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**INTERNATIONAL CONFERENCE ON TRAFFIC AND
TRANSPORT ENGINEERING**

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**November 27-28, 2014
Belgrade, Serbia**

- ICTTE Belgrade 2014 -
Proceedings of the Second International Conference on Traffic and Transport Engineering

ICTTE Belgrade 2014 has been jointly organized by the City Net Scientific Research Center Ltd. Belgrade, University of Belgrade, Faculty of Transport and Traffic Engineering and "Kirilo Savić" Institute. ICTTE Belgrade 2014 is co-hosted by the AIIT (Associazione Italiana per l'Ingegneria del Traffico e dei Trasporti) Research Center, Rome, Italy. The conference is supported by the EA SEA WAY project (Adriatic IPA, Cross Border Cooperation 2007-2013), and is held in Belgrade, Serbia, from 27th to 28th November 2014.

The conference covers a wide range of topics related to traffic and transport engineering, with the aim of representing the importance of all modes of traffic and transport, especially the importance of improving these industries, and their compliance to one of the most significant principles nowadays, sustainable development. ICTTE Belgrade 2014 gathers researchers, scientists and engineers whose fields of interest are traffic and transport engineering, and should provide them a good platform for discussion, interactions and exchange of information and ideas. ICTTE Proceedings have been indexed within Thomson Reuters's CPCI – Conference Proceedings Citation Index accessed via Web of Science.

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PREFACE - ICTTE Belgrade 2014

Why do we need a new transportation philosophy of history?



Ladies and gentlemen, distinguished guests and speakers, dear colleagues and readers,

I am delighted to welcome you to Belgrade and to the International Conference on Traffic and Transport Engineering (ICTTE Belgrade 2014).

ICTTE Belgrade 2014 presents state of art in the field of traffic and transport engineering. The conference is major conference in the region with the participation of researchers from more than 50 countries worldwide. Our research comprehensive network of people, research institutions and industry rapidly enlarge within ICTTE community.

The contributions to ICTTE 2014 have been high, with more than 120 papers divided into 18 sessions. Proceedings will be indexed within Thomson Reuters's CPCI – Conference Proceedings Citation Index accessed via Web of Science. After the conference, I have truly hope, that new research groups will find opportunities in some of Horizon 2020 perspectives, Danube Transnational Programme 2014-2020 strategic partnerships, Adriatic and Ionian Initiative, etc.

After the conference, a selection of papers will be edited to make a series of thematic volumes, covering broad topics of interest for the scientific community and end users. These volumes will be published by International Journal for Traffic and Transport Engineering (IJTTE) special edition by the end of 2015.

I am delighted to welcome you to Belgrade, the hart of Serbia, and I hope you will enjoy your work as much as social networking activities organized by our team. I hope old participants and new comers will join us in 2016 and fill history with their cooperation.

ICTTE 2014 Director

Olja Cokorilo

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EXAMPLES OF ALTERNATIVE TRANSPORTATION SYSTEMS IN URBAN ENVIRONMENTS

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Abstract: For the first time in human history, more than half of the world's population is living in cities, with every third citizen living in heavily populated urban informal settlements. In the next 50 years, more than 3 billion people, or approximately two-thirds of future urban population, could be living in slums. What will transport in urban environments look like in the future? Decades ago, people imagined modern metropolises as cities in science fiction movies, with flying cars and buildings above the ground. In reality, futuristic urban transport pod car systems are likely to be succeeded by rickshaws and bicycles. While we aspire to start living in ultramodern cities of the new millennium, alternative transportation systems that are appearing in overcrowded metropolises around the world are bringing us a taste of reality. Urban transport planners have started to resolve this topic, considering alternative transportation systems in urban environments. Slums are not only a social and urban phenomenon, but also a product of the lack of mass public transport. This paper will try to demystify urban transport phenomenon and present the seven W's (Who, What, When, Where, Why, for Whom, and hoW) on the topic. Specific urban environments conditions, that have generated alternative forms of public transport, can be recognized as a base for classifying different implemented key-study examples of alternative transportation systems in urban environments. In this way this paper can be used as a basic survey paper on the topic.

Keywords: transportation, mobility, alternative transportation, informal settlements, slums.

