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The “doom scenario” (□ or can we avoid it?)

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*‘Wright’s Law:
A doctor can bury his mistakes□
□ but an architect can only advise his client to plant vines.’
In: Arthur Bloch (1982): Murphy’s Law*

Summary

We live in uncertain times and present trends seem to lead to a gloomy future. The promotion of walking as a transport mode is described here as an essential element of policies aimed at avoiding increased social inequalities, poorer life quality, economic slump, deteriorating health and rising violence, which could all be the consequences of higher petrol prices in anticipation of a final oil shortage. What we now know of global warming similarly leads to considering that walking and, more generally, non-motorised transport modes will have to grow. The optimistic vision is that reducing the dependency on oil of the transport system by developing new forms of mobility through combining non-motorised and collective modes can be made desirable through adequate policies. The pessimistic vision or “doom scenario” is what will happen if such policies do not develop. The policy-areas involved include urban planning and design, transport planning and operations, work organisation, access to services. Such policies will involve public and private stakeholders. They will have a cost for the tax payer, but doing nothing may cost even more. A most important point is that working on such policies should start now as the time-schedule for the unwanted changes promised by the current trends are to be expected in the short-term.

1. Introduction

The end of petrol (and natural gas) is not in itself a scenario, it is going to happen at some stage as oil and gas reserves are not unlimited. The question is: how soon and how brutally is this going to happen?

Ten years ago, the world oil reserves were estimated to last for another fifty years. Since then, exploration has continued and new reserves have been found or are expected to be found. However, the rate of development of emerging countries such as India and China was severely underestimated in the earlier rough forecast. Moreover, the cost of extracting petrol is going to increase due to the growing technical difficulties of reaching and exploiting the remaining resources, and the increase will be further compounded by speculation; we have already seen an example of this in 2008 when the price of motorized mobility increased in proportions unknown before.

In our present western societies, mobility depends essentially on petrol, even if the use of walking and cycling as transport modes is developing in specific areas and for shorter trips. For cost reasons and because of the geopolitics involved in accessing petrol reserves, availability of petrol at the individual level will not last as long for everyone so that both economic and social problems can be expected long before reserves dry up. One can

reasonably doubt that current technical research on alternative energies will produce efficient large-scale replacement solutions in time to avoid the problems for the populations most likely be deprived of petrol at an early stage. Thus one can legitimately wonder what kind of "doom scenario" will develop if no voluntary policy is implemented to counter the present trends and the differential effects it will have on mobility for the most vulnerable population groups.

There are reasons, however, to hope that policies aimed at reducing non-renewable energy consumption are indeed going to evolve in the short-term, not so much because citizens and politicians have come to envisage the end of petrol in a near future but because extensive use of petrol for transport and heating is now recognized as a key factor in global warming, with frightening expected medium- and long-term effects. If such policies eventually produce results, this may give our societies a little more time to adapt to the new conditions resulting from oil shortage. Moreover, the economic worldwide slump started in 2008 may also have slowing down effects on global petrol consumption, although it is now difficult to gauge how long this new trend will last.

Thinking ahead, we anticipate a "doom scenario" based on the future unavoidable oil shortage if public policies remain on the level of "business as usual". Being optimistic, we can explore what could be the components of policies to slow down and accompany changes, and thus open the way for a new less petrol-dependent quality of life. As transport and mobility are key issues for the oil demand as well as for people's lifestyles, they will have to be at the core of the new policies. The implication is that the development of walking (as of other non-motorized transport modes) as a mobility tool available to all citizens is unavoidable if we wish to reduce dependence on fossil energies and contribute to reducing the global warming effect; it is also desirable as it will reduce environmental nuisances affecting health (pollution, noise), improve personal health and well-being, and help provide all groups of the population with equal mobility choices. Promoting walking is therefore at the core of the "optimistic scenario", which requires re-thinking our social organisation as well as our mobility environment.

2. The "doom scenario" or what will happen if the present trends go on

There is no doubt that the costs of exploring for oil and extracting it are going to increase as the easy-to-get-to resources have been exploited first: objectively, cheap petrol is coming to an end. To further compound this natural trend, oil is sold on the market and the growing scarcity of the resource will trigger speculation as countries and large businesses start hoarding it on a large scale. The aggravating factor is that, although in a globalized market a barrel of crude oil will have the same value world-wide, at the end of the chain citizens will not have equal access to petrol and their basic needs will not be equally satisfied.

Hence the "doom scenario", which can be anticipated in the absence of strong policies to face the trends and accompany changes. The scenario is described below in definite terms as it is realistic enough, a trend rather than a vision: becoming aware of what can be awaiting us is, hopefully, the best advocacy to promote the policies leading to a more optimistic situation.

