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DOI

[10.1016/j.sbspro.2013.06.483](https://doi.org/10.1016/j.sbspro.2013.06.483)

Publication date

2013

Document Version

Final published version

Published in

Procedia - Social and Behavioral Sciences

License

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[Link to publication](#)

Citation for published version (APA):

Morar, T., & Bertolini, L. (2013). Planning for pedestrians: a way out of traffic congestion. *Procedia - Social and Behavioral Sciences*, 81, 600-608. <https://doi.org/10.1016/j.sbspro.2013.06.483>

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1st World Congress of Administrative & Political Sciences (ADPOL-2012)

Planning for Pedestrians: A Way Out of Traffic Congestion

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Abstract

This paper discusses the negative effects of planning for personal motorized mobility, a phenomenon currently taking place in Romanian cities. After presenting the general and particular picture of the increase in private vehicle ownership, it analyses the subject of pedestrian accessibility by looking into the past and present situation. Based on GIS measurements of population within specific service areas of public facilities, the foreseen solution takes into consideration a flexible way of planning which adapts to the existing urban structure. The results allow conscious planning decisions focused on the type and number of population with good access to these facilities.

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Selection and peer review under the responsibility of Prof. Dr. Andreea Iluzia Iacob.

Keywords: Pedestrian accessibility, urban planning, public facilities, service area;

1. Introduction

The age of mass car ownership started in Europe during the 1960's and the 1970's, a situation also studied by Buchanan in his 'Traffic in Towns' report from 1964 (Buchanan, 1964). This report stated that most probably, private vehicle ownership will be available for everyone around 2010 because of the high amount of sales which will make second-hand cars extremely cheap. Based on data from the UK, it assumed that there will be one private vehicle for every two persons. This growing trend was forecasted acknowledging the advantages of individual mobility, not only in terms of comfort but also in terms of a continuous increase of private car use.

Much of these predictions related to automobile transport growth have proved correct, as shown today by the ever-increasing number of vehicles in Europe. The same goes for developed countries across the Globe as shown by Rudinger, Donaghy, and Poppelreuter (2006, p. 63), stating that "most populations of the OECD countries have achieved almost complete motorization". Considering the case of Romania, there has been an increase in motorization rate of almost 200% from the beginning of the 1990's. In 2009, Romania had 200 vehicles/1000 inhabitants, still under Europe's average of 473 (Eurostat, 2012).

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2. Problem definition

Given the capacity of the street network laid out before the 20th century, the dense urban fabric of most European cities shows drawbacks in accepting personal motorized transportation.

Yet still, city managers in developing countries continue to plan for private transport, following the same patterns laid out 40 years ago by West-European nations (United Nations, 2010). These patterns are summarized by Fig. 1, based on world economic growth, which has had a positive trend in the last 200 years (Maddison, 2007) and is still expected to grow, according to the International Monetary Fund (Perry, 2009).