INTRODUCTION

Cities, as mayor drivers of social and economic development, encourage the migration of people. It is estimated that by year 2050 more than two-thirds of the world's population, approximately 6.2 billion people will be living in cities. [Pinderhughes 2004] The increasing growing number of city inhabitants creates pressure on rational usage of city resources, especially in the domain of land usage. The planning profession had engaged the problem of intent city expansion into the surrounding suburbia and rural areas. This territorial expansion created the need for more frequent and longer trips to central urban areas. Cities had suddenly and uncontrollably grown, in such a way that a sufficiently system of public transport could not be developed, and individual transport became essential. Car-oriented cities were created. [Vugt, Lange, Meertens 1996]

With the number of cars increasing, the level of traffic was increasing as well, creating delays and congestion on existing infrastructure grids. The solution for the emerging problem requested new infrastructure capacities that demanded new land resources and urged dislocation of city activities, furthermore enhancing the growing demand for privately owned motor vehicles.

The growing number of cars, as well as the increasing traffic congestion, led to significant problems like pollution with carbon dioxide, noise pollution and reduced public safety. Experts agree that the universal presence of the privately owned motor vehicle as the main mode of transporting people and goods breaks the quality of life in the cities. Individual transport, in modern urban communities, has become untenable. Experts from various fields are trying to deal with the given problem in different ways. Reducing the usage of motor vehicles, as well as the promoting and developing public transport and alternative non-motorized individual transport. Countries leading the changes in alternative transportation systems are economic superpowers like China, Japan, USA and the countries of Western Europe. [Pinderhughes 2004]

1. TRANSPORT

Transport is an infrastructural system that efficiently transfers people and goods. It helps the development of trade, and in a long run provides socio-economic development and vitality of the city. [Korica 2008] Transport infrastructure consists of a set of different modes of transport: air, water, road, rail, cable etc. The system can be divided into infrastructure, vehicles and operations. The base of the infrastructure is the network (of highways, tunnels, bridges, streets etc.) that accepts and facilities (stations, pumps, maintenance centers, garages, parking lots, individual vehicles etc.) that regulate transport. These two combined ensure normal operation, and are equally important in all aspects of the system.

Road transport takes 80% of all traffic of goods and passengers. It is leading in the length of its network (24 million km or 70% of the world transport system), and is in the general economics a necessity. Only in year 2012 70.520.493 vehicles were produced of which 52.726.117 individual cars. The automotive industry has an average annual turnover of 1.889.840 million euros, employs over 8 million people, and 50 million people are indirectly dependent on it. Transportation plays a critical role in the creation of the urban center and its forms, and is the main factor of how successfully a society develops. Forms of transport greatly vary depending on the level of development of the country, socio-economic conditions and geographic characteristics.

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The transport infrastructure affects the city's physical structure, spatial arrangement of the surroundings, routes of travel and generally the way the urban area is used. [Pinderhughes 2004] All transport activities that appear within the city urban area are considered city traffic.

2. CITY TRAFFIC IN DEVELOPING COUNTRIES

Underdeveloped countries and developing countries represent a large group of countries with a lower living standard, underdeveloped industrial base, and low per capita income. City traffic in such countries is very direct, mainly consisting of travel from home to work. According to research in 1990, 40-50% of all trips in such urban environments were to work, traveling to school 20-35%, and only 15% of travel was for some other business-social purposes. [Armstrong-Wright 1997] Transport in these countries is usually based on mass public transport, walking and individual small motorized and non-motorized vehicles driven by human or animal power. [Pinderhughes 2004] According to a study conducted by the World Bank, public transport makes up 50-70% of all city traffic, where leading the way are small motorized and non-motorized vehicles (such as bicycles, motorcycles, tuk-tuks, rickshaws etc.) as the cheapest and most convenient means of transportation. These vehicles are an imperative in the area of human activity, as their role is to facilitate the transport of people and goods in a safe, reliable and cost-effective manner. [Enoch 2012] Still such vehicles are considered inadequate modes of transport because they cause traffic jams and congestion.

