

# **Energy consumption and urban transport: toward a new rationality ?**

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## **SYNOPSIS**

This paper explains how an internalisation of externalities is necessary but not sufficient for a sustainable urban mobility, requiring a new "democratic rationality".

## **ABSTRACT**

Urban car traffic, with "traffic jam" and low vehicle occupancy, represents an obvious waste of energy. To face up to this problem, one needs to overcome the economic "good sense" which says to increase simply the price of car driving. For that, we propose a twofold process:

### **1. The "wasting rationality" : a traffic-jam preference?**

After a reminder of the relationships between activities, localisation, and mobility, we propose a comparison between social external costs of automobile and an estimation of individual car users benefits. Such a monetization in the case of France will show the possibility of an implicit preference for traffic-jam and wasting energy: this waste of energy corresponds to rational economical choices by individuals.

### **2 Towards a new rationality?**

In his recommendations for a more sustainable mobility, the economist proposes generally an internalisation of the environmental costs. But this cannot be sufficient to change the implicit preferences for traffic-jams. More precisely, such an increase of urban transport prices, would not be socially bearable, if it were not integrated into a new global city planning process: better public transport, rehabilitation of city centres with less room for cars, diversification of activities, ethnic and social makeup, limiting of large commercial centres in suburban areas, and control of urbanisation with green belts.

Thus, our paper will attempt to demonstrate how the search for a new rationality must face up to a fundamental difficulty. On the one hand, the preferences for day-to-day living naturally tend to obey individualism. On the other hand, the preferences for sustainable development in a finite world with more friendliness, impose a minimum of collective organization, only possible in a well living democracy.

## **INTRODUCTION**

A lot of economic researchers concentrate now on the environmental costs of car mobility. It is today scientifically agreed that the current mobility in the cities based on a continual increase in automobile traffic, can't be bearable in the long term. On the one hand, the social degradation of the quality of life in cities may have explosive consequences, whereas on the other hand, the global pollution generated by such mobility is a source for problems which could be fearsome.

This paper attempts to outline an interpretation of today's unsustainable urban growth, in terms of "wasting rationality". This interpretation enables us to explain how economics could help in the search for alternatives to this development, and that it is necessary but not the only response to the problem. We will then try to explain the main characteristics of a "new rationality" permitting more sustainable urban development.

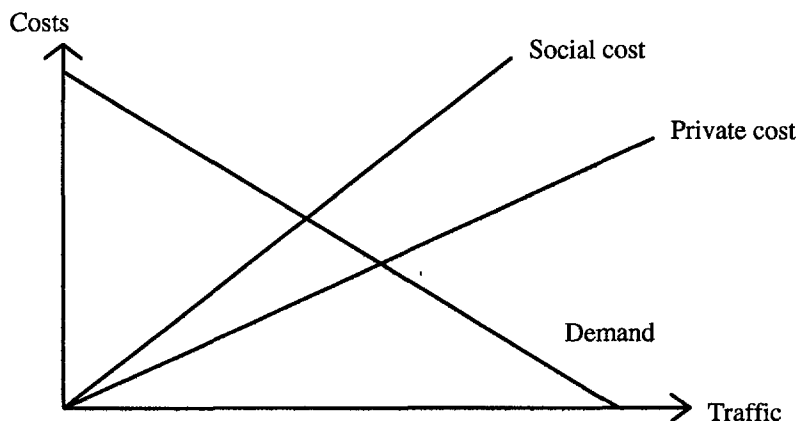
### 1. THE MOBILITY AS A PUBLIC GOOD : "WASTING RATIONALITY" AND TRAFFIC-JAM PREFERENCE?

In this first part, we will give an interpretation of the relationship between activities, localization, and mobility. We will show how this relationship leads to a vicious circle in favour of individual mobility. The state of the market at present, resulting from explicit or implicit choices during the last twenty years, is structurally favourable to individual transportation. Thus, we can speak about a traffic-jam preference : there seems to be nowadays no real alternative to traffic-jams : for most people, choosing the car is rational, because the evolution of suburban areas tends to damage the quality of public transportation systems. At the end of this section, a comparison between the advantages and social costs of car mobility will help to show whether it is economically rational to step outside the vicious circle of car mobility.

