt München, 252. Sitzung des Planungsausschusses des Regionalen Planungsverbandes München, 25.06.2019

Eggimann, S., The potential of implementing superblocks for multifunctional street use in cities. In: Nature Sustainability 5, 406-414, https://doi.org/10.1038/s41893-022-00855-2, 2022

Energieleben.at, Fahrrad-Stadt Groningen, 23rd August 2017, https://www.energieleben.at/fahrrad-stadt-groningen/, 2017

European Commission, Directorate-General for Mobility and Transport, Sustainable and Smart Mobility Strategy – putting European transport on track for the future. Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions, Document 52020DC0789, Brussels, 2020

EUROPEANMOBILITYWEEK, https://mobilityweek.eu/past-awards/sump-award/, n.d. accessed 10th August 2023

Fornauf, L., Entwicklung einer Methodik zur Bewertung von Strategien für das dynamische Straßenverkehrsmanagement. Dissertation, Technische Universität Darmstadt, 2015

Forschungsgesellschaft für Straßen- und Verkehrswesen (FGSV) (editor), Hinweise zu Einsatzbereichen von Verfahren zur Entscheidungsfindung in der Verkehrsplanung. Köln, 2010

Foerster, A. and Bernögger, A. (2018). Modellstadt 2030. Inzell Initiative (editor), 1. Auflage, München, 2018

Freie und Hansestadt Hamburg, Bezirksamt Altona, website of project „freiRaum Ottensen“, https://www.hamburg.de/altona/freiraumottensen/, n.d., accessed 25th August 2023

Fuchs, L.A., Was ist ein gutes Mobilitätskonzept? Entwicklung von Qualitätskriterien für integrierte Mobilitätskonzepte. Master’s Thesis, Technische Universität München, 2021

Geldermann, J., Lerche, N., Leitfaden zur Anwendung von Methoden der multikriteriellen Entscheidungsunterstützung. Wirtschaftswissenschaftliche Fakultät, Universität Göttingen, 2014

Georgouli, C., Cornet, Y., Stevarova, L., Petrov, T., Malichova, E., Urban Mobility Innovation Index 2021. Leading transformations with innovation and resilient urban mobility. Umii, UITP

Gertz, C. and Holr-Rau, C., Ziele, Strategien und Maßnahmen einer integrierten Verkehrsplanung – Planungsverständnis des Arbeitskreises. In: Reutter, Ulrike; Holz-Rau, Christian; Albrecht, Janna; Hülz, Martina (editor), Wechselwirkungen von Mobilität und Raumentwicklung im Kontext gesellschaftlichen Wandels. Forschungsberichte der ARL 14, Hannover, 2020

Grahl, S., Zielkonflikte im dynamischen Verkehrsmanagement. Ursachen und Lösungswege. 24. Verkehrswissenschaftliche Tage. Fakultät Verkehrswissenschaften "Friedrich List", 20.03.2014, Technische Universität Dresden, 2014

Hedel, R., Bertsch, V., Lenz, B., Stauffacher, M., Integrative Bewertung von Umweltmaßnahmen. Anwendungen multikriterieller Bewertungsverfahren zur Entscheidungsunterstützung. Conference Paper. Workshop am 16.11.2006, DLR Berlin-Adlershof, 2007

Heldt, B., Oostendorp, R., Pabst, E., Nachhaltig mobil – Überall? Die kleinräumige Verteilung des Potentials für nachhaltige Mobilität. Praxistauglichkeit eines neuen Index am Beispiel eines Münchner Quartiers. ARL-Kongress 2023 – Zukunftsfähig mobil! Leipzig, 22.06.2023

Heldt, B., Yosmaoglu, S., Neues Planungswerkzeug für Quartiere: Der Nachhaltige-Mobilität-Index. Emmett, iRights.Lab GmbH, Projekt Move Mobility, Website: https://emmett.io/article/der-nachhaltige-mobilitaet-index, access 21.08.2023

Hoffmann-Leichter Ingenieurgesellschaft mbH, Mobilitätskonzept für das Vorhaben Schumacher Quartier in Berlin-Tegel, Berlin, 2020

