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Parking Policies for Supporting Sustainable Mobility

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Abstract

Parking policies have become an integral part of modern urban planning strategies as transportation planners and engineers have recognized the substantial impact they may have on mode choice and travel routes, directly affecting urban mobility characteristics. For parking policies to be truly valuable and effective, they should be carefully integrated into a transport development plan aiming to achieve the long-term targets of sustainable mobility. To this end, this paper investigates the impact of parking policies on urban mobility characteristics and then highlights, through a case study in a medium-sized Greek city, the actions to be undertaken for their successful implementation.

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Keywords: sustainable mobility, parking policy, implementation actions, market uptake

1. Introduction

The significant increase of automobile use over the past years has highlighted parking as an integral part of modern urban planning strategies aiming to efficiently manage demand for transport. Transportation planners and engineers have become aware of the substantial impact that parking policies may have on mode choice and travel routes (Feeney, 1989) directly affecting urban mobility characteristics such as traffic congestion, accessibility, safety, etc as well as the environment (air & noise pollution) thus influencing economic development (Sisiopiku, 2001).

Parking policy is considered to be one of the key links between transport and land-use policy (Marsden, 2006). Traditional parking policies have been focusing on creating parking supply far in excess of demand, fostering in that way car use while undermining public transit, walking and bicycling. However, subsequent parking policies mainly focused on the effective management of the existing parking supply, which proves to be a major impediment for establishing an effective and balanced urban transportation system (Bradley, 1996). Being more transit-oriented, recent parking policies aim to

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effectively manage parking demand through several types of interventions including control on the number of parking spaces and their spatial distribution, parking costs, parking time limitations, residential parking permits, provision of employee parking, etc. which, through different levels of policy enforcement, can lead to less car dependent forms of transport (Shiftan, Y., Burd-Eden, R., 2001).

In order to make parking policies truly effective, they should be carefully integrated into a transport development plan aiming to achieve long-term quality targets and provide a holistic vision of a city. These targets set out quality requirements and define a desired situation that can be characterized by the term “sustainable mobility”. Within this context, several actions have been undertaken focusing on the development of more efficient conventional transport technology, the use of alternative fuels, the promotion of an efficient and affordable public transport system, the encouragement of environmental awareness, the use of sustainable land-use planning, etc. (The Federal Environment Agency, 2005).

This paper focuses on the implementation of different parking policies in order to meet the targets of sustainable mobility. To this end, it first examines how parking policies can affect traffic conditions, how they can contribute to meeting the targets of sustainable mobility and what are the factors that influence their acceptance by the local communities. Then, through an examination of sustainable policies to a medium-sized Greek city, the paper indicates the actions/steps that should be followed in order for the measures/policies to be successfully implemented. Finally, through a cross-comparison and evaluation, the benefits that road users may derive in terms of time and money savings are highlighted, leading to a more livable and attractive community.

2. Overview of the impact of parking policies on urban mobility characteristics

2.1. Introduction of parking policies

The development of parking policies is usually driven by the following factors: (i) increasing car ownership and car use, (ii) increasing population, (iii) less available space for car parking, (iv) limited road infrastructure and (v) available alternative modes of transport. The framework in which parking policy measures are introduced to a city as a whole or to a certain part of the city usually follows a similar pattern visualized in the following figure (Fig. 1).

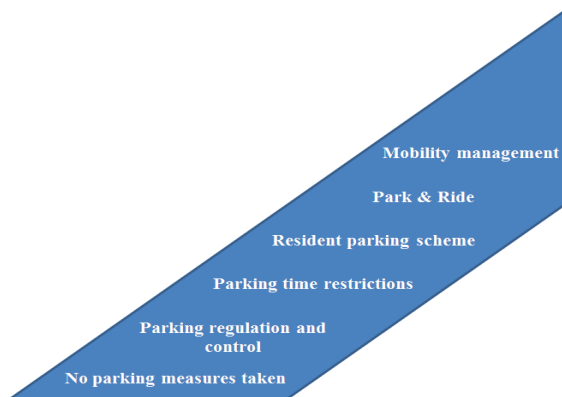


Fig. 1 The evolution of parking policy measures (de Wit, 2005)

In case where no special measures are taken, available parking space is used until the number of parked cars has a negative impact on the quality of life in an urban area. At that point, parking regulations should be enforced (e.g. parking time restrictions) forcing long-term parkers to search for alternative available parking spaces in areas often away from city centers or select another transport mode while visitors are encouraged to efficiently use their parking time. However, tight parking control policies tend to offset the problem to neighboring areas, which are often residential ones. Residential parking schemes (parking permits for residents only) will then have to be introduced allowing residents to park in preference to non-residents. Further increase to parking demand results in the introduction of paid parking

as a demand control measure. The differentiation in parking tariffs then becomes the key to control the use of parking spaces.

