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UNECE Transport review for the year 2012 "Urban transport and mobility"

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Note by the secretariat

Summary

The note provides the Inland Transport Committee with a review of the publication "Transport review for the year 2012: Urban transport and mobility". It also highlights the importance to further strengthen and study urban transport and mobility since urban transport systems are integral parts of national transport systems. Moreover, it provides information regarding the main objectives and the structure of the publication as well as a preliminary analysis of some indicators based on data received so far.

The Inland Transport Committee is invited to consider how this topic should be followed up regularly, and which Working Party should take the lead. The Committee is invited to encourage governments and municipalities of their capitals to support the secretariat's survey on urban transport and mobility.

I. The Mandate

1. At its seventy-fourth session in February 2012 the Inland Transport Committee of the United Nations Economic Commission for Europe (UNECE) took note of the draft publication "Review of the transport situation in 2011 and emerging trends in ECE region". The Committee also endorsed the decision by the Working Party 5 to transform the review into an annual publication on transport trends and economics in the ECE region (ECE/TRANS/224, paras. 20–21). At its twenty-fifth session, WP.5 adopted this year's theme on urban transport and mobility (ECE/TRANS/WP.5/52, paras. 31–34).

II. Introduction and background

2. The mayors of the world's 25 largest cities are each responsible for more people than most national prime ministers. For example, London, ranked twenty-third in the world, has more residents than nations like Denmark, Ireland, New Zealand or Paraguay, and if Karachi, globally the largest city, was a country it would rank above Greece, Hungary or Portugal in terms of population. The combined population of the world's eleven megacities — cities with more than 10 million inhabitants — equals that of Japan's population.

3. There were eleven megacities in 2011. In addition to Karachi, Shanghai, Mumbai, Beijing, Delhi, Buenos Aires, Metro Manila, Seoul, Sao Paulo, Moscow and Jakarta are members of this select group of cities. Istanbul and Bangkok, with populations of more than nine million, are placed 12th and 13th in the list of largest cities in the world.

4. According to the latest statistics, 80 per cent of European Union citizens live in urban areas, and 40 per cent live in large urban areas of over 200,000 inhabitants. They share in their daily life the same space, and for their mobility the same infrastructure. Public transport, cars, lorries, cyclists and pedestrians all share the same infrastructure. On average, a European citizen makes 1,000 trips per year and half of these are less than 5 km long. For many of these shorter trips walking and cycling could be a true alternative. Urban mobility accounts for 40 per cent of all CO_2 emissions of road transport and up to 70 per cent of other pollutants from transport. One in three road fatalities occurs in cities. Congestion problems, too, are concentrated in and around cities. European cities increasingly face problems caused by transport and traffic.

5. The car is by far the dominant urban mode, contributing about 75 per cent of kilometers travelled in EU conurbations. Cars cause so much congestion that, in some European cities, average traffic speeds at peak times are lower than in the days of the horse-drawn carriage. Increased car use has been accompanied by safety and environmental problems, as well as by a downward spiral of under-investment in public transport.

6. Public transport is an important alternative to the car, playing a major role in the bigger cities where it carries 2.5–3 times as many people as private transport. Public transport is also important for an estimated 40 per cent of EU households who do not have a car. Predictions suggest that, without further intervention, public transport will maintain its market share in the next decade only in the larger conurbations where it has a clear advantage in terms of image, reliability and speed.

7. Road transport is largely oil-dependent and produces the great majority of transport emissions to the air. In addition, nearly all of Europe's city inhabitants are exposed to air pollution levels that exceed EU limits for particulate matter (PM). Substantial progress has been made over the last decade in reducing vehicle emissions, but hotspots continue to be a

problem and growing traffic levels are a threat, or may even reverse progress in urban air quality and greenhouse gas emissions.

8. The question of how to enhance mobility while at the same time reducing congestion, accidents and pollution is a common challenge to all major cities in Europe. Cities themselves are usually in the best position to find the right answer to this question that takes into account their specific circumstances. More than anyone else, city dwellers directly experience the negative effects of their own mobility and may be open to innovative solutions for creating sustainable mobility.