Høynes, R.C., Kolltveit, L.W., Oslo 2019 A car free city centre. In: WIT Transactions on Ecology and the Environment, 226:3-16, March 2022

ILS Institut für Landes- und Stadtentwicklungsforschung gGmbH, International vergleichende Stadtforschung: Eine Handreichung für die wissenschaftliche Praxis im ILS Arbeitskreis „Comparative Urban Reserach“, Dortmund, 2018

Landeshauptstadt München, Mobilitätsreferat, 2035 Die Mobilitätsstrategie der Stadt München, muenchenunterwegs.de, https://cdn.muenchenunterwegs.de/live/static-content/2035_web_final.pdf, n.d., accessed 25th August 2023

Landeshauptstadt München, Mobilitätsstrategie 2035, https://muenchenunterwegs.de/2035, 2023

Liedtke, G., Lütjens, K., Piendl, R., Bahamonde, B., Francisco, J., Grimme, W., Hedemann, L., Maertens, S., O Sullivan, M., Scheelhaase, J., Scheier, B., Viergutz, K., Schöpfer, A., Winkler, C., Frieske, B., Österle, I., Leitfaden zur Entscheidungsfindung und Bewertung von Maßnahmen und Technologien im Verkehr. Projektbericht, 2020

Lorig, F., Persson, J.A., Michielsen, A., Simulating the Impact of Shared Mobility on Demand: a Study of Future Transportation Systems in Gothenburg, Sweden, In: International Journal of Intelligent Transportation Systems Research (2023) 21:129-144, https://doi.org/10.1007/s13177-023-00345-5, 2023

Mehler, F., Can a city’s mobility culture be changed? – A case study of the ‘Circulatieplan’ and its effects in Gent, Belgium. Master Thesis, Radboud University Nijmegen, 2019

Mueller, N. et al., Changing the urban design of cities for health: The superblock model. In: Environment International, Volume 134, January 2020, 105132, https://doi.org/10.1016/j.envint.2019.105132, 2020

Nanz, P., Fritsche, M., Handbuch Bürgerbeteiligung. Verfahren und Akteure, Chancen und Grenzen. Bundeszentrale für politische Bildung, Bonn, 2012

Oslo kommune, The Car-free Livabililty Progamme, https://www.oslo.kommune.no/getfile.php/13319592-1553857948/Content/Politics%20and%20administration/City%20development/Car%20free%20city/The%20Car-free%20Livability%20Programme%202019.pdf, n,d., accessed 25th August 2023

Rammert, A., Integrierte Evaluation. Zur Bedeutung eines ganzheitlichen Evaluations-ansatzes für eine nachhaltige Verkehrsentwicklung. IVP-Discussion Paper. Heft 3/2017. Berlin, 2017

Rammert, A., Öffentliche Mobilität bewerten: Ansprüche an mobilitätsbezogene Mess- und Vergleichsverfahren. In: Schwedes, O. (editor) Öffentliche Mobilität. Springer VS, Wiesbaden. https://doi.org/10.1007/978-3-658-32106-2_10, 2021

Rammert, A., Der Mobilitätsindex Entwicklung eines integrierten Planungsinstruments für Mobilität. Dissertation TU Berlin, In: Mobilität und Gesellschaft, Band 12, LIT VERLAG Dr. W. Hopf Berlin 2022, https://www.lit-verlag.de/media/pdf/06/6a/a0/9783643250520.pdf

Repetto, C., Benzi, L., Bagnasco, M., Hatzakis, T., Brinkmann, F., Alciauskaite, L., Andrushecich, A., Koenig, A., Developing the multi-dimensional mobility divide index (MDI) as a methodology to assess the accessibility level of public transport systems. (https://doi.org/10.12688/openreseurope.15153.1), 2022

Ritzi, C., Kassner, J., Evaluationsleitfaden für Beteiligungsverfahren Vhv – Bundesverband für Wohnen und Stadtentwicklung e.V., Schriftenreihe 11, Berlin, 2019

Rowe, G., Frewer, L.J., Public Participation Methods: A Framework for Evaluation. In: Science Technology & Human Values 25(1), 2013

Rupprecht Consult (editor), Decision makers summary for Developing and Implementing a Sustainable Urban Mobility Plan. Trialog Publishers, 2020