2.1. The geopolitical dimension

Oil resources are concentrated in some regions of the world. The fight for laying hands on the oil reserves has been a key motor of foreign policies since the 20th century and has already generated wars. In this global fight, some countries fare better than others because



they display more power and/or have little scruples in winning by all means. In this picture Europe, whose local oil resources are thinning, may not be well placed in the run, as being a warmonger goes against the grain, is indeed contrary to the very principles underlying the creation of the European Union. Within Europe itself, it can be hoped that a policy of equal access to whatever petrol there is will be organised at some stage. However, some European countries with little geophysical resources are more dependent on oil than others (as an extreme example, Malta depends on oil even for its drinking water which is produced by desalinization plants). So, ensuring equal access will require strong European policies involving both solidarity and optimization of the distribution of oil. It is indeed possible that oil shortage will generate significant population shifts inside Europe, either spontaneous or induced by policies aimed at rationalizing the use of energy.

More generally, if the needs for oil remain what they are now, the decrease in oil reserves worldwide will generate unrest or worse. Some oil-producing countries suffering from poor governance may face some local violent reactions from the people who will see their main source of revenue dwindling without any hope of their living standards being significantly improved in the remaining time (this has already happened, for example in Nigeria). Other countries will, on the contrary, search to obtain control of the resources which were previously in the hands of multinational private companies (this has started to happen in South America). Broad changes can thus be expected in the world economic and political order, involving a decrease of the influence of the Western world, including Europe, too dependent upon petrol. Resistance to such changes as well as grabbing for petrol wherever it can still be found may lead to more armed conflicts; these may in turn be fuelled, on one hand by multinational businesses with an interest in oil or in weaponry (see, for example, the case of Angola in the 20th century), and on the other hand by extremist terrorist organisations. Unrest and degrading living conditions in some of the poorer countries are bound to result in an increase of immigration flows towards Europe, in spite of the economic difficulties of this continent, thus adding to the more destitute groups of population.

Meanwhile, a renewed interest for the use of nuclear energy will probably appear in reaction to the situation. Nuclear power has been opposed by Green political organisations and civil society groups since the second half of the 20th Century, and has been consequently abandoned by some countries such as Germany. The industrial lobby may gather strength by offering a (temporary) alternative to petrol, obtaining new markets, intensifying the extraction of nuclear fuel, and overall pretending that oil is not necessary and a change of our leading source of energy is a way to perpetuate our present way of living: the risk of technology taking over policy is real. However, uranium is also a non-renewable resource, which means that nuclear energy is not the final solution to the oil problem. Moreover, access to world reserves is likely to generate the same kind of competition and social unrest as access to oil. While the development of nuclear-based energy in unstable and hardly democratic countries is already a security concern (see the present world attitude to Iran increasing its capabilities of obtaining nuclear fuel), the concentration of management powers into a small number of hands and the secrecy around technical processes to ensure safety conditions of nuclear plants may become a threat to democracy even in Western countries.

2.2. The social and mobility dimensions

Within (European) countries, access to whatever petrol has been secured at the international level will be determined by its retail price and the abilities of households to pay for it. While the more wealthy groups of the population will be able to cope, the less well-to-do or poorer groups will either have to abandon the use of private cars (or even motorcycles) or to allocate to it such a high proportion of their budget that spending for other activities will become severely restricted (possibly including health expenditures). Unfortunately, the poorer populations often live in urban peripheral suburbs or rural places where the cost of

land and habitat is lower but where public transport happens to be poor; their mobility choices will thus be reduced to an alternative between spending more time and energy on inadequate public transport for "mandatory" trips, or keeping to individual modes of mobility while suffering from a general decrease of quality of life in all other respects. Walking trips will increase and lengthen in the peripheral areas, not by choice but because of inability to pay for private transport modes combined with long distances to public transport nodes. Bicycling will offer an alternative, but only for the physically able citizens and provided bicycles are accepted on public transport vehicles (or adequate parking facilities are offered in the vicinity of the major transport exchanges). In any case, "non-indispensable" trips for culture, leisure or tourism which mean a lot for social interaction and quality of life will drastically decrease.

Meanwhile, the population groups still able to afford petrol will enjoy increased space for travelling as a growing proportion of others will have given up using their cars; thus, they will save time and will be able to increase their activities or enjoy a rest. Speeds will tend to increase, especially on the formerly congested urban thoroughfares, with the expected adverse effects on road safety, particularly on the safety of unprotected road users. Policies to enforce speed limits will thus need to be strengthened.