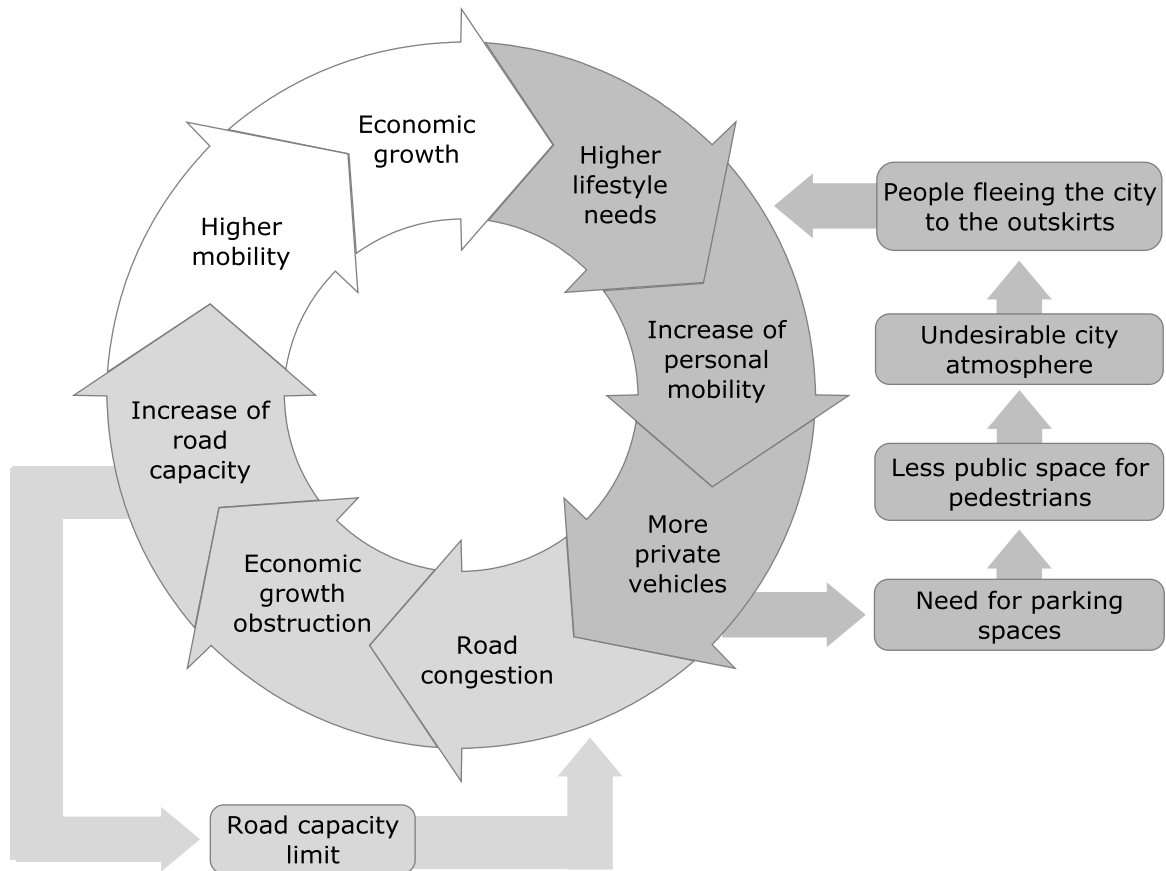


Figure 1. Patterns of effects caused by the increase in private vehicle ownership

The patterns that emerge are in the form of vicious circles that mainly affect infrastructure, putting pressure on the existing built environment. Considering an economic growth caused at first by exterior factors, a country's population gets higher incomes. Higher incomes allow citizens to have different expectations in terms of needs, one of them being increased personal mobility (Ingram & Liu, 1999). This increase in mobility means giving up public transportation and purchasing private vehicles. Given the existing city structure which accepts a finite limit of vehicles, authorities need to make compromises to create parking spaces. These compromises affect the built environment and the other traffic participants like pedestrians and cyclists. The decrease in quality of urban environment makes people feel unsafe (example: occupying sidewalks with parked vehicles makes children use the road for riding bicycles or playing which forces parents to dedicate more time to child's supervision). People thus

seek a safer environment offered by a private garden often available only in the outskirts of the city (the center being already fully built or with too high land values).

Once a family has moved out of the city, increase of personal mobility no longer represents a personal choice in improving quality of life, but a necessity. More vehicles thus need to be purchased for other family members which, along with the ones purchased for increasing quality of life, lead to road congestion (Nobis, 2003). The time spent in traffic delays economic activities and stops people from engaging leisure activities. The obstructed economic growth, as in the case of 1970's Singapore (Keong, 2012) is currently treated by increasing road capacity through means of creating more lanes, creating roundabouts, optimizing traffic lights or one-way streets. Yet all these means can increase capacity up to a limit, as demonstrated by Buchanan's study (1964). Until this limit is reached, mobility continues to grow, leading to better trade, exchange of information and car industry development, which again creates economic growth. Once the point of maximum road capacity is reached, people start spending more and more time for daily job commuting, as in the case of today's metropolitan Moscow (Mason & Nigmatullina, 2011).

In conclusion, the main circle presented in Fig. 1 forces into action other two vicious ones that will, in the end, slow it down or even put it on halt.

2.1. The case of Romanian cities

Taking a closer look at Romanian cities, we encounter most of the elements shown in Fig. 1, starting with the economic growth (Dracea & Cristea, 2010), and ending with the Romanian capital city of Bucharest investing hundreds of thousands of Euros into road infrastructure (Bucharest General City Council, 2005) because of the constant growth of private vehicles (Guga, 2010) and the risk of permanent traffic jams (Fistung, 2006).

The same goes for the other main Romanian cities, but on a lower scale compared to Bucharest, considering the lesser economic development and population number. So, according to Fig. 1, we can identify the main phenomenon as shown below.