The measures presented above along with the concept of Park & Ride, which enables motorists to park on suburban areas and reach their final destination by public transport (Dijk & Montalvo, 2011) serve the concept of “mobility management” aiming to enhance the accessibility of cities ensuring an acceptable mobility-chain for travelers. Although they do not represent the entire variety of parking policy measures that have been introduced worldwide, they prove to be the most popular ones, of which each one has a direct and different impact on traffic (de Wit, 2005).

2.2. Impact of parking policies on traffic

Generally, less parking spaces exacerbate the environmental impact of vehicles since drivers tend to “circle the block” in order to find a place to park their vehicles. In city centers, often highly congested areas, parking availability may affect traffic volumes entering the area while the location and layout of parking spaces may have an impact on traffic within the center (Bradley, 1996).

A typical example of a successful parking policy is the one implemented in the city of London. Within the framework of maximizing non-car travel use and making the best use of London’s public transport network, working parking levies were introduced at first. However, it was found out that their implementation will be too costly with only 3-4% traffic reduction thus businesses and employees (around 75%) were strongly opposed to this idea. The revision of the parking system was then integrated into the congestion charging program leading to 28% and 3% reduction in parking activity inside and outside the congestion charging zone respectively. Furthermore, the recent technological advances made possible to link parking charges with the emissions level (Baigabulova, 2010).

Another successful experience has been documented in the city of Vienna, where the “Parking Space Management” program resulted in 25% reorientation of visitors to public transport, 25% decrease of the use of parking spaces in the morning and 10% in the afternoon while traffic, searching for parking spaces, decreased from 10 to 3.3 million passenger car kilometers annually leading to the reduction of the average time needed to locate a parking space from 9 to 3 minutes.

A study that was undertaken in the Helsinki metropolitan area, also highlighted the effects that different parking measures can have on the share of car traffic in the modal split: (i) an increase in parking costs by 30% was found to lead to a decrease of car share of 8-10% while a doubling of parking costs would lead to a 21% decrease of car share, (ii) if parking costs would always be at the same level as the fares of public transport, car share would decrease by 8% (de Wit, 2005).

In Munich, a before and after study indicated the impact of residential parking permits on the modal choice of employees. The share of SOV dropped from 44 to 32% while traffic peaks and search traffic during the day were reduced. Such reduction in the share of SOV was also reported in Kaiserslautern (6,4%) as a result of parking time limits.

In Salzburg all on-street parking spaces were transformed into short-duration spaces (90-180 minutes), leading to a decrease of the average occupancy from 85 to 76% while the average parking duration was reduced from 169 to 124 minutes. In total, traffic in the city’s core area decreased by 5,5% (Topp, 1995).

Beside the above indicative examples, many cities worldwide have reported several positive impacts on traffic characteristics as a result of the implementation of appropriate parking policies. The EU support plays an important role on the wide dissemination of experience between cities and countries.

2.3. Parking policies towards sustainable mobility

Planning a sustainable transport system proves to be a complicated task with high degrees of uncertainty mainly due to (i) the large number of alternative potential policy packages and the way they are implemented and (ii) the travelers’ response to each of these packages (Shiftan, Kaplan, & Hakkert, 2003). Focusing on parking policies, research has highlighted, over the last two (2) decades, several issues that have been raised through the implementation of inefficient parking policies mainly concerning aspects of (Deller, J., Hoeksema, D., 2011):

- *Economic development*: parking increases the cost for new developments, takes up valuable space and reduces development yields
- *Travel and lifestyle patterns*: low parking costs and excessive parking availability supports sprawling development and unsustainable travel patterns
- *The environment*: parking policies fostering vehicle-depend travel patterns can result in substantial increase of land and fossil fuel consumption due to low density.
- *Social inequalities*: inefficient policies may cause an disproportional distribution of parking costs to low-income households , who drive less, own fewer vehicles and make more use of alternative transport modes
- *Transport demand*: parking is influenced by a range of complex and unpredictable socio-economic factors, which cannot be modeled accurately.