#### 1.1 The "wasting rationality" due to the suburban areas development

1. We adopt the implicit hypothesis that car traffic growth and low urban density are linked phenomena : in the developed countries, there is no low urban density without high household motorization rates, or high motorization rates without low urban density (ORFEUILLE 1994). It has been demonstrated how energy consumption per head grows in a hyperbolic way with urban sprawl (NEWMAN and KENWORTHY 1989).
2. City centres are characterized by more social diversity (GUENANT 1992) than suburbs based on a specialization of residential area with social (or even racial) segregation (INRETS 1993). These segregations are due to the natural individual tendency to avoid people different when searching for new housing, a tendency encouraged by the suburban housing market, separating people according to their incomes (individual housing areas for the middle class, and social collective housing areas for the poorest and racial minorities).
3. The main degradation of quality of life accompanying an urban evolution based on car traffic and low urban density can be summarized as follows:
  - (a) Costs of the degradation of the environment through the increase in car traffics (CROZET 1994).
  - (b) Costs of the degradation of public and commercial local services : deficits in public transport (EMANGARD 1994), crisis of local stores in suburban areas (COURLY 1993)
  - (c) Costs of social degradation, loss of friendliness, suburban crisis (TOURAINÉ 1992).
  - (d) Costs of energy and global climate damages (MARTIN 1990)
4. If we consider that all these effects occur as a consequence of an urban development based on household motorization and the increase in urban car traffic, we conclude easily that the individual transport prices are less important than their costs. The social and environmental costs of the "automobile civilization" are external from their prices for the users. This means that the mobility is subsidised, and more or less considered as a public good. This is confirmed through the social monetizations of time in the evaluation of public roads investments.

Figure 1: Difference between transport costs and prices : the mobility as a public good



Panel 6

## 1.2 The suburban areas development due to the "wasting rationality"

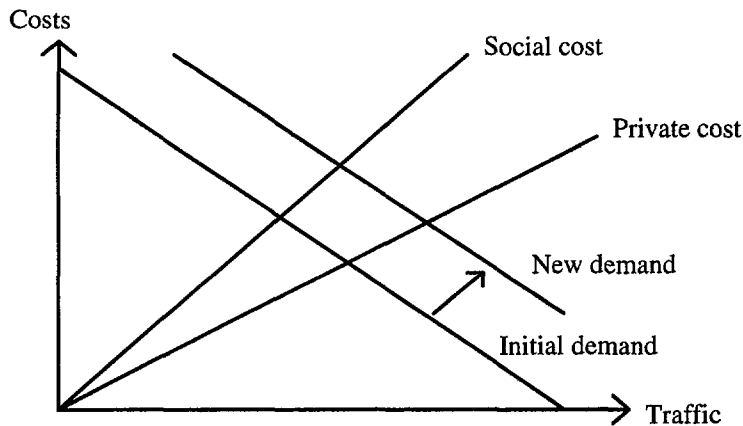
1. The externalisation of a great part of individual mobility costs generates an increase in the demand of mobility. This phenomenon can be explained as followed :

The externalisation of environmental costs induces an increase in the demand of transport, with the extension of urban areas.

- (a) -> The degradation of the quality of life in city centres "leads more and more people (families, firms) to leave the centres for the peripheries" (ORFEUIL 1994), generating new car traffic.
- (b) -> The degradation of public and commercial proximity services reinforces the need of owning a car to have a good access to further services.