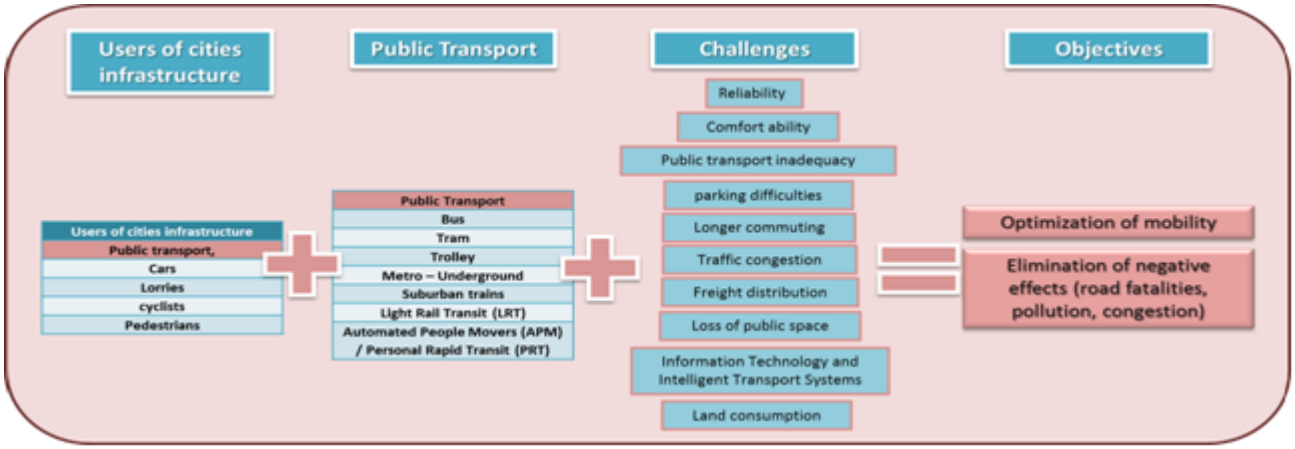
9. The following table summarizes the users of cities infrastructure, the public transport alternatives and the negative results that users of cities infrastructure produce.

Public Transport	*Users of cities infrastructure*	*Negative results*
Bus	Public transport	CO_2 emissions
Tram	Cars	Road fatalities
Trolley	Lorries	Congestion
Metro – Underground	Cyclists	
Suburban trains	Pedestrians	
Light Rail Transit (LRT)	Motorcycles	
Automated People Movers (APM) / Personal Rapid Transit (PRT)		

Source: UNECE

10. A planner of urban transport is facing the following challenge: he or she has to best use the public land and financial resources to optimize the urban transport network and its connectivity with the national transport network by achieving the optimal mobility, maximum reduction of negative effects (congestion, road fatalities, pollution) and maximum provision of transport services to users.

11. This equation is a continuous challenge for urban transport planners as cities are becoming bigger and bigger and more people are becoming users of cities infrastructure and transport services. The following graph illustrates the challenges that urban transport and mobility face.



Source: UNECE, people.hofstra.edu

12. The larger the city, the greater its complexity and the potential for disruptions if this complexity is not effectively managed. The most important transport problems are often related to urban areas and take place when transport systems, for a variety of reasons, cannot satisfy the numerous requirements of urban mobility. Urban productivity is highly dependent on the efficiency of its transport system to move labor, consumers and freight between multiple origins and destinations. The most notable urban transport challenges are:

(a). Connectivity: connectivity with the national transport network is a prerequisite and it should be ensured. Efficiency of urban transport network depends on its connectivity with the national network. Especially in cities where people choose to live outside even of the metropolitan area and to commute every day. These commuters are actually using the national transport network which is connected with the urban one;

(b). Reliability: a citizen would use public transport if he/she could trust it. Trust for services provided, time schedules and connectivity is the most important factor for a user.

(c). Comfort : users are looking for services. All means of public transport should provide services to their users. Air conditioning, cleanliness, ticketing machines, stations that protect and provide travelling info by electronic means, etc.

(d). Public transport inadequacy: Many public transit systems, or parts of them, are either over or under used. During peak hours, crowdedness creates discomfort for users as the system copes with a temporary surge in demand. Low ridership makes many services financially unsustainable, particularly in suburban areas.

(e). Parking difficulties: Since vehicles spend the majority of the time parked, motorization has expanded the demand for parking space, which has created problems with land management particularly in central urban areas; the spatial imprint of parked vehicles is significant. Congestion and parking are also interrelated since looking for a parking space creates additional delays and impairs local circulation.

(f). Land consumption: The territorial imprint of transportation is significant, particularly for the automobile. Between 30 and 60 per cent of a metropolitan area may be devoted to transportation, an outcome of the over-reliance on some forms of urban transportation. Yet, this land consumption also underlines the strategic importance of transportation in the economic and social welfare of cities

(g). Longer commuting: people are spending an increasing amount of time commuting between their residence and workplace. An important factor behind this trend is related to residential affordability as housing located further away from central areas (where most of the employment remains) is more affordable. Therefore, commuters are trading time for housing affordability.

(h). Traffic congestion: Congestion is one of the most prevalent transport problems in large urban agglomerations, usually above a threshold of about 1 million inhabitants. It is particularly linked with motorization and the diffusion of the automobile, which has increased the demand for transport infrastructures.

(i). Freight distribution: Globalization and the materialization of the economy have resulted in growing quantities of freight moving within cities. As freight traffic commonly shares infrastructures with the circulation of passengers, the mobility of freight in urban areas has become increasingly problematic.

(j). Loss of public space: The majority of roads are publicly owned and free to access. Increased traffic has adverse impacts on public activities which once crowded the streets such as markets, parades and processions, games, and community interactions. These have gradually disappeared to be replaced by automobiles. In many cases, these

activities have shifted to shopping malls while in other cases, they have been abandoned altogether. Traffic flows influence the life and interactions of residents and their usage of street space.