Although the use of cars is growing in recent years, car traffic is a negligible part in the transportation system of Africa, Latin-America, India and Southeast Asia. The population in these countries depends on mass public transport, but things are changing. Most are experiencing rapid population growth and urbanization, and many have fast-growing economies. Enhanced mobility has positive effects on the economy allowing more efficient transport of goods and people, improving the performance of work and income. Although the benefits are enormous, the costs can be substantial as well. The number of privately owned motor vehicles is increasing in almost all developing countries. China is a good example of this, as one of the largest car manufacturers in the world. The Government of the Republic of China stimulates, through a variety of projects and initiatives, car purchases. Despite the fact that China has the most polluted air in the world, urban planners and government leaders are creating regulations and laws that favor the usage of cars. This phenomenon is connected not only to the increase in personal income but also to the idea of maintaining the economic development of the country making internal consumer demands.

3. CITY TRAFFIC IN DEVELOPED COUNTRIES

Contrary to transport used in developing countries, people in developed countries use fewer types of transport. Developed countries have the largest stake in the global use of cars and a very small percentage of small motorized and non-motorized vehicles. Traffic in these countries is very diverse, as travel from home to work takes only a third of all trips, where two-thirds are social and recreational trips. The population is facing a big problem of dependence on privately owned motor vehicles. The use of cars has risen over the past 5 decades. The number of motorized vehicles increased from 75 million to 675 million between 1950 and 1990. Almost 80% of these vehicles is primarily used for individual transport. In the period between 1970 and 1990, the total number of kilometers flown per passenger increased by 90% in Western Europe. [Armstrong-Wright 1997]

There is a misbalance in energy usage. For example, although USA accounts for less than 5% of the world's population, it spends more than one third of the energy for transport, at the global level. In 2000 in USA there were more registered owners of cars than registered voters. A resident of North America consumes five times more energy on transport than the average Japanese, and nearly three times more energy than a citizen of Western Europe. [Pinderhughes 2004] Europeans have a greater tendency to use alternative forms of transportation such as bus, train or bicycles. Cars in Europe take between 11 - 26 % of all trips, and walking and cycling between 33 - 50 %. Still from 1970 to 1995 car traffic in Europe has doubled, for example the number of private cars in the UK has increased by 93 % from 1971 to 1992. Although, western Europe is understanding the sustainable issues of car dependence, and is making its green strategy, the new members of EU that are in economic transition are busting their economy by stimulating car purchases. Between 1995 and 1996, car sales in Poland grew by 40 percent, in Warsaw in 1996, there were about 400 cars per 1,000 people and motor traffic is becoming a major source of air and noise pollution. [Wright 1997]

4. INDIVIDUAL TRANSPORT

There are many reasons for choosing car over other means of transport and alternatives, such as: speed, time, cost, flexibility, as well as social reasons such as comfort, status and security of transport. However, cars have multiple negative consequences, especially from an environmental and economic point of view. They contribute to the pollution of the environment (during production polluting the environment, and afterwards by using fossil fuels as an energy source creating harmful gases) directly or indirectly, and thus affecting human health. For example, from the International Energy Agency (IEA) the total CO₂ (carbon dioxide) emissions in 2010 by sectors were as such: electricity and heat production 41,2%, energy industry own use 5,2%, industry and construction 20,4%, households 6,2%, other sectors 4,6% and traffic 22,3%, where CO₂ emissions from cars took an astonishing 18,5%. [Wright 1997] The transportation sector is nowadays the fastest growing, and is producing an enormous amount of greenhouse gases. It is expected that emission of CO₂ rises for 57% by 2030. A total of over 500 million cars that use gasoline,

combined with thousands of power plants that use coal, make the main driver of climate changes. [Brown 2001]Cars account for more than a quarter of the world's production of carbon dioxide in whole, through production and by using fossil fuels. Accordingly, the reduction of emissions from this sector will have a major impact on air quality, health and global warming.

Noise pollution is also one of the most important problems in modern transport. Noise at the edge of highway can reach a level of over 80 decibels-dB, which is a very high degree of noise disturbance, and with long-term exposure, can cause permanent harm to hearing and neuro vegetative systems. It is estimated that 170 million people that live in the so-called gray areas of noise pollution in suburban areas (with 55-65 dB) are addressed.[Brown 2001]From the social point of view, the use of a car is threatening the quality of urban life, via contamination, pollution, reduced efficiency and expensive cost of transportation. In addition, there is an increasing number of traffic accidents, reduced public safety and general alienation of people in traffic.