## 2. THIS INCREASE IN DEMAND GENERATES AN INCREASE IN THE EXTERNAL COSTS

Figure 2 : Increase in the demand due to the externalisation of environmental costs



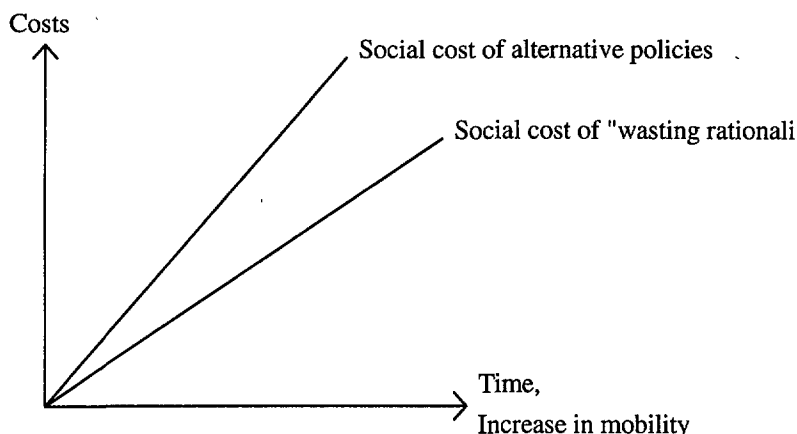
## 1.3 "Wasting rationality" due to "wasting rationality": the vicious circle of an unsustainable development

1. Externalisation of social and environmental costs, increasing the mobility demand, leads to a future new increase in social and environmental damages. This increase in mobility demand induces a degradation of the possible alternatives to mobility. The costs of such alternative policies become even more dissuasive.

2. This continual degradation of possible alternatives maintains the urban system within a vicious circle of increase in social and environmental externalities, enslaving the society in an uncontrolled development (MORIN 1980). This process can be explained as such:

- (a) -> People and activities search individually a better quality of life outside the centres with a paradoxical global degradation of quality of life through increase in individual mobility, social and environmental damages, individualism -> (a), (b), (c), (d)
- (b) -> Individuals need to have and use their car to get to public and commercial services even farther, encouraging the disappearance of the proximity commercial and public services -> (a), (b), (c), (d)
- (c) -> The degradation of social proximity and friendliness generates more social proximity degradation, through the development of individualism (TOURAINÉ 1992) with a search for satisfaction through individual consumption: individual housing, individual transport, big commercial centres only accessible with cars -> (a), (b), (c), (d).
- (d) -> If the costs for energy and global climate change become reality, the mobility reduction in low urbanisation density areas might tend to always more immaterial relationships (telematic, teleworking), and even more social segregation (INRETS 1993) -> (c).

Figure 3 : The vicious circle of the external social and environmental costs increase



#### 1.4 Is it economic to step outside the vicious circle ?

Monetization of the external costs, comparison with an estimation of individual benefits from car driving

1. Shall the economy determine whether it is optimal to continue this way, or if it is better to step outside this vicious circle ?

2. The economy, with the acceptance of some hypothesis and causalities, can propose a monetization of the external costs causes and consequences of the "wasting rationality" : between 10 and 20 billions of Ecu/year for 120 billions of veh.km/year in urban and suburban areas in France.

(a) Monetization of the costs of the quality of life's degradation. A study from the LET has outlined the following valorisations (CROZET 1994):

- noise : 0,001 to 0,005 Ecu/veh.km
- local pollution : 0,01 to 0,04 Ecu/veh.km
- accidents : 0,005 to 0, 017 Ecu/veh.km
- use of space : 0,01 to 0,03 Ecu/veh.km.

Each year's total for France represents a value between 3 and 10 billions Ecus (for 120 billions of veh.km)

(b) Monetization of the costs of the degradation of public and commercial proximity services due to urban sprawl (deficit of public transport, growth in the costs of proximity stores in suburban areas)

The estimated deficit and subsidies only in public transport were estimated at a value of 2,13 billions Ecu in 1993 (UTP 1993). This value represents a public opportunity cost of the willingness to ameliorate urban accessibility, and reveals the order of importance of these service degradation costs, which we can estimate for all the services to be between 3 and 5 billions Ecus.

(c) Monetization of the costs of the degradation of social proximity, friendliness.

We could try to make a monetization of police costs, suburban criminality, health expenses... But the budget decided upon in France to ameliorate the quality of life in the cities, 1,26 billions Ecus for 1995 (LE MONITEUR, September 1994) can already be considered as an opportunity cost of these social degradations, which we estimate to be between 1,5 and 3 billions Ecus.