(k). IT and Intelligent Transport Systems: Improves public transport as operators can improve their services by having accurate information on the location and progress of vehicles. In addition travelers can get up-to-date information from the appropriate websites, stations and other points of information.

III. UNECE and Urban Transport and Mobility

13. So far, Transport division's only involvement in analysis of urban transport and mobility, has been through its contribution to the PEP programme. At its last session, WP.5 (ECE/TRANS/WP.5/50, para. 42) adopted its terms of reference and rules of procedures whereby WP.5 should review general transport policy and development trends and analyze specific transport economic issues. It should encourage the exchange of data between member States on transport policy developments, particularly relating to inland transport. There are many initiatives by different organizations on urban transport and mobility but few of them focus on data collection and statistics analysis. The data collected from these organizations is either generic and in parallel specialized (number of vehicles per habitants or loans given for urban development, World Bank), or dedicated to urban development for specific cities (UITP) and mainly do not cover the UNECE region.

14. The main objective of this publication is:

(a.) The mapping of UNECE capitals' urban networks and the illustration of urban transport and mobility indicators;

(b.) To shed more light on one of the biggest challenges in developing sustainable urban transport systems – that of creating economically, efficient, socially affordable and accessible, as well as environmentally-friendly urban transport systems;

(c.) To underline the fact that urban transport networks are integral parts of the national transport networks and should be recognized as such;

(d.) To underline the magnitude of negative social, economic and environmental effects of transport in urban areas where the majority of population of UNECE is currently living;

(e.) To provide policymakers with best practices and successful examples from the region allowing then to make informed policy decisions;

(f.) To bring together visions of policymakers from different levels of Governments (national, regional, local) as well as transport planners and academia and provide a platform for thinking about future policy choices.

14. Transport Trends and Economics 2013: Urban transport and mobility will include data received from the capitals of the 56 UNECE Member States. To collect this data, a questionnaire was prepared and sent to UNECE Member States in November 2012. The questionnaire includes 26 questions and has the following structure:

(a). City profile includes six questions on the size of the city, the kind of public transport modes in operation and the types of transport operators that exist per transport mode;

(b). Urban Transport Infrastructure includes a section on *private transport infrastructure*, with four questions on the length of roads, number of parking spaces and daily number of passenger cars, motorcycles, taxis and bicycles; and a section on *public transport infrastructure* with two questions on the length of lanes and lines of different transport modes, the number of stations / stops and the number of parking spaces servicing these modes;

(c). Urban Transport Capacity, includes one question on different types of each public transport mode, a short description, number of vehicles, the number of passengers sitting and standing and the average age;

(d). Urban Transport Operations, includes eight questions on the average speed, the number of employees work , the number of vehicles used in peak hours, the type of energy used as well as the number of passengers and the number of passengers injured in each public transport mode;

(e). Ticketing, includes three questions on the structure and the cost of tickets, the ways of buying tickets and the ways of validating and monitoring validation;

(f). In the end of the questionnaire there are two general questions on the **strategy or initiatives** implemented by the different organizations with positive results for the public transport of the city;

15. Based on the quality of data received a profile for each city will be prepared and analysis of more than 60 urban transport indicators will be performed.

16. The recommended indicators – depending on the quality of data received - that will be analyzed and presented are the following:

i.d	indicators
UT1	BUS reserved route length per 1000 inhabitants
UT2	TRAM network length per 1000 inhabitants
UT3	METRO network length per 1000 inhabitants
UT4	TROLLEY reserved route per 1000 inhabitants
UT5	URBAN TRAIN network length per 1000 inhabitants
UT6	LIGHT TRAIN network length per 1000 inhabitants
UT7	BUSES per 1000 inhabitants
UT8	TRAMS per 1000 inhabitants
UT9	METRO per 1000 inhabitants
UT10	TROLLEY per 1000 inhabitants
UT11	URBAN TRAIN per 1000 inhabitants
UT12	LIGHT TRAIN per 1000 inhabitants
UT13	BUS seat kilometer per capita
UT14	TRAM seat kilometre per capita
UT15	METRO seat kilometer per capita
UT16	TROLLEY seat kilometer per capita
UT17	URBAN TRAIN seat kilometer per capita
UT18	LIGHT TRAIN seat kilometer per capita
UT19	Average speed of BUSES