Opposite of the common opinion, excessive use of cars may cause downside economic effects as well, as a country can easily badly invested in unsustainable transport infrastructure systems and make irreversible debts. The economic impact is also felt at the local level. Maintaining a vast transport network is expensive. Frequent traffic jams can stifle the development of the local economy and thus reduce business growth. Economic efficiency of the transport system is reflected in the cost of infrastructure, transport costs, time costs, and so on. Transportation costs of using cars are 30 - 40% higher compared to the cost of public transport. Time costs are another important factor. To solve the existing traffic congestion by building new roads to city residents to save time is not possible. One cannot achieve the expected benefits. Although the use of a car makes it easy to find and execute jobs, the money that is spent for the fuel is forcing people to leave the periphery and move closer to the urban center of the city, recanting from the comfort of a single family house. Congestion reduces efficiency of the economy because employees spend more time on the way to work. Facilities for passenger traffic have a high cost of building, and occupy a large part of central urban space. Usually traffic takes 20% of city land use from the entire city and in some areas like downtown up to 40% of the total surface area, making it undoubtedly an important item in the cityland economy.

The main objective of traffic is improving overall city mobility in accordance with the social, economic and environmental development goals. In urban areas with high urban activity, traffic congestion cannot be avoided by increasing the capacity of the traffic network, with new construction of roads and parking. Based on previous experience of city development and theory, it is a fact that a synchronized urban transport system of roads and parking spaces that would allow unlimited use of cars is not possibility to build.

5. PUBLIC TRANSPORT

Through comparison of the advantages and disadvantages of both modes of transport, individual and public, it is possible to draw some conclusions. Private transport has advantages of privacy, comfort, direct speed, has independence and freedom of movement, has more possibility for destinations and traveling routs, can be paused, is flexible, and has additional possibility for transporting goods. Disadvantages are in price (fuel, tolls, taxes), of parking, usage stress (traffic jams and congestion), security regarding accidents, isolation, and is not urban efficient.Public transport has advantages of price, it runs automatically, is less stressful to use, one can relax, has possibility of quality time while driving (reading, completion of certain obligations, etc.), lower concentrations of pollution, is social active, is more urban efficient, and has a high velocity of transportation (using special lanes for public transport etc.). Disadvantages are in lost time while waiting, comfort, security, lack of specific paths and traveling routes, need of having another form of mobility, occasional unreliability, possible overcrowdings, and has no additional possibility for transporting goods.

Public transport is a transport service available to the all public. From aspects of environmental protection, health and economic prosperity, the use of mass (large-scale) public transport has many advantages compared to transport with privately owned motor vehicles. Benefits of public transport compared are multiple. Internal combustion engines are on top of that 3 to 4 times less efficient than electric motors. Globally for example rail transport produces 35 times less carbon dioxide than cars, and spends an average of 4 times less energy. [Maletin 2003] Metro consumes 0.03 kg of oil per passenger - per kilometer, a car 0056 kg, what is very close the consumption of air travel at 0076 kg. Less energy-demanding and more environmentally friendly than other modes of transport, public transport comes to less pollution per person, and also reduces traffic congestion. Investment in public transport is therefore the future for city commuting.

In most major cities in Europe and the USA public transport systems are developed and regularly maintained. However, in the cities of Africa and Asia, as well as in the cities of Eastern Europe, the system is not developed. Statistics show an increase in the use of public transport, over the last ten years in many countries. Between 2004 and 2008 there was a large increase in the use of mass transportation in Europe andUSA of about 11-12% and even 20% in the UK. A recent survey in the USA shows that the cost of driving, added up with the cost of making infrastructure for driving, the cost of regulation air pollution, noise, time cost of traffic jams and accidents (about 125 million), is in reality 3 times higher than the price that are paying users of highways via tolls and petrol. That means that driving individual owned motor vehicle is constantly draining our economy. Some economics concluded that it would be up to 5 times cheaper to run a city without a car, and that such an outrage idea is implementable. [Beirao& Cabral, 2007]

6. KEY-STUDY EXAMPLES OF INNOVATED TRANSPORT

The purpose of a road is to transport people, not necessarily cars. With this in mind alternative transportation systems try to respect this statement and move more people on the existing roads build for cars. From the perspective of the quality of urban life of the population, it is generally accepted that traffic has a significant impact on the social, economic and natural environment, and that overcrowded, polluted and noisy cities are not adequate for life. As the problems associated with the use of cars are piling up, with the fact that the growth in motorized transport has negative effects on the economy, and that there is a collapse of mobility in existing megalopolises, the traffic planning is increasingly discussing about alternative innovated transport.

