A NEW PARKING ORGANISATION:
THE KEY FOR A SUCCESSFUL SUSTAINABLE CITY OF THE FUTURE

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Transport policy of today

The transport system of today is running into a more and more unsustainable position. If we analyze the indicators of current transport policy, we can recognize the helplessness towards the problems, basic ignorance concerning causes of the problems, cost ineffective measures, and disciplines, which are problem producing and not problem solving.
The applied measures and the fields of political interests of today are traffic flows, concession medication, road pricing, public transport subsidies, telematics (ITS Intelligent Transport Systems) and urban and land use planning based on such assumptions (DETR, 1998b, DETR, 1998a, Knoflacher, 1994, Knoflacher, 1997).

The effects of this attempts and efforts are:

- increasing transport problems
- increasing deficits in public transport and in community budgets
- increasing air pollution
- ideology instead of rationality
- populism instead of responsibility.

Causes of the situation

Transport science has lost its grounds. We have inadequate informed and educated teachers in this field, we have inadequate educated experts and administrators, anxious politicians and we have disciplines in the field, which have not understood the problem. Measures they are introducing are symptom-oriented and not cause-related. This is happening on all levels of our organizations and our society. The EU-commission is wasting tax payers money for useless research since it has no access to real transport researchers. One of the proofs is: instead of supporting qualified scientifically research they use the money for the so called "best practice", whatever this means. The general "best practice" means a symptom-oriented treatment of transport problems which has – in the best case - temporary effects.

The EU-policy is totally inconsistent due to the lack of knowledge about this technology driven transport system and its interactions with society, environment and economy. Therefore ideological based decisions are driving the EU-policies and non knowledge and scientific based one.
National policy and national transport research is in the same position, since the system is not understood by the traditional experts. (There are of course some exceptions). Since these experts are the producers of the problem they try to solve, they cling to their unbearable assumptions like babies to their teddies.
On local level, a lot of experiments are on a path without any systematic research.

The situation can be characterized by the Brueghel-picture "Blinds are leading blinds".

This harsh description can be described by the following few selected indicators of the transport system:

- 1h driving a car cost at least 40 minutes of people lifetime in the system (only in the “first world”)
- the congestion problem is greater then ever before
- CO2 emissions from road traffic are increasing
- The growth of transport miles is greater than GDP growth
- There is no solution for public transport subsidies
- More and more of land is paved for a more an more inefficient transport system
- Increasing unemployment worldwide
- Increasing number of conflicts between infrastructure developers and the public
- Urban sprawl is increasing.
- Freedom of choice for the people is decreasing.

Excuse for the situation

The development of technical means and traffic indicators, like speed, was so fast for the human society, that nearly nobody at least in the professional arena has understood what happened with:

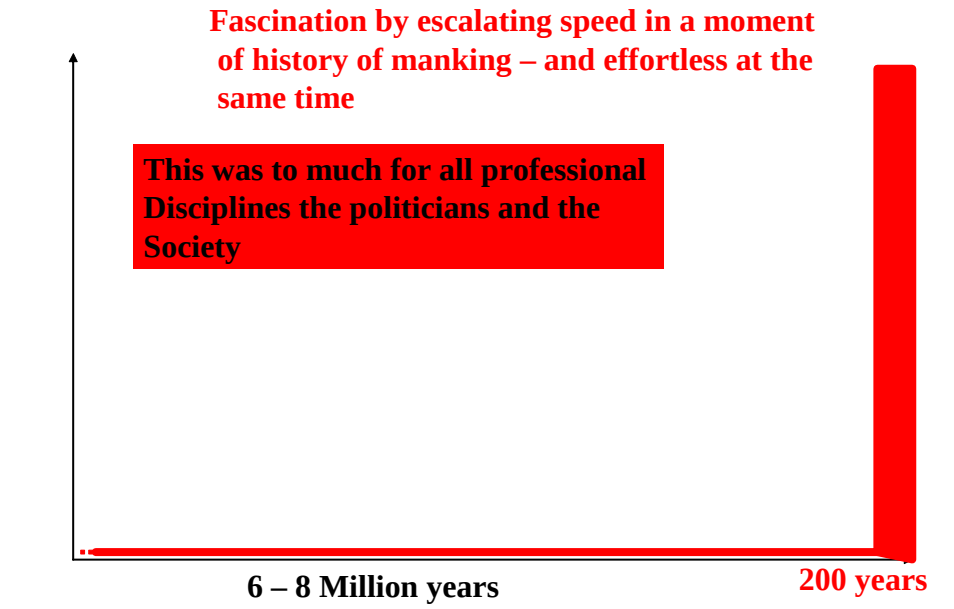
- the transport system
- the cities
- the settlements
- the families
- the society
- the cultures
- the climate
- the environment

Transport exporters have nothing in mind about all this effects, they are happy if the speed is high and the mechanical part of the flowing traffic is uninterrupted.