UT20	Average speed of TRAMS
UT21	Average speed of METRO
UT22	Average speed of TROLLEY
UT23	Average speed of URBAN TRAINS
UT24	Average speed of LIGHT TRAINS
UT25	Length of road per thousand inhabitants
UT26	Length of motorway per thousand inhabitants
UT27	Parking facilities – not servicing public transport – per thousand inhabitants
UT28	Parking facilities – servicing public transport – per thousand inhabitants
UT29	Passenger cars per thousand inhabitants
UT30	Motorcycles per thousand inhabitants
UT31	Taxis per thousand inhabitants
UT32	Bicycles per thousand inhabitants
UT33	Total public transport vehicles per million inhabitants
UT34	Other – than the above mentioned – public transport vehicles per million inhabitants
UT35	Annual passenger BUS transport fatalities per million inhabitants
UT36	Annual passenger BUS transport injuries per million inhabitants
UT37	Annual passenger TRAMS transport fatalities per million inhabitants
UT38	Annual passenger TRAMS transport injuries per million inhabitants
UT39	Annual passenger METRO transport fatalities per million inhabitants
UT40	Annual passenger METRO transport injuries per million inhabitants
UT41	Annual passenger TROLLEY transport fatalities per million inhabitants
UT42	Annual passenger TROLLEY transport injuries per million inhabitants
UT43	Annual passenger URBAN TRAINS transport fatalities per million inhabitants
UT44	Annual passenger URBAN TRAINS transport injuries per million inhabitants
UT45	Annual passenger LIGHT TRAINS transport fatalities per million inhabitants
UT46	Annual passenger LIGHT TRAINS transport injuries per million inhabitants
UT47	Number of park facilities per kilometer of reserved public transport lanes

UT48	Passengers cars per number of park facilities
UT49	Passenger cars per kilometer of road
UT50	Motor cycles per kilometer of roads
UT51	Taxis per kilometer of roads
UT52	Average age of buses
UT53	Average age of Trams
UT54	Average age of Metro
UT55	Average age of Trolleys
UT56	Average age of Urban Trains
UT57	Average age of Light Trains
UT58	Number of personnel working in BUSES per total number of BUSES
UT59	Number of personnel working in TRAMS per total number of TRAMS vehicles
UT60	Number of personnel working in METRO per total number of METRO vehicles
UT61	Number of personnel working in TROLLEYS per total number of TROLLEYS
UT62	Number of personnel working in URBAN TRAINS per total number of URBAN TRAINS vehicles
UT63	Number of personnel working in LIGHT TRAINS per total number of LIGHT TRAINS vehicles
UT64	BUS stops per total length of Bus lines kilometers
UT65	TRAMS stops per total length of TRAMS lines kilometers
UT66	TROLLEYS stops per total length of TROLLEYS lines kilometers
UT67	METRO stops per total length of METRO lines kilometers
UT68	URBAN TRAIN stops per total length of URBAN TRAIN lines kilometers
UT69	LIGHT TRAIN stops per total length of LIGHT TRAIN lines kilometers
UT….	Other indicators

IV. Preliminary analysis – Structure of the publication

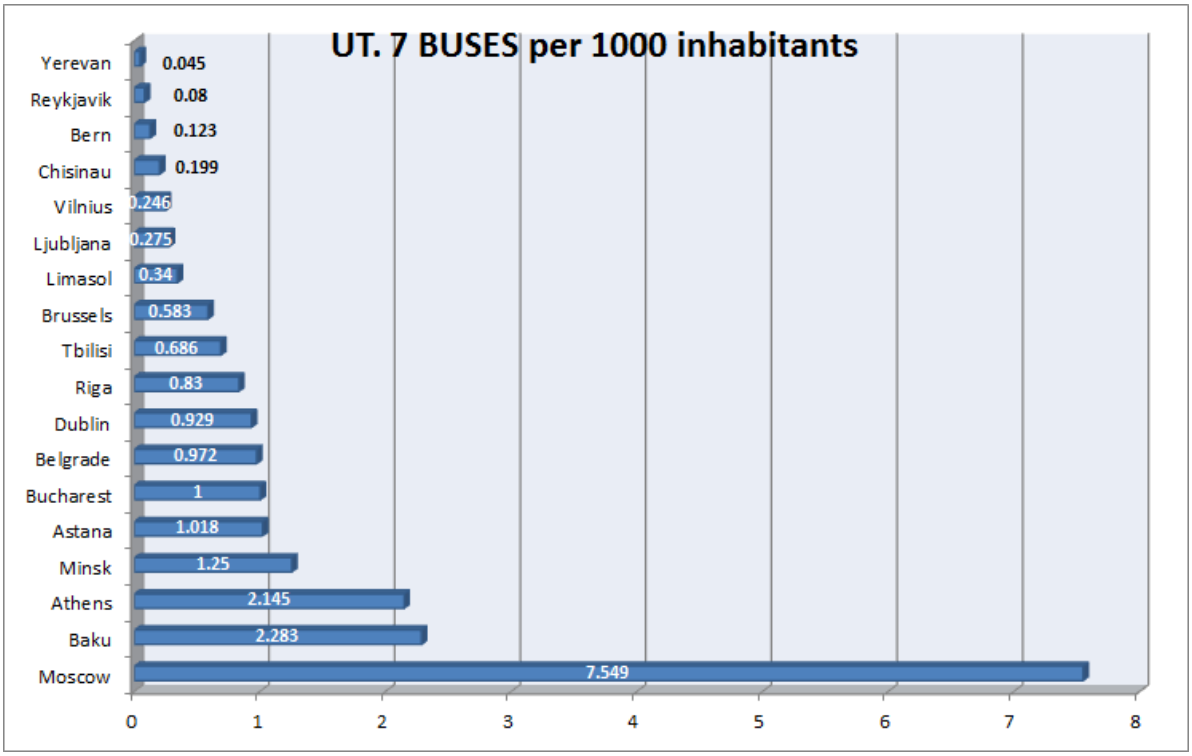
17. So far, 21 countries have replied to the questionnaire. Taking into consideration the length of the questionnaire, the complexity of the questions and the limited time, the response rate is very satisfactory. As the data collection is not yet finalized, we could not provide a full analysis and illustration of the indicators. The following is an illustration of how the analysis will take place and how the secretariat will present the findings and indicators.