Studies show that public and non-motorized modes of transport offer significant advantages over individual and classical public transport in urban communities. Besides being cheaper to produce, purchase and maintenance, they provide more transport opportunities, emit lower exhaust emissions and reduce congestion. There are numerous examples of cities in the world testifies to the strong initiative to reduce the negative impact of transport on the environment.

6.1. STREETCAR(PORTLAND)

Portland became the first city in USA that introduced a modern tram network in order to improve the existing system of public transport based on the bus and light rail. These trams were shorter, lighter, and narrower and were more flexible to maneuver in streets. A tram networks could be build faster than light rail, commuter rail or subway, and was sufficiently green. Most streets supported the weight of the tram route without additional construction work, thereby reducing the investment cost and timeframe. Setting the tram tracks in relation to the underground infrastructure such as water supply and transmission remained a problem that had to be addressed. Nevertheless, by 2001 funding was carried out by the state through a public-private partnership, and the new tram system was build. Cost of construction of the first phase amounted to \$ 56.9 million, including the purchase of seven trams. The tram system was called: Streetcar, and the lines were design in such a way to provide an alternative to driving for people who are already in the city. Stations are arranged to cover every part of the city and are set in accordance with the characteristic urban points in Portland. The line of the tram connects northwestern and southwestern of the city, so they can take in all passengers coming by light rail from the suburbs. The land use is minimal, as a greater part of its route, the Streetcar share the right lane with cars next to the parking lanes. At tram stations street parking is replaced with recessed curbs, where trams stop only on passenger demand. To ensure the flow of traffic, trams are equipped with a wireless system that allows them to influence the traffic signs. This system also allows the tram to offer real-time arrival information to passengers waiting at the tram stop. The popularity of the tram ride is on the rise. Although planned to transport up to 3,000 passengers a day, after 6 years of use, this number had grown to as many as 10,000 passengers a day.

6.2. CRGO (DRESDEN, GERMANY)

In Dresden tram traffic was applied in order to reduce air pollution and traffic congestion caused by heavy trucks. Dresden CarGo tram was designed to transport parts and materials from Volkswagen Friedrichstadt logistics centers outside of Dresden in a new sustainable factory in the center of Dresden. CarGo tram commutes on the existing city passenger tram rail network. Each tram carries 60 tons of material, which is equivalent to a truck with three trailers. What is interesting is that the tram tracks lead directly to the factory where old internal factory wagon tracks are integrated in the network. Trams were scheduled to be running 21 hours a day and carrying about 2,000 tons, in this way replacing transport more than 100 trucks per day. The success of the Dresden CarGo tram encouraged planners across Europe to see whether similar systems can work in other places, especially within old cities, where there is a problem of mixing passenger and cargo transport. As well as in urban areas where there are several companies that deliver goods to the same location. In Amsterdam CityCargo pilot program began in 2007. It is estimated that 53 trams and 600 electric trucks replaced about 1,200 delivery trucks before used in Amsterdam. This reduction in truck traffic resulted in the reduction of air pollution and noise, but also was a great money saver.