Considering the economic crisis, used cars are entering the Romanian market, continuously lowering the economic status of people affording a private vehicle, reaching in 2010 a 79.7 percent of all sold cars, in respect to only 28.7 in 2007 (Cruceru & Micuda, 2010).

This situation is creating pressure on municipalities to provide an ever increasing number of parking spaces (S.C. Veltona S.R.L., 2011) to avoid social tensions. Generally this comes at the expense of pedestrian space, with examples of redesigned streets with narrower or just one sidewalk (Marascu, 2012; VRN, 2012) and green space being sacrificed to create parking spaces (Deleanu, 2012; Tribuna, 2007). The phenomenon is not only coming from the authorities but also from residents who gather signatures requesting green space around condominiums to be removed to create parking spaces.

The poor condition of Romania's rail infrastructure (Fistung, Antonescu, & Popescu, 2003) leaves citizens with the private vehicle as best alternative for long distance travel. So, along with the urban sprawl phenomenon (Suditu et al., 2010), there is a continuous pressure on city arteries coming from exterior traffic, which is then transmitted to the whole street network. In response to this situation, authorities have started building bicycle paths. But, given the outdated regulations for bicycle infrastructure (STAS 10144/1-90 and STAS 10144/2-91), specifying for example the width of 1m for a one-way path (as opposed to 1.6m needed for a safe overcrossing), many still feel unsafe or disrupt pedestrians by being painted on the sidewalk.

As recommended by urban transport scholars, another solution is improving public transportation, but, with trams operating in only 14 out of 41 county seats, other modes of public transport use the same network as private vehicles, being subject to the same network speed.

3. A planning solution against congestion

In transport planning practice, there are three main ways of dealing with traffic congestion, namely improving public transport, planning for cycling and planning for walking. All of them are complemented by auxiliary means

like road pricing, ride sharing programs, transit oriented developments, bike rental facilities, and compact residential developments.

If in Romania the first two main ways gather attention from local authorities, there is no current theoretical framework for planning for pedestrians. This is why we chose to frame the tools that planners can use to evaluate and improve the pedestrian environment of cities.

First of all it is important to acknowledge the fact that on foot movement is a way of transport present at least at the beginning and end of every trip. If we look at statistical figures, we see that it accounts for 80% of journeys under 1.6km (Goodman & Tolley, 2003). The same authors state that these represent 28% of all journeys, number which is confirmed by a survey of seven European countries (European Commission, 2007).

The main answer to the question about how to plan for pedestrians is planning for accessibility instead of planning for mobility. We know that mobility assesses the ability to move from one place to another (El-Geneidy & Levinson, 2006) while accessibility represents the potential of opportunities for interaction (Hansen, 1959). Indeed, pedestrian mobility is a key factor of walking as transport mode, being related to infrastructure qualities like:

- Sidewalk width (Office of Planning Environment & Realty, 2012)
- Safety at crossing facilities (Florida Department of Transportation, 1999)
- Presence of ramps (Florida Department of Transportation, 2003)
- Protection from elements of nature (Bach & Pressman, 1992)
- Interaction with other modes sharing the same road surface (Kwon, Morichi, & Yai, 1998)

But, even with an ideal infrastructure, half of all walking trips still remain under 10min., with other 18% longer than 20min and only 9% over 30min. (New Zealand Land Transport Division, 2007). This concludes that facilities placed within reach represent the key to improving pedestrian transport.

3.1. A historical background of planning for pedestrians

Considering planning as “public forethought [...] before taking community-determined public-interest action” (Riddell, 2004, p. 12), before making recommendations, it would be useful to first look at how the pedestrian environment evolved throughout some defining moments of urban history.

We consider the medieval town as a starting point of the historical overview. The medieval town grew as a chain reaction starting with technological advances that allowed changing traction from ox to horse (Langdon & Claridge, 2011), resulting in doubling merchandise movement speed between settlements, and ending with the development of the marketplace.

Although planning was not regulated by an administrative authority, medieval towns can still be defined by several items. First of all if we look at town dimensions (Wolfe, 2009), radiuses from the central marketplace to the exterior walls were between 300 and 450m. There was a natural division of streets based on type of traffic, namely horseback and carriages were only allowed on main streets, secondary streets being used only by pedestrians (Prabhu, 2008). Walls were acting as barriers and gates were regulating main arteries. These radial arteries, connecting the plaza to the gates, further extended into the territory connecting it to its hinterland on which it depended (Keene, 1998). Another important characteristic is attention to foot accessibility by creating narrow pathways which literally cut through the built form to have faster connections between different points.