During a transitory period, one may observe a switch from medium-sized cars to smaller ones and to small motorcycles which are cheaper to acquire and to run. The movement, which should enable more citizens to keep to private transport longer while petrol prices go up, has indeed already started in cities where policies to reduce car traffic and increase public transport offer and use have not anticipated this potential side-effect (see, for example, the city of Paris, France). Unfortunately, a sharp increase in motorcycle ownership and use will create additional problems for road safety and traffic management in urban areas and may also be damageable to the environment (pollution, noise). New policies intended to make bike riding safer will have to allocate more road space to motorized two-wheelers, which is likely to be achieved through a reduction of the space dedicated to the more vulnerable but less efficient transport means, especially walking. Moreover, unless motorcycle and moped speeds are better controlled, pedestrian accidents are bound to increase.

In spite of its unwanted side-effects, the development of motorized two-wheeler use may at first appear globally desirable in terms of mobility and accessibility for all. However, not everybody can afford or can ride motorcycles or scooters, and even these means of transport will become too onerous for a growing number of households once petrol prices reach levels unacceptable for them. At best, accepting and accommodating a modal transfer from cars to motorized two-wheelers, as is now the current policy in most countries, can somewhat delay the process of pauperization and social segregation.

Social inequalities will become more conspicuous as the population will gradually divide into two separate categories of citizens, those who can afford to run private means of transport and those who can't. The two categories will differ in time management, amount of mobility, the amount and variety of activities available to them, and of course comfort of everyday life. The concept of the "popular car" available to every household, which underlay economic, land-use and urban planning policies through the second half of the 20th century, is indeed coming to an end.

The decrease in quality of life resulting from growing petrol prices, and the growing prices of other goods derived from oil, will of course generate dissatisfaction and low morale, which in turn will further aggravate the economic situation by decreasing consumption and, as a result, increasing unemployment. Thus, the groups of the population expected to suffer the most from expensive oil will expand. At the macro-level, this development compounded with mobility adaptation should lower the demand on petrol at least temporarily and thus slow



down the price increase; however, it cannot be expected to reverse the trend in the longer term as there are uncompressible needs.

Thus, social and economic inequalities are bound to rise inside most countries that depend on oil from external sources. Due to degrading economic conditions, the number of homeless people in cities will keep increasing with obvious health consequences. It is also to be feared that highly visible inequalities in the society may lead to more delinquency, inter-personal violence and extremism, particularly within the less socially advantaged population groups (see WHO Violence Prevention Programme). The more well-to-do citizens may be encouraged to take measures for self-protection such as closing up residential areas (a phenomenon which is already happening in some European cities), which will in turn create greater spatial segregation between the rich and the poor, make inequalities more tangible and thus contribute to perpetuating them□ and resulting in violence.

The run on non-renewable energies, and the terrorist movements it may induce, may well endanger democracy as the privacy of citizens is restricted and surveillance increased. Indeed, such a trend appeared in the beginning of the 21st century in some American and European countries which had always been proud of the freedom they used to afford their citizens. At the micro level, this should in time lead to restricting the rights or opportunities of people to demonstrate or simply meet on urban streets or other public areas. Walking would become less desirable and sojourning near to impossible.

2.3. The Pedestrian in the "doom scenario"

In summary, what will be the typical Pedestrian and his/her environment in the "doom scenario"? Walking may remain a choice of means of transport for anybody on short distance trips. Leisure walking should decrease as the greatest part of the population will have less free time and sojourning in urban space may become uncomfortable. On the contrary, long distance walking should sharply rise, not through choice but through obligation, and this mostly for the poorer citizens and those living far away from public transport nodes, and who are unable or unwilling to cycle. In a society with growing inequalities, the Pedestrian will thus symbolize the less advantaged groups of population in terms of economic status and physical abilities. Furthermore, increasing spatial segregation in urban areas will concentrate long distance walking in the less well-to-do neighbourhoods where amenities are in general poor.

The long-distance Pedestrian will also be a tired person as increased travel time combined with work and other indispensable activities will make for long days without much time for rest. Senior citizens or persons with mobility impairment will of course suffer most and may have to reduce their amount of travelling much sooner than expected. However, walking being a positive factor for health, the average long-distance Pedestrian may eventually be in a better physical shape than the more well-off citizens able to use their cars longer.