6.3. SCHWEBEBAHN(WUPPERTAL, GERMANY)

The Schwebebahn system is used in Wuppertal in Germany since 1901. They are an important addition to the rail transport technologies because they save city space. The system can be placed in narrow rows, or across rivers or along existing roads without contributing to traffic congestion. Supporting structures are constructed of steel bearing components, and the railline is attached to the underside of the structure, so the vehicles are hanging on wheels that move on rails. Schwebebahn in Wuppertal is the oldest example of AirTram system in the world. Hanging 8-12 meters in the air, making a route of 15 kilometers and caring nearly 80,000 people a day this system is the primary public transportation system in the city of 500.000 inhabitants. This form of transport is very secure, as only five accidents and one victim had the system encountered for more then a century of existence. In the new millennium, thi AirTram it is getting a makeover with the modern Monorails and or SkyBus systems. Unlike conventional rail systems, these systems are separated from other traffic and pedestrians, usually appearing in strong commuting areas like airports (New York, London, Paris, Singapore) as well as downtown centers (Beijing, Venice, Tokyo). They avoid red lights, intersection

turns, and traffic jams. Unlike subways passengers enjoy sunlight and views, expensive and noisy ventilation systems are not necessary, and most importantly they obtain electricity from the track structure, eliminating costly and unsightly overhead power lines and poles.

6.4. BRT (CURITIBA, BRAZIL)

The Brazilian city of Curitiba adopted the practice of planning that integrates and focuses on the development of sustainable transport. After an initial unsuccessful plan of expanding the road infrastructure due to limitations of finance, the institute for research and planning implemented draconic measures to reduce the negative impact of private transport. Curitiba Master Plan reduced the spread of the city, introduced laws on zoning and land-use, created a transit-oriented city, reduced turnovers on individual transport, ensured effective public transport and engaged customers to use it.

Curitiba, a city of more than 1.5 million people had a big problem with traffic congestion. The public transport consisted of buses operated via private companies, making large traffic jams. Due to the lack of funds for constructing the subway, the city decided to improve public transport creating a new transport system BRT (Bus Rapid Transit) that has an independent bus networked, based on a bus that uses a priority lane that is integrated in the pedestrian zone. The priority lane allows the bus to operate independently of the surrounding traffic and is "free", organized and rapid such as any metro system, but costs much less. With a total length of about 45 miles, and making about 2 million transfers a day the Curitiba BRT is considered a success story, and is planned to be introduced in other Brazilian cities. It is believed that the BRT in the future will become a major alternative to the existing public transport, especially in cities with limited budget and free land space, as the ones in developing countries. Financial resources required to build 10 BRT lines are equal to the construction of 1 metro line and have almost the same passenger frequency. Analysts believe that BRT can be a good candidate for the existing road network to be adapted because of lower costs compared to other transit systems. The BRT system has in such ways been successfully applied in France, Turkey, and the USA. In Asia TransJakarta bus system is the largest BRT in the world, and is significantly reducing car traffic. Before this system, public transport in Jakarta was unsatisfactory. Congestion in the city streets, increasing the number of car users has led to degrading air quality in the city. Practice shows that 14% of travelers have changed the car for the BRT system.

7. NON-MOTORIZED TRANSPORT

Cities are increasingly turning to the use of non-motorized transport because of the benefits it brings to the environmental and economic aspects. Today, for a variety of reasons (health, environmental, financial, and others) cycling is increasingly popular, and is the most outspread and effective form of non-motorized transportation. The bicycle originated in Europe in the 19th century as a mean of recreation and since then has spread worldwide. The concept has not changed, except that today's bicycles are much easier and safer to ride.

Despite personal preferences related to cars, bicycles are not only a feasible alternative to motor vehicles, but are already an essential component of the transportation system in most developing countries, slowly gaining popularity in developed countries as a sustainable urban transport system. Cycling has become a common part of city traffic. Even at the begging there was a problem sharing traffic by cyclists, horse-drawn carts and pedestrians. Increasing levels of motorization and appearance of cars enhanced this problem. In most countries according to current traffic regulations the bicycle is considered a transport vehicle, and is therefore equal to other vehicles in traffic. This means that there are legislations on the required age of the driver, rules of movement on public roads and technical requirements. Compared with motorized vehicles, bicycles have many advantages, especially for commuting over short distances. They are a non-polluting mean of transportation that actually improves environmental quality by reducing air pollution, noise and congestion. They are much more convenient than public transport, because passengers do not have to wait, and can bypass traffic jams and save public money, and are very, very economical. Even the most expensive bicycles are much cheaper than cars. On average, a new car costs 6 times more than a new bicycle. A new highway will cost over 60 million dollars per kilometer, compared with 9 million per km of bicycle paths or tracks. Long-term savings are even greater when taking into account the savings associated with ongoing costs for fuel, repairs, registration and car insurance. Benefits provided by cycling are: zero emissions, harmless to other drivers, low purchase price and maintenance, easy access to urban areas, cheap infrastructure network, exercise and stress reduction, ability to transport goods and passengers, health etc.