(d) Monetization of energy and global climate change damages costs

The costs of global pollution due to urban car traffic monetized with 50 and 100% from Swedish tax values (HANSON 1991) can be estimated to be between 2 and 4 billions Ecus each year.

3. The economy can evaluate the benefits from car driving with a cost-benefit analysis of a modal report of 1% from automobile to other mode of transportation. Such an evaluation is based on the following hypothesis :

- user car costs : 0,15 Ecu/veh.km
- time value for car : 11,6 Ecu/h, french normative value
- yearly urban traffic : 120 billions veh.km
- average car speed : 40 km/h
- the alternative to car using (public transport, bicycle, foot) needs 200% more time.

4. If we compare the advantages of the transfert (decrease of external and user costs, between 0,28 and 0,38 billions Ecus) and his costs (loss of time, 0,35 billions Ecus), we notice that the answer to question 1 depends upon the strength of the preferences for the environment.

5. The "wasting rationality" corresponds to a society in which the individual's economic preferences are the only preferences being relevant. If human preferences for environment are weak (lowest values of external costs), the balance sheet of the "wasting rationality" stays positive. Thus, there is no reason to change the situation, and our work is finished.

6. If it appears that human preferences for social and physical environment are strong, and perhaps more relevant than the market preferences (highest values of external costs), the economic balance sheet of "wasting rationality" becomes negative, and it becomes urgent to step outside the vicious circle of car traffic growth and urban degradation. This leads us to the second part of our presentation.

## **2 THE QUALITY OF LIFE AS A PUBLIC GOOD : TOWARD A NEW RATIONALITY?**

In this second part, we will consider particularly the problem of the internalisation of external costs presented before. In the first place, considering the only economic pricing system, we will try to explain how such an internalisation is not only insufficient, but could also lead to a deterioration of the situation. These limits lead us to introduce the necessity of a global approach of cities' policies, the internalisation of external costs being bound to a lot of other measures to ameliorate the quality of the cities. We will then specify in which way such an internalisation corresponds to a "new rationality".

### **2.1 The limits of economic pricing of externalities**

1. It is easy to show the impossibility to evaluate " the right prices" for externalities which could lead to a scientific agreement. The causalities between polluter and victims are difficult to establish (ROTHENGATTER 1988), a lot of social and environmental damages are not clearly known (social quality of life degradation, climate long term damages), and the indirect evaluations based on avoiding costs depend upon the hypothesis chosen by the economist (PEREZ 1992). Environment stays an essential political problem.

2. In a recent study, the LET presents two main limits of an internalisation of urban car traffic with the direct economic "road pricing": social discrimination, and possibilities of new funds for road investment (CROZET 1994). The positive opinion of road lobbies about "road pricing" let fear a possible interpretation in terms of "road privatisation", which could induce a lot of new private road projects, encouraging car mobility.

3. Some observations in the case of Rennes, France (GUENANT 1994) show that the evolution of suburban urbanization has been made in the following way: the richest households live near the city centre, whereas the poorest live farther away and have a longer way to go from home to work. This shows the unfair aspect of road pricing which could penalize the poorest.

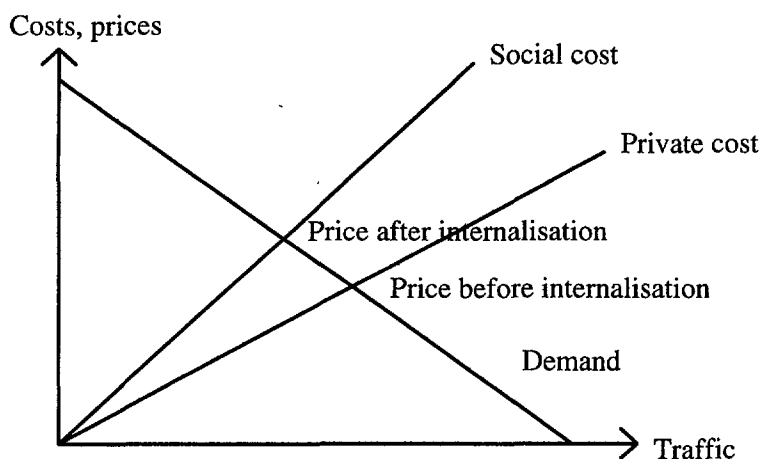
4. In the same direction, we specify how an action solely on road pricing can have worse effects than no action at all: possibility of damaging the attraction of the city centres, and encouraging the localization in the peripheries where roads stay free from pricing (PEREZ 1994).