As parking is not an end itself and is always arising from other needs, parking policies should be an integral part of any city's policy on mobility and accessibility taking always into consideration the basic principles of sustainability (Weinberger, R., Kaehny, J. & Rufo, M., 2010):

- The minimum parking requirements in an area should subsidize driving by shifting the costs of car use to development and the non-driving public.
- The direct and indirect parking costs should burden parkers and not the other road users
- As excessive parking worsens the accessibility level of an area, parking requirements fostering the use of more sustainable transport modes (public transit, walking and bicycling) should be set.
- Increasing parking supply lowers prices and stimulates increased parking demand.
- Parking demand is influenced by price and travel alternatives.
- The supply and price of on and off-street parking influence each other.

While these issues are well understood they are infrequently invoked. However, a handful of cities in the United States of America are using them to develop new policies which support broader sustainability and economic development goals.

2.4. Public acceptance of parking policies

The public acceptance of parking policies proves to be a major issue since the complexity of parking is often not well understood and accepted, leading to a general rejection of parking measures. To this end, communication and information with / to the public seems to be the key for an effective parking policy acting as a part of an integrated transportation planning process. More specifically, the public acceptance of parking policies relates to (de Wit, 2005):

- *Provision of the necessary information to the public (prior to the measures)*: Residents have to be informed regarding the proposed parking measures and be aware of their scope and objectives.
- *Perceived benefits*: Parking policies should be perceived as a facilitating tool and not as a way to increase revenue.
- *Availability of alternative transport modes*: Practical experience from many countries indicates that a sufficient supply of public transport should be part of a parking policy package.
- *Revenue allocation*: The public should be informed regarding the use of parking charges and the benefit that is expected to be derived from them for the transport sector.
- *Level of policy enforcement*: Where policy enforcement is not very strict, high rates of non-acceptance are reported in the form of illegal parking (indicator of acceptance).
- *Innovative measures*: Innovative measures can contribute to a higher acceptance of parking policies due to a higher discipline concerning regulations of payment issues and parking time restrictions.
- *Communication efforts*: Communication efforts should already be initiated in the very beginning of the decision making process
- *Earlier parking policy experiences*: The EU support for activities aiming at the wide dissemination of good experiences between cities and countries proves to be an important issue.

A good example of a parking policy introduced along with the participation of the public is that of Barcelona. With the integrated offer of different services, the Barcelona Mobility Services (BSM) worked towards achieving efficient and sustainable mobility in the city. Although this new initiative engaged

additional financial burden to the users of this parking area since 2001, the general acceptance of the parking policy has increased by more than 20%. The shop owners particularly appreciated the advantages of the new parking management system ("City Parking in Europe" consortium, 2007).

3. Introducing a new parking policy in a medium-sized city in Greece

Parking policies no longer characterize only large-sized cities. Medium-sized cities also present special challenges in terms of parking policies and sustainable mobility. A parking policy in a medium-sized city must address several issues, ensuring the accessibility of the city center urban facilities and encouraging migrant workers to change their mode of transport promoting the use of public transport and other sustainable modes. Hence, in order to meet sustainable parking policies it is critical to introduce measures that address all aspects of sustainable mobility such as environmental awareness, more efficient energy consumption, social acceptance and economic viability (CERTU, 2009). Such measures were proposed in a transport study in which the parking characteristics of the city of Giannitsa were investigated.

The city is located about sixty (60) kilometers outside Thessaloniki and has a population of thirty-thousand (30.000) inhabitants. The field measurements of parking survey were held between January and June 2007 and the whole parking study ran for about a year (November 2006 – December 2007). The parking study led to specific results summarized below (Papoutsis, K. & Sdoukopoulos, L., 2008):

- *Parking supply in the study area: 7962* parking spaces of which **3590** are on-street spaces (45%) and **4372** off-street ones (55%).
- *Parking demand is 9321* parking spaces
- *Illegally parked vehicles: 1359* vehicles (**932** due to parking legislation and **427** due to road geometry)
- *Parking turnover* (of three selected routes within the city): **2,37** veh/15h in the first route, **4,22** veh/15h in the second and **3,32** veh/15h in the third.
- For all three routes: *legal parking turnover: 3,61* vehicles/15h, *illegal parking turnover: 3,05* veh/15h and *total parking turnover: 3,33* veh/15h
- *Distribution of the total parking demand based on the total parking duration: 67%* of the total number of vehicles had parked for **up to 2 hours**, **24%** had parked **between 2 - 7 hours** and finally **9%** them had parked for more than **7 hours**.