These principles of self-organization of foot traffic are important because they provide practical guidelines of managing tight urban spaces where living and working coexist.

The next step in urban history is the industrial revolution, which, by introducing coal and steam power considerably increased transport speed and, on a general level, shifted manual and animal labor to mechanized one. This period may be considered starting from the second half of the 18th century and ending with the First World War.

Urban planning starts to make its way as a discipline after the middle of the 19th century also because of changes of ownership in property which went into public or private hands, the demolition of the city walls and inner-city reforms which took place in some cities (Vilagrasa Ibarz, 1998). The main purpose of urban planning movements of the Industrial Revolution was dealing with problems created by overcrowding, namely solving the health and social

crises of cities and balancing city/country opposition. Planning was also rooted into the ideas of Enlightenment, meaning that the urban space had to be a coherent system that would integrate functions like hospitals, markets, schools, prisons etc. Architects and engineers began to see the city as a "dynamic system in which mobility and viability were the most important challenges" (Sánchez de Juan, 2001, p. 4), as seen in Ebenezer Howard's Garden City diagram where the distance between the railway station and the city center was 10 minutes walking time and the whole diameter of the city was no larger than a 30 minutes' walk (Howard, 1902, p. 129).

We conclude that the use of public transportation had to integrate walking capabilities and could not represent a total break from man's self ability to move.

Looking into the development of East-Europe, we consider the inter-war period as minor in terms of new development, and reach the socialist era which started after the Second World War.

In socialist regimes, cities were seen as main points of modernization, and "the productive industrial sectors of the economy were regarded as fundamental for rapid economic growth" (Sailer-Fliege, 1999, p. 9). This is why a rapid expansion of cities was urged for, following the principles of economic efficiency through agglomeration, and leading to development of large compact urban areas. Pre-socialist inheritance was considered unproductive and was to be gradually demolished (Ioan, 2005).

To reach these goals of rapid economic growth, taking advantage of full authority, the state commissioned architects to develop efficient urban forms characterized by population density and relying on public transport (Hass-Klau, 2003). In Romania's case the post-war governments had to supply the need for housing by building relatively cheap collective dwellings. They were generally placed in the proximity of industrial areas, and until 1999 state-built housing reached a total number of 3,181,700 apartments (Luca, 2009). The theory behind these developments was the neighborhood unit concept. It stated that no matter how large the new city would be, it should assign one hectare for 300 to 500 people and 12sqm of floor space per person. The neighborhood units would have a population of 7000 inhabitants and have utilities like kindergartens, playgrounds, schools and shops according to normative indices. There would be a separation between automobile and pedestrian traffic and the complex would be delimited by major transportation routes (Fisher, 1962). The same ideas were applied in the capitalist society at the same time, with the example of the County of Buckingham who prepared a plan in the 1960's for a new town of 250.000 inhabitants organized around communities of 5-7000 people. Each of these communities was placed at seven minutes walking distance to a central monorail station (Moughtin, 1996). A similar approach has been implemented in a study by Branea, Radoslav, Gaman, and Morar (2011) on the Romanian city of Timișoara

3.2. Current state of planning

In Europe, there are currently two planning trends which didn't see large-scale implementations, namely car-free and low-car developments (Melia, 2010). There are two reasons why their implementation is difficult, namely because a car-free residential development requires a new build form and free land for building is generally scarce in European cities, and secondly, they require public consultation which makes them unsuitable for countries where community involvement in planning isn't common.

In Romania's case, with planning regulations not requesting accessibility planning, current master plans seek to address urgent issues such as providing land for private housing and ensuring the functionality of road infrastructure. Cities with outdated master plans use zone plans to solve issues below neighbourhood level. These zonal plans, although supposed to follow the master plan's guidelines, often end up serving the private interests of the land owners commissioning them. Planning without an integrated vision leads to villages around cities being swallowed by the main body which is extending with a village-type pattern. This means that what neither the industrial nor the socialist city could reach is seen today in the free market economy, namely man's self ability to move being denied by the necessity of using the private vehicle.

Attention to pedestrian environment is only taking shape in some city centres by creating pedestrian-only streets and redesigning public squares. These actions are visible in tourist destinations which inherited historical centres, like Cluj-Napoca, Brașov, Sibiu, Timișoara, Oradea, and Bucharest. They represent a step forward, but follow a

trend which has been going on in western countries for at least twenty years (Topp & Pharoah, 1994), and do not solve problems of peripheral neighbourhoods.