5. More precisely such a pure economic road pricing may encourage spatial specialization rather than fight against it : richest activities and population in the centres, and poorest activities and population in the periphery, outside the road pricing perimeter (INRETS 1993).

6. Logically, these elements induce politicians to oppose the road pricing concept.

7. The following figure helps us to understand political and social resistance against a pure economic pricing : it induces a diminution in road traffic, but through an increase in transport prices socially unacceptable.

**Figure 4 : Internalisation with a rise in transport prices (socially impossible)**



## 2. 2 The need for a global approach of city planning, bounded to car traffic costs internalisation

1. An economic internalisation cannot be sufficient to change the implicit preferences for traffic-jams. More precisely, such an increase in urban transport prices, would not be socially sustainable, if it is not integrated within a new global city planning process:

(a) Degradation of quality of life through car traffic growth

-> rehabilitation of city centres with less space for cars, more for children, pedestrians, cyclists, public transportation (DUCHENE 1994);

-> control of urbanization encouraging green belts, avoiding the extremes (too big or too low densities) (HEIMERL 1992);

(b) Degradation of public and commercial proximity services (deficits of public transport, growth in the costs of proximity stores in suburban areas)

-> good alternative public transportation systems (PEREZ 1994);

-> limiting large commercial centres in suburban areas to protect proximity services and trade (COURLY 1993).

(c) Degradation of social proximity and friendliness.

-> urban planning favouring diversification of activities, ethnic and social diversity, proximity social contacts, friendliness;

-> friendly public transportation system avoiding as much as possible too big massifications and underground routes (PEREZ 1994).

(d) Global climate damages

-> strong pricing of car using, oil taxes (HANSON 1991).

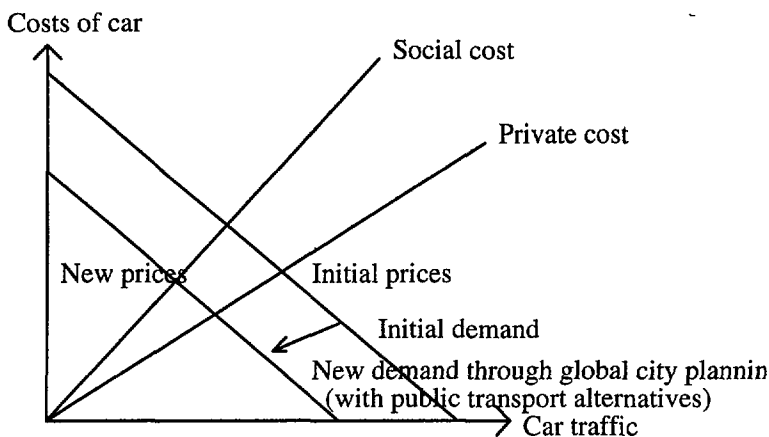
-> more social housing subsidies for the poorest, measures to facilitate changes of properties  
(MARTIN 1992)

We see how this new global city planning process allows an increase in transport costs and lessening in mobility insofar as it offers alternatives to mobility.

4. These alternatives to mobility allow a decrease in mobility demand, with a possible stable evolution of individual transport generalized prices (as shown on the figure). In the case of economic pricing, the increase in prices is compensated with the amelioration of speed through less traffic. In the case of physical reduction in street capacity (pedestrian areas, bicycle ways, light rail systems), the reduction of traffic allows constant conditions of circulation.