18. The first part of the publication will feature the city profiles. All the basic information concerning the cities which replied to our questionnaire will be illustrated in a structured manner. With one glance, the reader will have an overview of each city's urban transport system and its main figures. The following table illustrates an example of a city's profile.

CITY					
Metropolitan area	Size (square kilometers)	2130	**City center**	Size (square kilometers)	0.215
	Population	2122300		Population	298369
Bus	Tram	Metro	Trolley	Urban Train	Light Train
☒	☐	☒	☐	☐	☐
Transport operators	Bus	Private	48	Public	2
	Metro		0		1
BUSES lanes in kilometers	Metropolitan area	3452	**METRO lanes in kilometers**	Metropolitan area	34.56
	City center	1095		City centre	
	Number of stations	664		Number of stations	23
UT.1		**UT9**		**UT13**	
UT.3		**UT15**		**UT19**	
UT7		**UT21**		**UT27**	
Please describe a strategy or initiative implemented by your organization with positive results for the public transport of the city.					

19. The second part of publication will feature indicators analysis. The following schemes illustrate the preliminary analysis of some indicators based on data received by 21 ECE member States.

BUSES per 1000 inhabitants

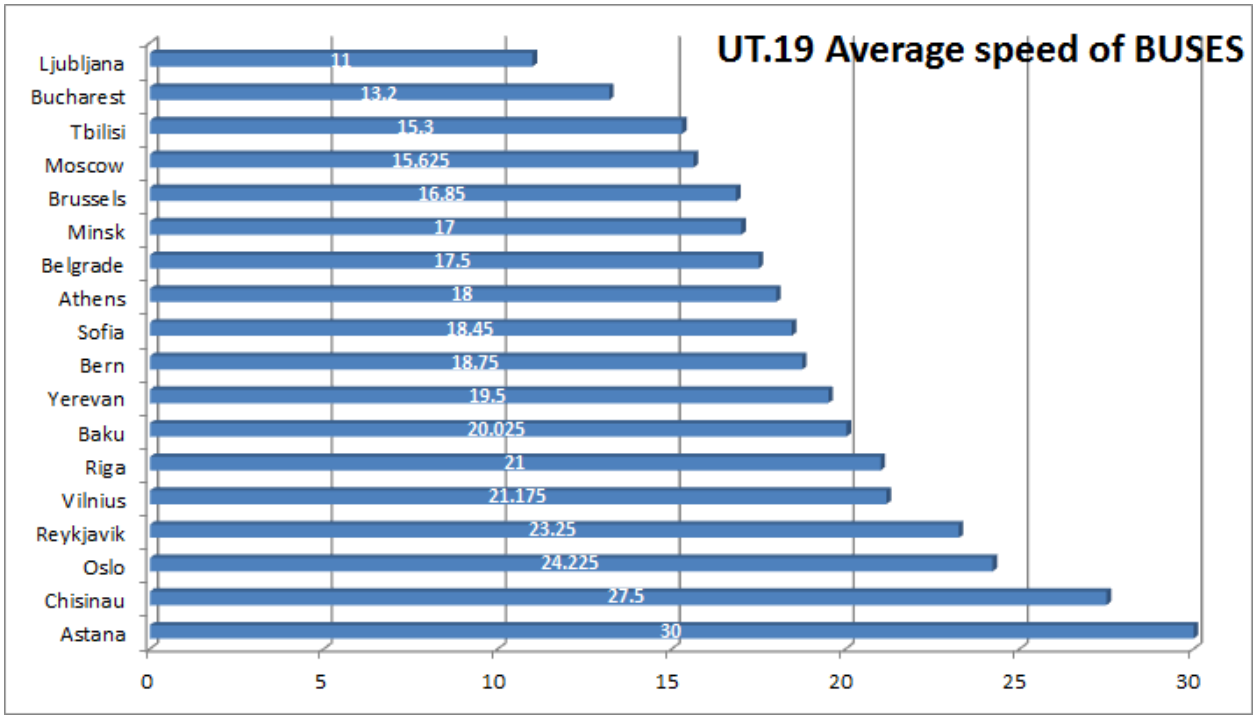


Source: UNECE

20. This indicator illustrates the number of buses that are being used for one thousands of inhabitants. More buses should provide better service to citizens. For instance we can see from the preliminary analysis of this indicator that Moscow uses 7,5 buses for a thousand inhabitants and the city of Yerevan uses 0,04 buses – meaning the 4% of a bus for 1000 inhabitants.