History

Man has existed for six to eight million years as a biped on the globe. This is the only mode we are really familiar with. Transport technology was developed so fast during the last hundred years of human evolution compared with the whole history in transport before. We have experience with about 10.000 years with settlement, cities, boats, horses, only 200 years with cyclists, about 150 with railways, 100 years with cars and airplanes, 50 years with TV and since few decades we have some experience with telecommunication. The fascination of speed can be understood, if we show the rapid development of maximum speed of cars. If we draw the development of travel speed by on a time scale of six to eight million years the speed has exploded in the last micro-millimeter of this line twenty to fifty times.

Evolution of travel speed



22.08.2003 11 H. Knoflacher

The evolution of travel speed has fascinated the society since it was effortless at the same time. This fascination has made people forgetting all the effects on our culture, the environment, the society. This rapid change was too much for all professional disciplines, the politicians and the society.

Traditional perception of the transport system

Only the mechanical modes were seen for more than hundred years by experts and professionals. For decades the car was the only mode, which was recognized. The focus was and still is traffic flow. There is an enormous lack of understanding of system effects. Personal experience in the new environment were taken as system effect and extrapolated to the whole system. The professions had no time to provide decisions on a sound scientific basis, so professionals put their assumptions into a set of dogmas guarded by national and international professional societies and lobby groups. These dogmas are till today the substitute for the missing scientific knowledge.

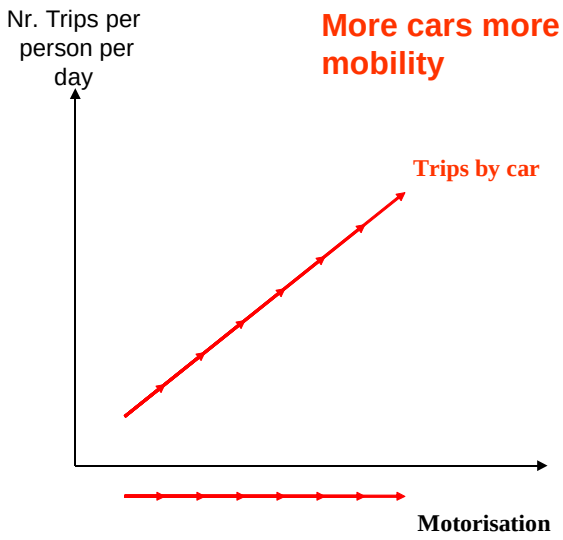
Basic dogmas of the transport professions in theory and practice

The following dogmas are out of question the professionals were:

- Growth of mobility
- Timesaving by increasing speed
- Freedom of modal choice

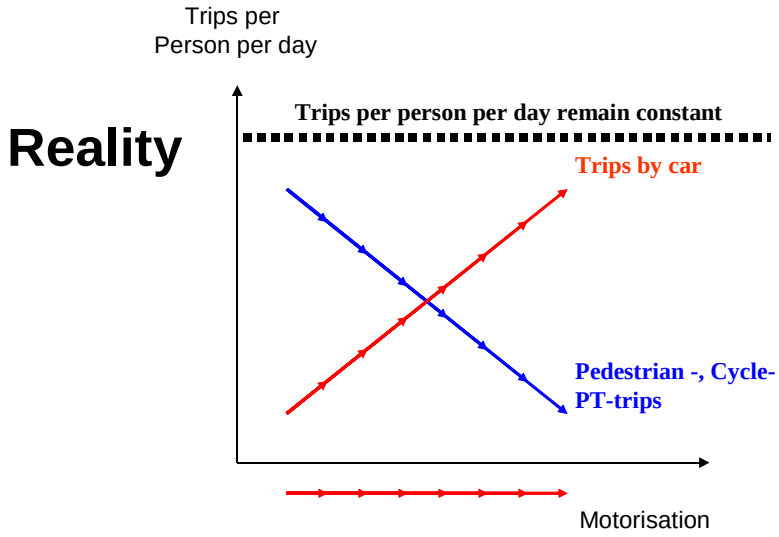
Dogma No one, the growth of mobility,
is based on the observation, that with the increasing motorization the number of trips by person per day is increasing. This was so impressive, that the urban space was converted into a parking space.

Dogma Nr. 1:Growth of Mobility



But the reality is different. Mobility is always related to some purposes. If the purposes do not change, mobility does not change. This is exactly the case. If trips by cars are increasing, trips for pedestrians, cyclists and public transport are decreasing. But all physical, financial an legal provisions were made for the new mode. So trips by car were made, they are not happening. At the same time the mobility of all other transport system users was reduced. The number of trips by person per day remain constant.