The current road environment is seldom designed to facilitate long-distance walking and make it safe, if only because long distance walking is not supposed to happen. When long walking trips become more common, meeting pedestrian quality needs will become crucial. Moreover, car and motorcycle speeds will have to be firmly controlled in order to prevent a deterioration of safety and to decrease pollution and noise in the walking environment. However, the Pedestrian representing essentially the less powerful groups in society, there is a good chance that improving the walking environment will have a low priority in the mind of decision-makers who will also be reluctant to impose any restrictive policies on private vehicles (as is now the case for motorcycles). In the medium term, the positive effects on health of walking should thus be tempered by the negative effects of pollution and accidents.

2.4. The time-scale

The "doom scenario" sketched above is not linked to the complete disappearance of petrol which is likely to occur within this century, whether in fifty or ninety years. It describes, as much as we can forecast them now, the trends and problems which our European societies are going to experience in the much shorter-term in *anticipation* of the future oil shortage. There is no time to lose if we want to devise policies to slow down and change a process leading to poor individual prospects of a full and happy life, to inequities and social unrest, to international armed conflicts, to growing inter-personal violence and to democracies under attack.

Another "doom scenario" which is related to global warming, shows the unwanted climatic changes to be occurring much faster than earlier expected, so that they may occur on the same time scale, which means in our lifetime. Policies to limit the damage expected in both scenarios should obviously be linked, although we will focus here on the first set.

3. Avoiding doom: the "optimistic scenario"

3.1. The necessary processes

We clearly do not want this "doom scenario" to come true, although we are already at its onset. It is therefore urgent to devise policies aimed at changing it into a desirable one. What is desirable is sustainable progress for citizens, which means evolving a way of life based on lower consumption of natural resources, ensuring health and maintaining life expectancy equally for all, and satisfying the basic needs without which life would not be worth living: peace, habitat, food, safety, justice, equal rights, democracy, social intercourse, culture (the "people's right to happiness"). We will show that the promotion of walking in an environment meeting the pedestrians' quality needs should play a major role in policies aimed at reaching a fully satisfying way of life.

Turning the "doom scenario" into a desirable one involves two processes:

1. Slowing down the move towards the end of petrol and, more importantly, towards unacceptably expensive petrol, so that:
 - more time is available for technical research (on alternative energies, new transport modes, new principles for urban planning, etc.),
 - the adaptation of society and way of life to the new expected conditions may be achieved progressively, with the strong hope of avoiding or at least compensating for the unwanted effects described in the "doom scenario".

This process is in line with what is required to slow down and cope with global warming.

2. Using the unavoidable changes to promote better quality of life for all through appropriate supporting policies. This goal is not only essential for people to adhere to the necessary changes, it is also in the end the essence of the difference between the "optimistic" and the "doom" scenarios. In the transport sector, it involves promoting the modes which pollute the less and consume no fossil energies (walking, cycling) while planning for these modes to become pleasant, safe, easy, and therefore desirable for all population groups, whether rich or poor.

At the macro level, both processes should involve deep changes in economics and policies as well as improved and strengthened governance at all levels (cities, regions, states, the European Union, the United Nations and other international organisations). In what follows,



we will only examine the implications of the processes on mobility and transport and their induced effects for citizens, in particular on health and quality of life.

3.2. Slowing down the move

The first process involves decreasing petrol consumption in transport. Reducing mobility would be an obvious solution, so obvious that it comes naturally in the "doom scenario", at least for a growing part of the population who will have to cut down on non-mandatory trips. However, this is one of the effects we should seek to avoid: individual mobility has been an acquired benefit of mankind in the past century, is essential for economic growth, should be a corollary to open markets in a globalized world, and is for most people necessary for personal achievement. There is no doubt that mandatory trips could be shortened or their frequency reduced, for example through changes in work organisation and in the location of commercial and other major services, but "constructive" mobility should remain a right for all and avenues have to be explored to reduce oil dependency without reducing the opportunities offered by the transport system.

Technical progress in the design of vehicle engines, aimed at making them less greedy in motor-fuel, should reduce petrol consumption and emissions, at least in cities. This contribution should not be ignored, but progress has not been as fast as could have been hoped (for lack of anticipation of the "doom scenario" by car manufacturers, perhaps). Moreover, research on less fuel-greedy solutions should extend to motorcycles whose numbers are rapidly increasing. Considering that the technology is not yet there and that it takes up to ten years to renew a vehicle fleet, the "doom scenario" may be well under way when this solution becomes fully operational. At the European level, co-ordinated public policies may hasten the process.