The examination of the parking characteristics in the city of Giannitsa as presented above, along with a stated-preference survey which was also conducted aiming to identify the respondents' (residents and visitors) point of view regarding the major traffic problems encountered within the city, indicated the main problems that the local community faces, which can be summarized to the following: (i) high rate of both car ownership per habitant and usage, (ii) the illegal parking as a result of the increased parking demand exceeding the existing parking supply in the city center, (iii) the low turnover of cars at on-street parking places, (iv) the traffic congestion caused by drivers circling the area in order to locate an available place to park and (v) local delivery trucks occupying many parking spaces aiming to serve their customers during peak hours.

The proposed measures aiming to alter the parking status quo of the Giannitsa city center and meet the targets of sustainable mobility can be summarized to the following:

- *Introduction of a Controlled Parking Zone (CPZ) in the city center:* Within this zone (Fig. 2), two types of interventions were proposed. The first focused on the central roads within the CPZ, where a pricing parking policy was introduced forcing both residents and visitors who want to park there to pay a fare of 0,5 €/hour. The proposed parking policy was expected to last all days (except Sunday) from 9 a.m. to 3 p.m.. The remaining available parking spaces would permit the parking needs of the residents who live within the CPZ. By acquiring a specific resident card, residents would have the opportunity to park there, free of charge. The potential benefits according to pertinent literature include: (i) less congestion due to lack of obstructions (e.g. illegal parking), (ii) higher turnover of parking spaces - thus easier to park, (iii) reduced pollution and fuel use due to less circulating traffic and less congestion, (iv) safer streets due to less circulating traffic, (v) improved emergency service access due to less congested streets, and (vi) reduced resources for enforcement.

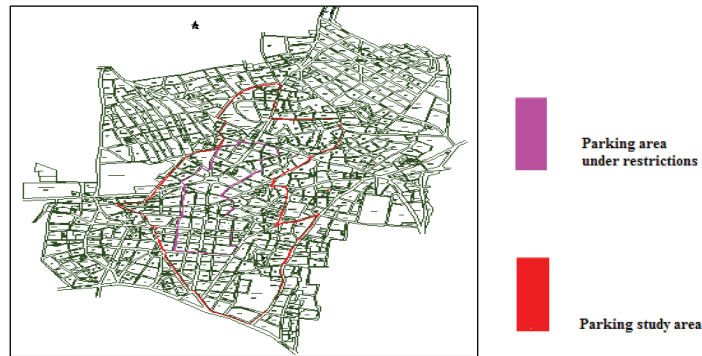


Fig. 2: Urban area of Giannitsa city and the according parking regime (Papoutsis, K. & Sdoukopoulos, L., 2008)

- *Converting 'illegal' parking places to 'legal' ones* within the CPZ by removing the existing parking signs in several streets. During the survey, it was found out that those parking spaces being illegal did not improve the traffic conditions within the city center. This change would lead to a slight increase of the existing parking supply within the CPZ.
- *Install short pillars on certain points with the city's transport network in order to prevent illegal parking.* This measure was included in the broader context of proposing traffic calming measures that would prevent illegal on-street parking, such as widening the adjacent pavements, modifying the layout of the existing parking spaces and clearly marking them. Streets nearby areas of increased attraction such as the police headquarters, the municipality administration etc., were found to be highly congested during peak hours due the large number of cars illegally parking there. Installing short pillars on the one side of the street would prevent vehicles from illegally parking there while the specific parking places (even though they were illegal) were proposed to be located to a free of charge public parking place located around 150 meters far from that area.