Schmid-Querg, J., Keler, A., Grigoropoulos, G., The Munich Bikeability Index: A Practical Approach for Measuring Urban Bikeability. In: Sustainability 2021, 13(1), 428, https://doi.org/10.3390/su13010428, 2021

Scholles, F., Bewertungs- und Entscheidungsmethoden. In: ARL – Akademie für Raumforschung und Landesplanung (editor): Handwörterbuch der Stadt- und Raumentwicklung, pp. 221-234, Hannover, 2018

Schürmann, R., Verlagerungswirkungen und Umwelteffekte veränderter Mobilitätskonzepte im Personenverkehr. PTV Transport Consult GmbH, Auftraggeber: Bundeministerium für Verkehr und digitale Infrastruktur, Karlsruhe, 2019

Schuh, H., Entscheidungsverfahren zur Umsetzung einer nachhaltigen Entwicklung. Dresdner Beiträge zur Betriebswirtschaftslehre, Nr. 45/01, Technische Universität Dresden, 2001

Sedlmeir, G., Ein Walkability Index für München. In: Münchner Statistik. 2. Quartalsheft, Jahrgang 2022, Verkehr und Umwelt, 2022

von Stülpnagel, R., Binnig, N., How safe do you feel? - A large-scale survey concerning the subjective safety associated with different kinds of cycling lanes. Accident Analysis & Prevention, 167, 2022 https://doi.org/10.1016/j.aap.2022.106577

Sumitomo Corporation (editor), North Hanoi sustainable city: international city concept to lead a new ASEAN era. Februar 2023, https://www.sumitomocorp.com/en/jp/enrich/closeup, access 21.08.2023

Sustainable Urban Mobility Indicators: Harmonisation Guideline – web version, MOVE/B4/2017-358, https://transport.ec.europa.eu/system/files/2020-09/sumi_wp1_harmonisation_guidelines.pdf, 2020

Tan, H., Smarter Mobility for Better Urban Development: An Exploration of Urban Smart Transportation Governance Based on International Comparison, Paradigm Academic Press, Studies in Social Science & Humanities, ISSN 2709-7862, MAY.2023, VOL.2, NO.52023, 2023

Technische Universität Hamburg (TUHH) (editor), Evaluation des temporären Flanierquartiers ‚Ottensen macht Platz' in Hamburg-Altona. Study on behalf of Bezirksamt Altona, Hamburg, 2021

Thibault, G., Clerq, M., Brandt, F., Nienhaus, A., Bayen, A., Urban Mobility Readiness Index 2022. OliverWyman Forum and Berkeley University of California (editor), 2023

Thomas, A., Aldred, R., Changes in motor traffic inside London's LTNs and on boundary roads. Report, Active Travel Academy, funded by Possible, published under a Creative Commons BY-NC-ND 4.0 licence: https://creativecommons.org/licenses/by-nc-nd/4.0/, January 2023

Umweltbundesamt, Fact Sheet "Oslo: autoarme Innenstadt mit Fokus auf Partizipation", 2021

United Nations, The Sustainable Development Goals Report. New York, 2016

United Nations, Economic and Social Commission for Asia and the Pacific (ESCAP) (editor), Tracking sustainable mobility in Asia-Pacific cities 2022. Bankok, Thailand, 2022

Viergutz, K., Scheier, B., Das „COSSTA-Verfahren": Vorschläge für Zukunftsszenarien zur Bewertung integrierter intermodaler Mobilitätskonzepte. 11. Wissenschaftsforum Mobilität 2019, Track 3: New Dimensions in Urban Mobility: Neue urbane Mobilitätskonzepte, Duisburg, 23. Mai 2019

WBCSD Mobility, Sustainable urban mobility, Abschlussbericht der City Task Force Hamburg, Sustainable Mobility Project 2.0 (SMP 2.0), 2016

Windmüller, D., Heinrichs, E., Rhode, J., Wagner, A., Nahbereichskonzept Friedrichstraße. Abschlussbericht, LK Argus GmbH, Berlin, 2022

World Bank, 2019: Benchmarking Transit-Oriented Development