The search for new fuels to use in vehicles is even less promising in the short and medium terms:

- "green petrol" produced from plants is competing for agricultural space with food crops; recuperation of unused or rejected vegetal matter may be a better proposition, but converting this matter to fuel is still too energy-consuming;
- natural gas has the advantage of having virtually no adverse effect on climate but natural gas is a limited resource just as petrol and its price is evolving in the same way; producing gas from other resources is energy consuming;
- the development of a vehicle engine using hydrogen cannot be useful without the development of an economically viable process to produce hydrogen on a large scale, using alternative energy to petrol; this is at the moment a long-term process;
- production of electricity based on alternative energies may be a pre-requisite to the generalisation of the electric car, even in countries endowed with nuclear power plants; electric cars also require a wholly new infrastructure to enable city dwellers to recharge batteries at frequent intervals, unless real technical progress is made in this field; remarkably, research on electrical vehicles is only now getting a priority in the European Union while the issue was raised decades ago;
- hybrid cars may offer a promising intermediate solution, but are bound to be more expensive (two engines are needed on each vehicle) and therefore inaccessible to many; there has been no real assessment of the global gains in energy consumption to be expected from a broadening of the market for hybrid cars.

Without ignoring the possibility that some progress can be made through such technical solutions (neglecting possible compensation effects of consumers' behaviour), more has to be done in the short term to slow down depletion of the World's oil reserves and this involves reducing the amount of trips made by individual transport modes consuming petrol. Policies

to reduce car and motorcycle travel without restraining essential ("constructive") mobility imply a change of balance between transport modes to increase the parts of the most efficient ones in terms of persons transported per unit of energy (public transport) and of the non-motorized modes (walking and cycling). This requires a comprehensive re-design of our cities' transport systems with the aim of organising networks integrating motorized and non-transport modes so they complement each other. Such a process has already been under way for a while in European countries but needs to be hastened. Particular attention has to be given to suburban areas where dependency on individual motorized transport means is the highest and the ability to pay for expensive petrol will be the lowest.

In order to promote and plan for walking (and cycling) in a global oil-saving transport system, three key issues are to be taken on board:

1. The subjective limits as to how much people accept walking (or cycling) have to be reconsidered: if we are to avoid the "doom scenario", we need to make the hypothesis that most citizens may walk (or cycle) more than the short distances presently acknowledged in mobility surveys, given the right conditions. For those who can't or won't, technical aids can be designed just as they have been for car driving: the research focus should now switch from the driver to the pedestrian. Some devices, such as "pedestrian accelerators", which were explored in the 70s but have since been considered viable only for subway stations or airports, should be re-examined and other solutions involving low energy consumption may be invented. Individual aids targeting the less mobile pedestrians should also be developed, for example to compensate for balance problems or any other kind of impairment.

In all cases, walking more will involve changes in people's time-budgets which may partly be organised at the individual level but may also require framework policies such as reduction of weekly working-time and improving the proximity to work or living places of the most essential services.

2. Car ownership has to decrease at least in dense city areas: at the macro-level, this is necessary to make more public space available for other means of transport and collective activities (especially by reducing the amount of parking space required); at the individual level, this should decrease the primary reflex of taking the car to go anywhere. Of course, lower car ownership requires different ways of access to cars are available when absolutely needed for trips which cannot be reasonably performed through the combination of other means offered by the transport system. This may be achieved through individual practices such as shared ownership of vehicles (between neighbours, colleagues, etc.) or car-pooling, new commercial offers facilitating renting a car at fixed periods or for sudden errands, etc. Some local authorities have already evolved policies to encourage shared use of cars and, if such policies expand, their effects can be expected in the short term.

For the medium term, decreasing car ownership also calls for different urban planning principles aimed at providing the necessary services within reasonably short distances from home, so that they can be reached by walking. The services useful in everyday life include local administrations, medical and health centres, and essential shops in sufficient number to ensure that goods prices remain competitive. Habitat has to be restructured to make optimal use of the urban space while affording the residents comfortable living conditions. Some local authorities have already experimented along these lines by promoting "Dense (or car-free) Neighbourhoods", but this timid effort needs to be encouraged and much further developed.



3. There is a need to design new transport modes in order to provide a more acceptable alternative to cars than the motorcycles currently in use: less fuel-consuming, less noisy, more protective of their users, providing less incentive to speeding, less aggressive to pedestrians, better designed for the performance of daily chores and more compatible with the use of public transport.

The usefulness and safety of modes more akin to walking such as rollers, foot-scooters, gravity-propelled two-wheelers or others should also be examined and decisions taken as to whether they should be included in transport plans and which type of space they should occupy.