5. Such an internalisation of mobility costs in the users prices means that the time earnings, have no longer to be considered as social benefits (such time earnings only represent private benefits). As a compensation, what we call "new planning city process" means a shift from subsidies for mobility to subsidies to alternatives to mobility. In this direction, the quality of life has to be given more consideration than in the past, and from now on more than mobility, as a public good.

*Figure 5 : Internalisation with a moderation in mobility and stable transport prices (city planning, commercial planning, quality of life, social diversity, good public services and transport)*



### **2.3 Such a global city organization is linked to a new rationality, which can only appear with a stronger pressure of political preferences (environment, quality of life) which challenge economic preferences**

1. The fundamental difficulty of such a change of rationality can be summed up in the following way : the "wasting rationality" induces day-to-day living problems which only have long term structural solutions, but all day-to-day living solutions tend only to postpone the problems in the long term. In this way, it is shown how a development of public transportation can lead to a future critical financial crisis (TABOURIN 1986). This crisis can only be controlled with surface transport system replacing the car (WIELAND 1993), but such systems, good in a long term, find in a short term a lot of political resistance (PEREZ 1994).

2. Long term solutions need coordination (between city planning, transport planning, cities' sociologic analysis, commercial centres policies), planning (result and source of coordination) and organization (result and source of planning) (HEIMERL 1992), three conditions not always easy to set up. Such conditions are only possible if the political institutions allow them to exist, which is not always the case (GARGAILLOT 1992).

3. Long term solutions can only appear if society allows the expression of quality of life preferences in public policies, which challenge economic short term preferences (KAGESON 1994). The problem of a "new

urban rationality" is more to let the city's inhabitants express their political preferences in the reality of their environment rather than to evaluate for them what their needs are.

4. The resistance against every change of rationality is very strong in administrations, lobbies, cultures, and such an expression in reality of fundamental political preferences needs a sane living democracy (MORIN 1980). Local referendums may help people feel concern about the life of their city, making new city planning process a reality (BOVY 1991).

#### **2.4 "Democratic rationality" due to "democratic rationality": a virtuous circle of sustainable cities development?**

1. People more concerned about their environment makes city development more sustainable: the quality of urban political measures could increase with explanations and debates taking place between citizens and politicians; the help of active citizens groups could make the politicians become more imaginative and brave.

2. Improvement of the quality of life makes people feel more concerned about their environment: people are more ready to defend and improve something existing from which they can take advantage of rather than something only potential. It is possible that a better local environment and city quality of life are the best weapons against individualism.

3. The "democratic rationality" could leads to a virtuous circle of sustainable city development. Such a concerned about their environment of life, their city, and have the wish and satisfaction to control its development.

### **CONCLUSIONS**

Our paper tends to demonstrate that today's evolution of urban mobility, which leads to a vicious circle of wasting (wasting of non renewable resources, wasting of environmental quality), is economically rational, if we take as basis of economic evaluations the only individual market rationality. It is rational for families to search for an individual house with green garden in the suburb, when the city centres' quality of life deteriorates more and more. It is rational for drivers to choose their car, when public transportation require to times more time for the same travel. It is rational to search satisfactions in individual material consumption, when the environment of the cities does no longer allow social friendly satisfactions. It is rational to take refuge in its own market preferences, when the expectations regarding political preferences stay unsatisfied because of all the conservatism of institutions, administrations and economic lobbies.

These observations help us understand why an internalisation based only on road externalities' pricing are insufficient to step out of the "wasting rationality". Such a pricing is not only socially impossible, it can be ineffective. On the one hand, the economy shows us clearly how an internalisation can be socially more acceptable if it is linked to political measures tending to offer an alternative to car mobility through an improvement of public transportation, quality of life, proximity services, social friendliness in the cities areas. On the other hand, sociology insist on the importance of the expression of political preferences in the day to day reality, to face up to the tragic tendency of our developed societies towards individualism. In fact, there cannot be a significant improvement in the cities' environment without the expression of such a political preference, accompanying economic pricing: this represents a step towards a new "democratic rationality". Allowing a new urbanity, and encouraged by such a new urbanity, this "democratic rationality" is the condition for a shift from a vicious to a virtuous circle regarding cities' and societies' sustainable development.



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