In conclusion, we see that planning for pedestrians during history has at started from a self-management to a gradually planned approach until the extensive growth of the private vehicle. This growth didn't affect man's acceptable travel time, but extended the accessibility radius, making life relying on one's self ability to move difficult.

4. Planning for access to daily facilities

Our vision is not reversing the current trend of society's evolution, but offering an alternative for the 73.1% Romanian households which do not own a car (National Institute of Statistics, 2012, p. 30). This alternative may be offered through evaluating pedestrian access to neighborhood-scale public and private facilities used daily. An example of private initiatives is Romanian food-chain stores (La Doi Pași and Mic.ro) that have developed in the last two years neighborhood-scale shops instead of supermarkets designed for car-use. The same trend is partly followed by large-scale retailers like Billa and Profi.

Since current Romanian master plans use mixed land-use regulations, in the last twenty years, small commerce occupied ground-levels of residential buildings, but survived only in places with enough population support it. This is why the administration's role would only be advisory in the case of private investments (pharmacies, shops, and private kindergartens) but decisive in the case of public facilities, namely: public squares, parks, bus stops, playgrounds, kindergartens schools and health clinics.

We have seen in the historical overview, and in other accessibility studies (Cervero & Kockelman, 1997; Cervero, Murphy, Ferrell, Goguts, & Tsai, 2004) that an accepted pedestrian service area is generally considered 10min. walking, meaning roughly 800m. Our suggestion is that accessibility planning for these facilities shouldn't follow a single timeframe (or distance), but one according to type and importance. The first step in spatial analysis of public service provision is estimating the specific service area (Bigman & Deichmann, 2000). Academic literature on accessibility can be used to identify these individual service areas, as shown in Table 1.

Table 1. Service areas according to facility type

Facility	Maximum distance (m)	Source
Neighbourhood public space	800	Pasaogullari and Doratli (2004)
Local food shop	250	Achen (2005)
Neighbourhood scale food shop	500	Achen (2005)
Bus stop	400	Hurley and Horne (2006); Regional Plan Association (1997)
School	800	(Müller, Tscharaktschiew, & Haase, 2008); Timperio et al. (2006)
Playground	200	Jansson and Persson (2010)
Railway station	800	Hurley and Horne (2006)
Residential green	150	Van Herzele and Wiedemann (2003)
Neighbourhood green (1ha)	400	Van Herzele and Wiedemann (2003)
Quarter green (1-5ha)	800	Van Herzele and Wiedemann (2003)
District green (5-10ha)	1600	Van Herzele and Wiedemann (2003)
Health clinic	3200	Phillips (1981)

This shortest distance-index is based on the assumption that people tend to use the closest facility, as demonstrated by Mayhew and Leonardi (1982).

The suggested methodology for evaluating pedestrian accessibility follows three main principles: building the city's density on household level, mapping the addresses or contours of the type of facility studied and mapping types of neighborhoods. With the help of ArcGIS 10 and Network Analyst, objective results may be drawn by calculating number and type of population within the service area, as seen in the study of access to public spaces in the Romanian city of Timișoara (Morar, 2012).

5. Conclusion

With the approach presented in this paper, local administrations have a way to work with the existing city structure, by creating accessibility plans for all neighborhood-level facilities. This way building, renewing or closing down actions may be based not only on economic or opportunistic principles, such as funds that need to be spent in a short timeframe on a certain type of activity (like creating new green areas). Building authorizations for new private facilities (like kindergartens) may be issued after a discussion on several placement options according to the service area of existing ones. Street networks proposed by new zonal plans may be tested before final authorization if they improve or diminish access between neighboring points of interest. Accessibility levels can be evaluated and improved also based on population needs, since different age or income groups have different needs as shown by Michelson (1977). One of the final and most important aspects may be that if applied on national level, it may allow comparisons between past, present and possible future, and between different cities

Further research may mean introducing density parameters for sustaining public facilities, as seen in the work of Moughtin (1996).

As a final conclusion, we consider this approach extremely useful because it offers an alternative to mobility planning in a state that has the chance to learn from planning errors which in the past affected current motorized states.

Acknowledgements

This work was partially supported by the strategic grant POSDRU 107/1.5/S/77265, inside POSDRU Romania 2007-2013 co-financed by the European Social Fund – Investing in People.

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