Re-designing the transport system involves redistributing the available public space to ensure smooth flows and safety for all modes, including of course walking, and to facilitate changes of modes during trips. It can be seen that in our "optimistic scenario", the diversity of modes and activities occupying the public space should be much greater than now, which calls for new models of space-allocation and traffic planning and for creativity in order to move towards the new organisation of urban transport. This organisation, which has to take into account both short-term transport conditions and future developments, will be determined by the distribution of existing and expected trips using various combinations of modes; this implies that stronger links are established between urban planning, which shapes mobility needs, and transport planning. The switch in emphasis from the use of private cars (or motorcycles) to the use of non-motorized and new intermediate modes also involves significant changes in the balance of power of the various decision-makers and stakeholders at city and state level as well as in European institutions.

Thus, changing mobility patterns and structure and the offer of transport leads to rethinking the city, bearing in mind particularly that a key objective is reducing social inequalities. In order to maintain mobility and accessibility for all through a multi-modal transport system involving new technologies and essentially based on public transport, low-energy intermediate modes, walking and cycling, a "creative city" would have to evolve in order to satisfy new requirements; in the medium and longer terms, this involves in particular:

- optimizing the use and cost of public transport by increasing the population density in peripheral areas, which may require the relocation of part of the population around transport nodes; this should involve a fiscal policy or financial incentives to avoid or compensate for the higher cost of housing usually to be found in places within easy access to the transport networks;
- decreasing unnecessary and unwanted trips or reducing the distances when such trips prove unavoidable: for example, "captive mobility" related to work could be reduced by creating multiple shared business centres and using telecommunication technology to link employers and employees (this would imply a deep change in working relationships within administrations and businesses); new plans to relocate schools and all other essential services could be devised in order to optimize the amount of time spent on trips;
- organising for the special needs arising from reduced car usage: for example, delivery of everyday life goods, assistance for pedestrians who have to carry heavy weights or bulky "luggage" or push baby-prams, facilities for pedestrians with impaired or weakening physical capabilities;
- compensating for the loss of freedom which may be perceived from having to abandon car usage for most trips by increasing environmental amenities for residents and public transport users, both through improved architectural design and landscaping of the public space and the allocation of some of it to the development of easily accessible green and leisure areas.

The evolution of urban transport systems can be significant in the short and medium terms, especially as some welcome changes are already under way. A creative city cannot evolve

so fast, but rethinking the city should become an ongoing process, involving public and private stakeholders, at least to provide a direction for present day urban policies and develop perspectives with and for the citizens which will show that there can indeed be an optimistic alternative to the "doom scenario".

3.3. Promoting better quality of life

Obviously, promoting a better quality of life cannot be achieved only through transport, but mobility is such an important part of everyday life that making the conditions in which it is performed safer, more comfortable, pleasant and likable for the citizens is a great step towards the goal. Moreover, the changes we seek to obtain in the transport system have a bearing on other fields of policy-making (and vice-versa). We will take here the point of view of the transport user.

At the macro level, new transport policies involving a greater share of non-motorised modes should lead to less pollution and less noise, which in itself is a significant improvement of life quality and is particularly important for the citizens who will walk more and longer distances. Moreover, re-allocation of urban public space can be performed to enhance freedom of movement of the most vulnerable road users and greater communication between the citizens and should make room for activities contributing to harmonious urban life (sojourning under all its forms: meeting, strolling, window-shopping, exhibiting art or curios, selling goods, etc.). The design of public space and the organisation of traffic, including in particular global speed control, should ensure greater safety of all modes and of changes from one mode to another. Health of the urban population should improve as a consequence of reduced pollution, noise and road accidents, and also through the positive effects which can be expected from the daily performance of an adequate amount of physical effort (walking, cycling) in a healthier environment.

At the individual level, the perceived quality of life of the citizens required to switch from private motorized modes to public transport, intermediate modes, walking and/or cycling should increase if two conditions are met: these modes are made desirable and the former advantages of driving a car have been greatly reduced. From the pedestrian viewpoint, walking should be desirable if:

- at the tactical level, the time budget allows for walking longer, and walking is an efficient way to go where one wants to go, either for whole trips or combined with other modes (public transport);
- at the operational level, the quantity of walking to be performed is compatible with the personal abilities of the pedestrian (possibly enhanced by newly developed technical aids) and the time needed for walking is compatible with practicing other needed or desired activities during the day;
- at all levels, the pedestrians' quality needs in terms of comfort, safety, aesthetics, pleasure (as identified and analysed in other sections of this work) are fully met by their environment;
- from a social point of view, walking becomes highly valued, whatever the reasons (it makes you look young and keep fit longer, it gives an image of dynamism, it shows a social concern for the future of mankind on Earth, etc.); there may also be additional bonuses in walking such as, for example, justifying a more informal dress code to go to work, choosing walking partners for regular trips to shorten the perceived duration of the trip and make it more interesting, etc.
- at the end of the day, some satisfaction has been drawn from walking (health and well-being, aesthetic pleasure, combination with other activities, etc.), so that it feels that tiredness from the effort has been worth it.