The new parking policy would set up **seventy (70)** additional parking spaces. The difference would occur by the parking scheme change in the new CPZ, and the addition of parking spaces into the CPZ regime which were previously illegal (Papoutsis, K. & Sdoukopoulos, L., 2008). The CPZ is expected to result in higher turnover of parking vehicles within the city center, less time required for a driver to locate available space to park and reduced traffic volumes. The implementation of a CPZ can also contribute to a great extent in minimizing CO₂ and other GHG emissions as well as energy consumption due to less operational costs. Other positive environmental impacts could be the de-escalation of the level of noise produced by cars (braking, sharp acceleration, etc) and the improvement of space occupancy, an issue of more relevance to aesthetic view of the urban environment. The expected outcome does not include the increase of total parking places offered in the study area because this could generate more car trips to the center of the city and finally aim to raise the traffic congestion than reduce it.

The social impact of parking policies is directly related to (i) accessibility (especially through reducing the journeys' time and cost), (ii) the increased use of sustainable transport modes (e.g. public transport, bicycling, walking) thus enhancing their attraction, (iii) improved quality of life in the city center resulting from the reduction of traffic congestion and the minimization of the negative environmental impacts and finally (iv) the increased efficiency of the overall transport system.

The economic benefits of parking policies can be realized through the improvement of the efficiency of local market operations in terms of consistent and reliable distribution services. The urban transport environment in medium-sized cities tends to cause delays especially in the highly congested city centers while the need to further increase parking demand becomes apparent for improving the efficiency of urban deliveries. In a nutshell, reducing traffic congestion as a result of the proposed parking policy (CPZ) could facilitate urban distribution activities thus realizing savings in terms of time, money and space occupation.

Another impact on the local economy that can be identified through the implementation of the CPZ is the increased accessibility of the local market, which is to a large extent located in the city center. Preserving the viability of shops in the center of Giannitsa proves to be an important issue as there is

fierce competition with supermarkets and other shops with large parking facilities located on the outskirts of the city. The proposed parking policy, along with the fact that no off-street parking is offered, can assist the visitors of the city center in efficiently using their parking time, enabling the high turnover of cars thus fostering further economic development of the local market.

4. Incorporating sustainability into parking policies in medium-sized cities

The overall impact of new parking policies towards the long process of achieving sustainable mobility proves to be substantial. A thorough review of pertinent literature as well as empirical knowledge enabled the development of quantitative and qualitative Sustainable Mobility Indicators (SMI) for evaluating the sustainable impact of the proposed parking measures. Falling under three (3) major categories i.e. environmental-energy, social and economic ones (Shiftan, Kaplan, & Hakkert, 2003), the SMI will facilitate the comparison of the before and after situation, highlighting the benefits that were gained.

As mentioned before, the over-arching target of the proposed CPZ is the augmentation of parking turnover and the reduction of traffic congestion especially in the streets of the commercial city center. To evaluate the impact of the implementation of the CPZ as well as other sustainable parking stimulating measures a set of SMI are proposed and described below (Sustainable Transportation Indicators Subcommittee, 2009):

Sustainable Mobility Indicators relevant to the **environment-energy**:

- **Overall parking rotation ratio per day (15h) and average parking turnover (per hour) in the CPZ.** High parking turnover indicates less trip time in the urban network (for parking place occupation) and less environmental emissions.
- **Total parking demand for parking stations as a percentage of the total parking demand in the area.** An increase in that indicator would show that the measures succeeded their target.
- **Annual energy consumption per resident (or in total) in the city center or in the introduced CPZ.** The reduction of this indicator would ensure the policy's successful implementation and effectiveness.
- **Levels of CO₂, NO_x, hydrocarbons and particles per resident (or total) in the city center or in the introduced CPZ.** Reduced level of emissions indicates effective parking policy.
- **Daily individual consumption of public space involved in parking.** Decrease in the value of this indicator means less traffic flow in the city center thus less parked cars (either legal or illegal).
- A secondary indicator could be **the level of noise in a central street of Giannitsa (per day or annually).**

With the context of urban sustainable mobility, the following **social indicators** could be considered:

- **Proportion of households owning 0, 1 or more cars.** Although not directly relevant to the impact of parking policies, this indicator can be considered in multiple ways.
- **Trips ending to the city center.** Limiting this indicator will result in less traffic congestion in the city center.
- **Expenditures for urban mobility: amounts for private/public transport relating to trips in the city center.** A slight cost reduction for private transport and/or an increase in the costs for public transport reflects an apparent change in resident preferences regarding their mobility in the network.
- **Awareness level.** Degree to which the awareness of the policies/measures has changed.
- **Acceptance level.** Attitude survey of current acceptance of the measures. The two last indicators are considered as quantitative ones.