21. However one has to be very careful when interpreting this figure because it depends on the public transport mode share, the existence of other public transport modes, the capacity of the buses, the extent of their use in terms of daily kilometers per bus, and the daily number and average length of bus journeys undertaken by each inhabitant of the city. According to World Bank and with so many variables the minimum requirement varies considerably from city to city, but will typically lie between 0.5 and 1.2 per 1,000 inhabitants.

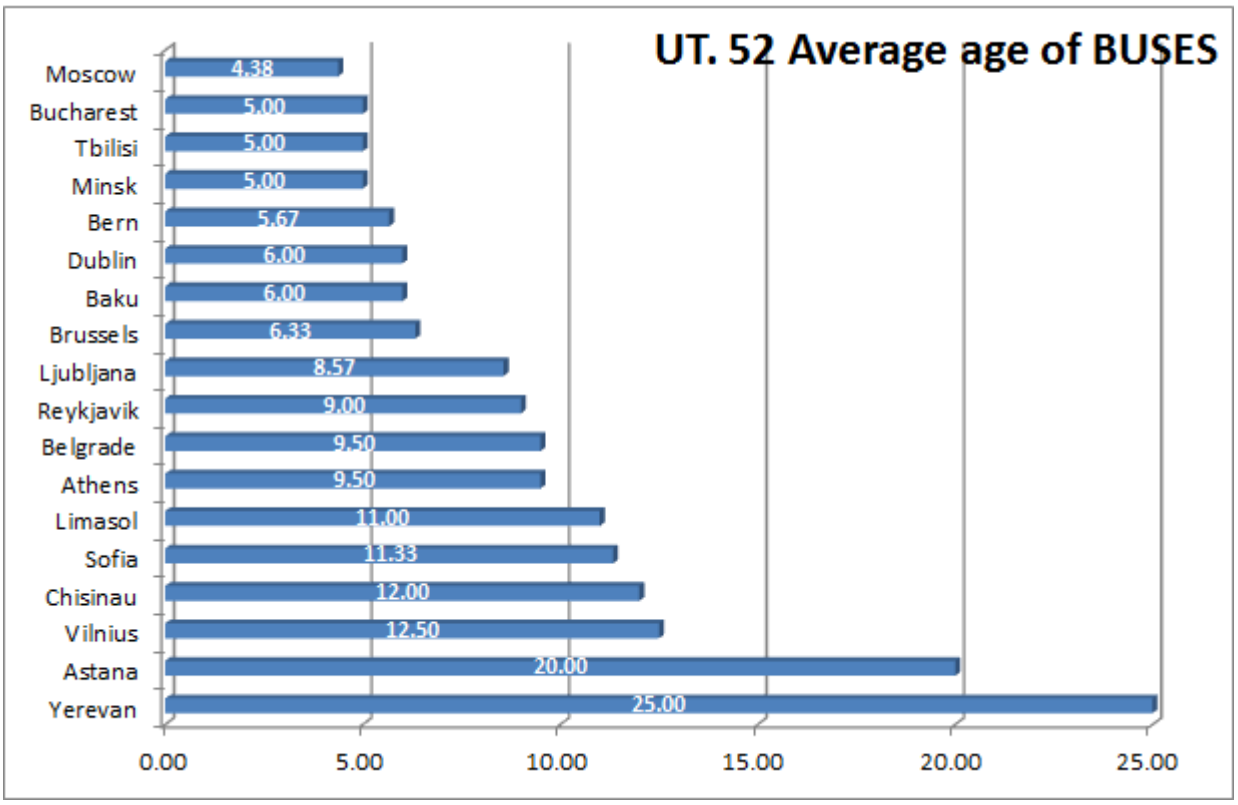
Average speed of BUSES



Source: UNECE

22. This indicator shows the level of technology and congestion. A congestion free fast mobility reduces time of travel and (most of the time) makes it more comfortable. This indicator should be evaluated in comparison with the one that illustrates the total length of BUS lanes (in km) per total length of BUS lines (in km). The average speed of BUS depends on the existence of dedicated BUS lanes, the size of roads, the congestion, and the structure of the city. From the analysis we can see, for example, that in Astana city buses run with an average speed of 30 kilometers per hour and in Ljubljana with 11 kilometers per hour. Astana is a new city with large roads and modern urban planning while Ljubljana is an old historic city which has not been planned according to modern mobility requirements. The history of each city and the structure of their historical centers influence the urbanization and therefore the traffic and busses speed.