Similar criteria can apply to making the use of bicycles or other acceptable intermediate individual modes attractive. As to public transport modes, a lot of research and experimentation has already gone into making them more useful and pleasant to use, although cost considerations often prevent transport operators to act on this knowledge. However, if the "doom scenario" is to be avoided, providing quality is indispensable; this means that priorities at national or local government levels should evolve so that more public money goes into public transport on a sustainable basis.

3.4. The Pedestrian in the “optimistic scenario”

In summary, what will be the typical Pedestrian and his/her environment in the "optimistic scenario"? Ultimately, walking will become a desirable way of moving around in cities, on its own or in connection with improved public transport modes. Walking time will be well integrated into everyday life activities, thanks to social reorganisation of working conditions and individual changes in time planning (indeed, the whole pace of life should slow down and stress should decrease!). There will still be “captive” long distance pedestrians, although in the medium term less than in the doom scenario; however, they will be joined in walking by more affluent people who are likely to abandon individual motorized transport means because driving will be discouraged by current local and framework policies and/or because they find better quality of life in choosing to walk. Thus the Pedestrian should represent a large and growing part of the general population. As a consequence, the Pedestrian will gradually become a major stakeholder, which should facilitate further planning and design policies taking into account pedestrian quality needs.

From a broader social point of view, inequalities will not grow as fast and as much as in the “doom scenario” and, at least, will not be emphasized in the performance of everyday trips and in the design of the public space. While good management of time at the individual level and in work and school organisation will hopefully govern the amount of activities each citizen can perform, walking coupled with sojourning in comfortable urban spaces will become in itself a valued activity. The Pedestrian will still be tired, but positive health effects from exercising in a healthier environment will be felt sooner and satisfaction from the time spent on the streets will increase.

In the medium term, the less able pedestrians, or those with a taste for new technologies or devices, will also have a choice of walking aids and of intermediate non motorised modes (still to be further researched and designed). Hopefully, such devices will be affordable for the citizens actually needing them and will be safe for use in an environment where space allocation to all non-motorized means of transport is equitable and well planned. Indeed, the planned cohabitation of new intermediate non-motorized modes should enhance the image of the less able road users and encourage them to be more mobile.

The “optimistic scenario” will develop in the short and medium terms at a speed depending upon the growing awareness of decision-makers and citizens. Before the ultimate stage is reached, we can anticipate successive phases in the Pedestrian’s experience which can tentatively be sketched as follows, based on policy indicators which are already conspicuous in a number of European countries:

1. At first, adjustments will be made within the existing physical and work environment. Policies aimed at curbing car traffic, containing the growth and use of motorcycles, increasing the offer in public transport, encouraging shared car practices and improving the existing pedestrian facilities should have short term effects on pollution and noise in city centres and dense city areas and improve health and environmental amenities. A significant proportion of residents of such areas will be tempted to use walking, possibly cycling, and public transport instead of their own car (if they still own one) as it will be easier than driving, although the more well-off segment of the population will cling to car-

driving. In less-dense urban suburbs, the dilemma between keeping to private motorization in spite of growing petrol prices and spending a lot of time on everyday mandatory trips at the expense of other activities will start being faced in the more modest households. Hopefully, the opportunities offered in the second and third phases will prevent this dilemma from extending to the greater part of the suburban residents.