Although the bicycle is a popular form of transport safety prevents most people who own bikes to ride them regularly. Most city streets are designed keeping in mind only the cars, and cycling in the street can be dangerous. The transport system has to have an independent network, as the bicycle is not considered an equal member of city traffic as other vehicles in practice. In reality, the most important preconditions for implementing cycling as a form of equal city transport is the existence of adequate infrastructure for the safe operation of bicycle traffic in urban areas. One must have built the infrastructure for bicycle traffic, which includes lanes and roads designed exclusively for bicycles, overpasses and underpasses for bikes at dangerous intersections, secure parking, and as important specialized space at work for changing into the work clothing.

Cycling as a mode of transportation is widely spread in many parts of the world. Asia continues are the dominant market. Between 1997 and 2002 bicycles made 52% of traffic, taking precedence over all other vehicles, including cars

and public transportation in Beijing. More than 15% of travelers in Japan used bicycles to travel to work or to commute to high-speed trains, with safe parking before boarding the trains that transport them daily. Many European cities are also bicycle dependant. For example, the Dutch government made a priority the safety of cyclists and implement a wide range of plans and measures to improve security. Today as many as 50% of all trips in the Dutch cities are done on bicycles.[Pinderhughes 2004]

Bicycles are an individual form of transport, where rickshaw are the bicycle public alternative. They are vehicles on bicycle wheels that does not pollute the environment and are used for the transport passengers as well as goods. Rickshaws are used in many parts of India, across Southeast Asia and many other developing countries. They have an important role in the traffic system, not only functional, but also social as they maintain a certain level of income of the most poor, and therefore are very popular among travelers. Rickshaws provide a cheap, reliable transportation option that is tailored to the traveler in urban communities. They are particularly useful for women, children, the elderly and the disabled who cannot with ease and comfort use public transport. For example, local rickshaw drivers in Mumbai daily bring and take children to school with great reliability and personal care. Despite these essential benefits, the city authorities in many developing countries, starting with a ban rickshaws, on the basis that the vehicle is moving slowly causing traffic jams or simply that it is not in line with the vision of the city that is modernizing, developing and progressing.[Pinderhughes 2004]

CONCLUSION

During recent years, there is an increase of the number of people living in cities, and as a consequence of this, cities are enlarging, unplanned and planned. The degree of physical expansion of newly built parts of cities often exceeds the capacity of basic public services and urban infrastructure. This includes the city transport infrastructure, as well as the existing traffic network. The demand of roads is growing so rapidly that the economy is struggling to supply the demand. With the increase in population there are a growing number of vehicles. Excessive car use is leading to constant city traffic jams, congestion and pollution, degrading the quality of urban life. People who live in the suburbs often have a faster and cheaper way to get to the center, because public transport does not cover emerging areas of the city. The city center is in this way depreciated. The use of private motor vehicles leads to a number of problems, and people are commuting across larger distances daily. The mobility of citizens has a negative trend, which is opposite to the social demand of the new millennium. Instead of better connected, people are becoming more isolated.

Rising energy prices, rapid depletion of non-renewable resources and climate changes affect both the lives of the people and the economies of the cities across the world. The idea that the era of individual transport is on the exhale is not new. Trying to predict the future is always risky, the need for alternative transportation systems in urban environments completely independent from cars and the existing public system will always exist. However, the concept of sustainable development, almost certainly, will not allow the artistic vision of urban congestion, such as those in science fiction movies. Although it will take more research to look at many aspects of future transportation systems in urban environments before choosing the right path, it is not difficult to conclude that the new target is a transportation system that is automated, safe, energy efficient and environmentally friendly. One can argue if the existing transportation system has become unsustainable, but nobody can argue that the need of steady improvements of this system and promotion of alternative transportation is a must. It is not important if the changes come via modernized public transport and green automatic individual transport of the future, or non-motorized individual transport of the past, as long as the changes enable the scale of city mobility to continue constantly growing.

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