Average age of buses



Source: UNECE

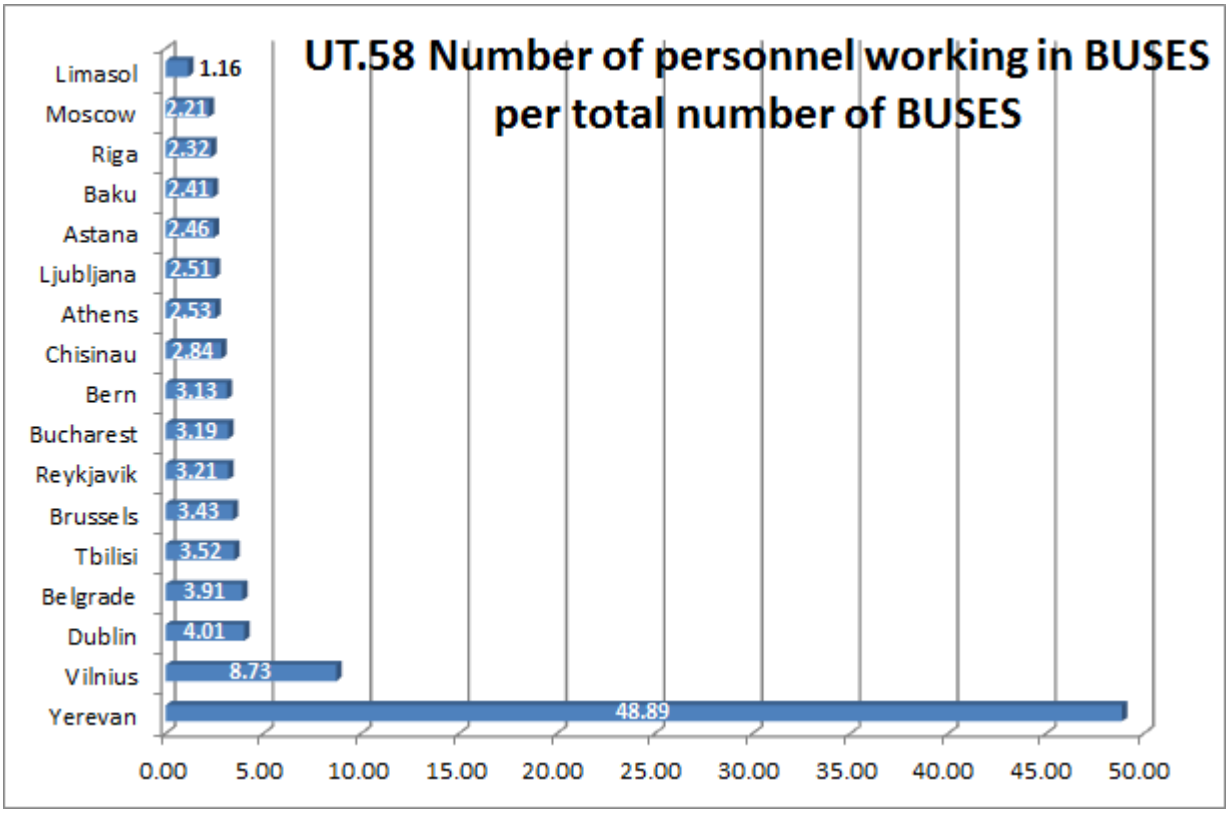
23. The average age of buses indicator is a useful one since it indicates the status of the fleet. Normally, if the fleet has an even age profile, the average age of the fleet will be approximately half the age of the oldest vehicle. An acceptable average age depends on factors such as the types of vehicles operated, levels of utilization and operating conditions, and is sometimes influenced by legislation: in some countries the operation of buses over a certain age is not permitted.

24. A high average age may be because high standards of maintenance enable vehicles to be successfully operated over a long life, but more often is because insufficient funds are available for fleet replacement.

25. A very low average age may be because vehicles are replaced when they are relatively young but may indicate that poor maintenance has resulted in a short vehicle life. In practice, where the latter is the case, it is not usually reflected in the average age because younger vehicles tend to remain on the "book" fleet strength even when they are no longer fit for further use. For a reasonably well maintained fleet of premium quality vehicles operating on urban services in a developed country, the average fleet age would typically be between five and eight years.

26. From our analysis we see that Yerevan city's buses have an average age of twenty five years and in Moscow or Bucharest five years.

Number of personnel working in BUSES per total number of BUSES



Source: UNECE

27. Staff productivity is a key indicator of overall operator efficiency. It can also be useful when comparing the efficiency of different operators.