2. The first large-scale investments to be made bear on the extension of the public transport services to the outer parts of urban areas: this is in fact already happening in many European cities. Line extensions or new lines of tram, subway, train, buses will first be linked to existing poles of work or residences in order to bring relief to a significant portion of the population and to maximize returns from investments (if not to make them financially profitable). As a consequence, more people living in the suburbs will switch from individual motorized modes to public transport, and longer-distance walking to reach the new transport terminals or nodes will start happening. The need to improve the quality of the walking environment on the main pedestrian routes will be felt, which should trigger action to avoid a deterioration of road safety conditions as well as dissatisfaction of the citizens who are changing their way of living by becoming long distance pedestrians. Allocation of space to cyclists is also likely to become an issue, but as pedestrians are gaining political strength, they should be able to obtain equitable treatment in the improvement of street design. At this stage, people living in less dense areas, either because they have a lot of money or, on the contrary, because they had to choose a cheaper low-amenity area as their residence, will not fully benefit from the new transport offer. The poorer groups will keep on facing the same dilemma as in the first phase. Some aging or disabled people will suffer from a loss of mobility.
3. New intermediate transport modes should begin to appear and street design will have to be adapted to their use which should grow very fast once they are available. This should offer new opportunities for the less able pedestrians and for the citizens living far away from transport nodes. The whole urban road network will be re-classified and new forms of space allocation (and time allocation at signalized junctions) devised to take care of the new modal mix. The physical environment of pedestrians should start to significantly improve across urban areas, which should make long-distance walking less of a chore and more of a positive activity. Places for sojourning will be provided and improved to meet the demand of the less fit pedestrians who will need to break their longer trips as well as to increase the attraction of walking. Pedestrians will represent a larger mix of the population, including physically impaired and ageing people.
4. Longer term policies will start bringing in benefits. Incentives for the poorer people to move into areas better served by the public transport system will reduce the proportion of citizens suffering from decreased quality of life while optimizing the use of existing public transport lines and reducing the need for new ones. Conversely, planning and building new public transport lines to link the peripheral areas around cities may appear as an alternative solution to concentrate the population in newly designed neighbourhoods, thus introducing a completely different conception of urban areas based on smaller inter-connected urban units. However, the only way this solution could bring benefits to the poorer population groups and help fight inequalities is by controlling land and property prices around the new transport nodes. At this stage, the need for long-distance walking should come down to more reasonable levels than in the previous phases, which will be felt as a gain of time and opportunities by the citizens who will have been able to move to better locations. New neighbourhoods and re-designed ones after “densification” will afford a better and healthier environment for the pedestrians and, more generally, the residents as they will have been planned on the basis of low car ownership and therefore will have more space to allocate to sojourning and other public activities.

This summary description of the evolution of the pedestrian situation is based on the assumption that sound and strong policies are implemented to counter the anticipated “doom effect”, and the corresponding public investments are made. Considering what the alternative would be, this is not a utopia and we have to assume that suitable communication will increase the acceptability of some of the more radical solutions, especially as a majority of citizens should profit from the changes. However, as public policies have to be compatible with our globalized market economy, it is rather difficult to predict what the time-scale will be for the four phases described. Our guess is that the useful technological development will be fully applicable in five to ten years, which should mark the beginning of phase 3. Of course, the policies to bring about each phase should be thought out beforehand.

4. Conclusions: overall implications for the future of walking

Avoiding the looming “doom scenario” is a priority for responsible decision-makers who look ahead and this priority is soon to become obvious to most citizens. In order to switch to an “optimistic scenario”, sound transport policies, in particular in urban areas, are needed. Promoting longer distance walking (and cycling) in conditions meeting pedestrian quality needs is a key to such policies.

The “optimistic scenario” implies that walking will be performed on a daily basis, as a self-standing transport mode or combined with public transport, by a larger share of the population, for longer trips and a longer time than now, with ample possibilities of stopping on the way and sojourning in the public space. To bring this situation about, walking has to be perceived by the citizens as desirable. To make the situation sustainable, walking has to be felt useful, practical, safe, comfortable, interesting, and compatible with other activities and daily chores.

To reach these goals, new policies need to evolve, not only in urban and transport planning, but also in the organisation of work and access to essential services. Such policies should involve institutional actors as well as private stakeholders and the citizens themselves need to play a part in designing the changes. New technologies can be harnessed for the purpose, both as organisational tools and to provide aids for the temporarily or permanently less able citizens. The citizens will acquire greater political visibility and power as stakeholders, which means that once under way the new policies should become increasingly easy to develop and implement.

The “optimistic scenario” will have direct costs to be supported by the tax-payer for re-planning parts of urban areas, providing more efficient public transport, re-designing the urban environment for all transport modes, providing the logistics for special needs and developing technical research focused on non-motorized and intermediate modes, although the citizens will continue paying individually for part of the cost of their own mobility. The collective cost of the “optimistic scenario” has to be compared with the increasing costs to be expected in the “doom scenario”, and has to be balanced against the global expected benefits, such as to keep providing affordable petrol for a longer time, to avoid increased inequalities and violence in the society, and to improve quality of life, well-being of citizens and public health. The development of walking (and cycling) and the policies needed to bring it forth should also contribute to slowing down global warming, and these benefits are invaluable for mankind.

The switch to the “optimistic scenario” has to occur soon. But in regards to the key issue of promoting walking, the research done on pedestrian quality needs should make us well prepared!

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