Economic indicators should be carefully considered as they represent local market uptake which encompasses local authorities, residents and companies. A list of recommended indicators would be:

- **Delays of freight distribution in the city center and especially in the CPZ.** Minimization of delays in urban freight distribution would improve the performance of the urban logistic system.
- **Modal shift to non-motorized transport means per trip type or per traveler type.** This quantitative indicator reveals the change of travel options to more environmentally friendly transport modes.
- **Quality of urban mobility (walking, cycling, public transit, driving, taxi, etc.)** This indicator will reveal the improvement or not of the quality of mobility in the city center.

5. Comparison between cases – Cross evaluation

The above mentioned parking policy, introduces sustainability aspects into the city’s transport network aiming to achieve environmental, economic as well as social welfare. To estimate the impact of the proposed measures to the city of Giannitsa, a direct comparison with cases/cities of similar characteristics either in Greece or abroad is performed and described below.

An example of successfully implementing a CPZ has been recorded in Graz, Austria. The CPZ was introduced in the central and inner city following a similar pattern to the one in the city of Giannitsa. As a result, the “spillover” effect on the inner controlled zone was reduced, keeping Graz economically healthy and maintaining its high mode share for walking, cycling and public transport (Rye, 2010).

In Norwich, the main employment center in East England, the increase of car ownership levels as well as the tendency of commuters parking in residential streets around the city center, forced the City Council to implement a more efficient charging measure based on vehicle technology. The main results of the new measure can be summarized to the following: (i) slight downward trend in the fuel consumption, (ii) reduction of the total amount of emissions (e.g. CO₂) coming out from vehicles use, (iii) slight increase of the public awareness regarding the new policy and (iv) increase in policy acceptance especially by those who suffer financially from the revised tariffs. Along with these results, there has been a trend to increase the use of fuel efficient vehicles, raise public awareness and the perception of the advantages in owing fuel efficient vehicles and engage political support. (CIVITAS "SMILE" consortium, 2008).

The CAGID initiative, carried out in 1970 in Boulder city (Colorado, USA) aimed mainly at improving access to downtown, managing and promoting downtown public space and promoting downtown business assisting the local market. Its main characteristics were the obligatory charging of on and off-street parking, pricing indicative to ensure short-time on street parking, and finally the parking revenue subsidizing the bus public transport which was carefully deployed to serve downtown employees. Some of the outcomes of this program in a twenty-five year period were: (i) a bondable revenue stream from real estate taxes and parking meters, (ii) issued debt to build centrally located public garages, (iii) promotion of seasonal events to attract visitors and promote business and (iv) raised meter rates to create turn-over and raise revenue for bonds and operations (Weinberger, R., Kaehny, J. & Rufo, M., 2010).

The range of measures that are proposed in the city of Giannitsa can be successfully transferred to cities of similar traffic and socio-economic characteristics around Greece with the objective to incorporate a sustainable aspect of mobility without sacrificing their existing structures. A diagnosis of the situation in the target city is required, followed by a pre-selection of the possible measures addressing the problems identified. Once this is defined, the transferability process can be initiated enabling the in-depth understanding of the steps involved and the hypothesis and feasibility of the process in order to become operational. The figure below (Figure 3) indicates guidelines that should be considered forming a transferability framework.

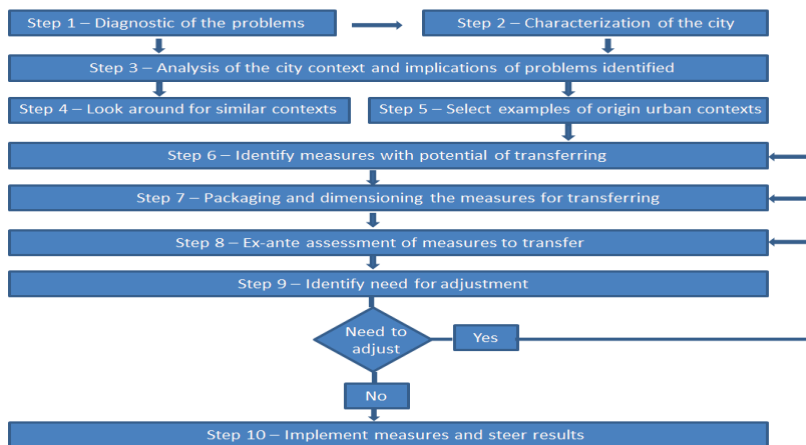


Fig. 3: Transferability guidelines of sustainable mobility measures to other contexts (Macario & Marques, 2008)