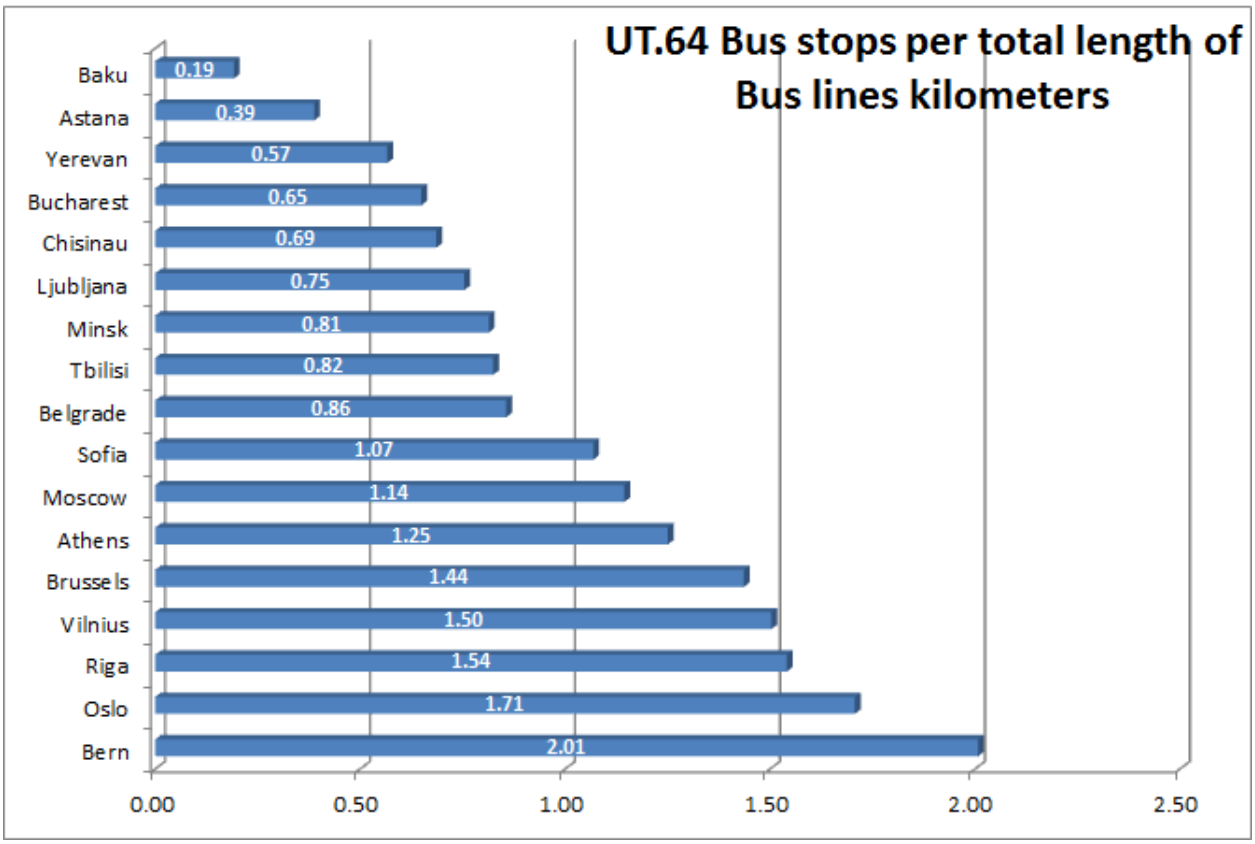
28. The staff-per-vehicle ratio is a useful measure of the effective use of staff, but must be treated with care, particularly when making comparisons between different operators. It will be influenced not only by levels of productivity and efficiency, but also by the length of the operating day. In some operations, particularly on intensive urban services, three shifts per day are required by bus crews, while on others, such as long-distance services, buses are normally worked by only one crew in a day, albeit often with very long shifts. The number of staff will be substantially lower if buses do not carry conductors.

29. The figure will also be affected if a significant amount of work, such as maintenance, is contracted out, although this is not common in the case of large operators in developing countries.

30. In an efficiently run urban undertaking in a developed country, a typical staff/bus ratio will be of the order of three staff per bus where all buses are operated by the driver only, and all maintenance work undertaken in-house; if all buses carry conductors this figure would increase to about five or six. In a developing country where wage levels are low and therefore many tasks may be undertaken using more labor-intensive methods, a reasonable figure, with conductors, would be between five and nine. Often, particularly in state-owned undertakings, the figures are very much higher than this. Excessive numbers of staff per bus not only result in unnecessarily high costs, but increase the problems of management and control.

31. From our analysis we can see, for example, that the city of Yerevan uses 48 employees (drivers, administration and maintenance employees) to operate one bus. The city of Vilnius uses almost nine employees and the city of Limassol almost one employee per bus!

BUS stops per total length of Bus lines kilometers



Source: UNECE

32. The number of bus stops is connected with the reliability of the service and the quality of the customer service provided by the urban transport of the city. The number of buses stops should not be high because then buses' speed and efficiency is being eliminated. On the other hand the stops cannot be just a few because then the actual purpose of urban transport is being lost. Some specialists mention that bus stops should be of walking distance from one to the other.

33. From the analysis above we see that the city of Bern has two bus stops for very bus line kilometer and the city of Baku has less than one stop per one kilometer of bus line. Again, the urban planning of the city, the structure and the size of the roads, the population density influence a lot the location and frequency of buses stops.