6. Discussion

Incorporating sustainability into mobility schemes proves to be a complicated procedure due to the great attention that has to be placed in the reformulation of urban mobility characteristics. Although parking management proves to be an appropriate tool for defining mobility aspects in an urban area or city center, the impact of parking policies supporting sustainable mobility cannot be easily evaluated.

Many attempts have been made to implement proper, targeted and sustainability-oriented parking policies. Eventually, any parking policy will aim to change long to short stay parking in urban areas preventing in that way commuters from occupying parking places, planned for visitors and consumers. A well-organized and carefully implemented parking policy will certainly have a mitigating effect on urban car-mobility along with other major benefits (environmental, economic and social). However, a lack of effectiveness characterizes such initiatives, due to the additional financial burden that arises for the local community. To this end, the successful implementation of a parking policy largely depends on the social acceptance of the proposed measures. Clearly there is a need to inform people that despite the additional financial burden that may arise, the proposed measures will benefit the local community in the long-term. The difficulty specifically lies on persuading professionals of conflicting interests for the proposed measures, which proves to be a key milestone in the implementation process of sustainable policies.

The above clearly highlight the necessity of widely disseminating policies and measures prior to their implementation. Changes on urban mobility schemes may be easily communicated among residents of medium-sized cities compared to the largest one as they share stronger relationships and present the same needs in terms of social welfare and economic and social status.

Medium-sized cities present special characteristics compared to the larger-sized ones, as residential, commercial, industrial and other areas are not clearly distinguished. In the city of Giannitsa, the CPZ was proposed to be implemented in streets nearby the city center, which are characterized as highly commercial and congested. However, the residential area proves to be really close to the commercial road network and sprawls up to the city's suburbs. Therefore, in medium-sized and smaller cities there is not a purely commercial area but instead central commercial road, whereas in larger-sized cities, the commercial areas are usually clearly distinguished from the residential ones.

After the successful implementation and operation of such policies, the next step is to replicate this approach on a number of urban areas within Greece presenting similar characteristics regarding their size, urban structure and network of transport services. These characteristics can slightly differ from a city to another. These differences will stoke thoughts on the sustainable character of urban travel systems. Comparative analysis will also lead to redefining the list of indicators proposed here. It also appears to be very interesting to explore statistical resources in different European countries enabling an international comparison with different mobility cultures and contrasted urban policies (Nicolas, J.P. et al, 2003).

To sum up, this research leads to ten key recommendations concerning governmental action aiming to foster sustainability into urban mobility patterns: (1) eliminate minimum parking requirements and encourage developers to 'unbundle' parking, (2) coordinate on and off-street parking management and charging, (3) charge for on-street parking to ensure that performance standards, including occupancy rates, are met, (4) create parking benefit districts, (5) use parking technologies that offer customers and policy makers the maximum flexibility, (6) reclaim street space from car parking for other needed public uses such as bike sharing, cycling lanes, widened sidewalks or shared spaces, (7) design parking facilities that are well integrated with surrounding buildings and walking environments, (8) incorporate parking policies into metropolitan transportation plans, (9) include innovative parking management in statewide livability initiatives, congestion management, air pollution control strategies, climate action plans and innovative financing programs and (10) promote parking and commuter programs that expand travel choices for employees and visitors.

The challenge for future urban transport systems will be to fulfill the demand for people's accessibility and mobility with efficient and quality services, minimizing at the same time the impacts on environment, local economy and safety while at the same time safeguarding the quality of life in the urban environment. To achieve this, projected actions (e.g. increased Park & Ride facilities, extension of controlled parking area, etc) will not be enough. There will always be needs and room for further

improvements such as extended transport and parking planning, which should be continuously regarded as crucial issues for the livability of a medium-sized city (Weinberger, R., Kaehny, J. & Rufo, M., 2010).

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