But the reality is different

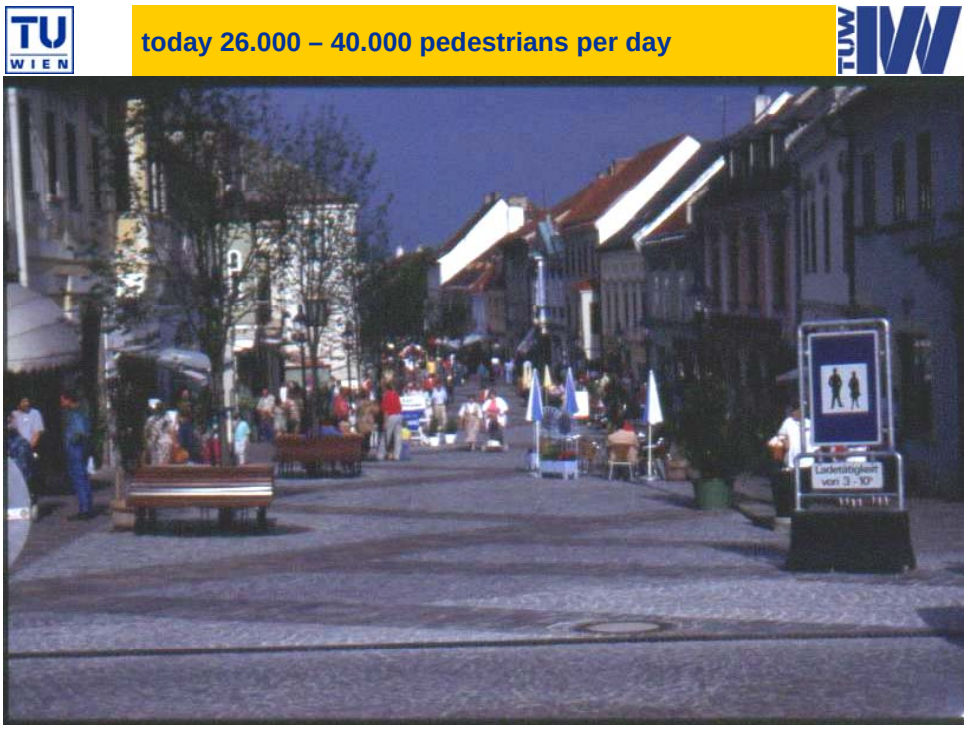


All provisions was made for the new mode

22.08.2003 16 H. Knoflacher

The system as we have it today, can be influenced by measures. This can be proofed by successful implementation of modern transport principles into a city like Eisenstadt. In 1975 the city was crowded with cars, 10.000 cars passed the city-center, only 6.000 pedestrians were counted per day.

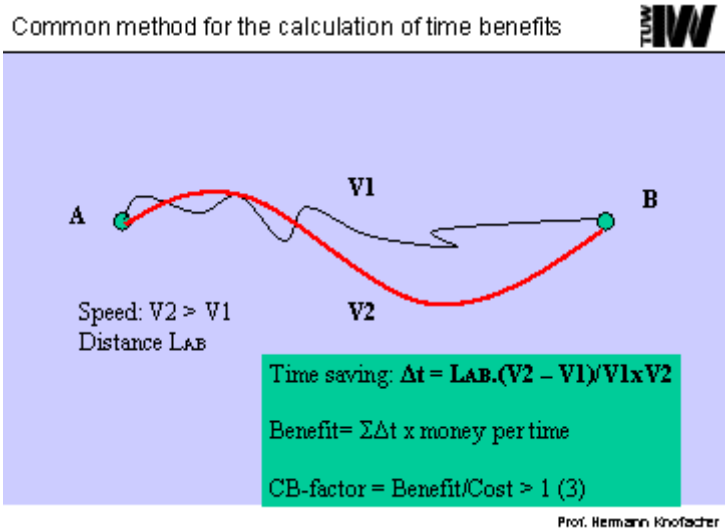
1975: 10.000 cars, 6000 pedestrian per day



Today 26.000 to 40.000 pedestrians per day are counted and there is an increasing business going up in the city-center. We have now a maximum of mobility in the city-center, but no cars anymore. A lot of measures were necessary to change this human behavior. Beside pedestrian area in the city-center the parking management was necessary. Cars are now parked in garages instead on the surface, traffic calming methods were introduced around the city-center and the city-taxi were introduced.

Dogma No two, Time saving by increasing speed

All investments into transport infrastructure are based on calculations, which assume less travel time by increasing speed.



By analyzing the development of individual speed of Austrians between 1955 and 1982 it was recognized, that the Austrians using cars, cycles, motorcycles or walking have increased have increased their speed about ten times within this period of 25 years. So a surplus of time should be expected since everybody is faster is saving time.

Travel speed 1955 - 1981

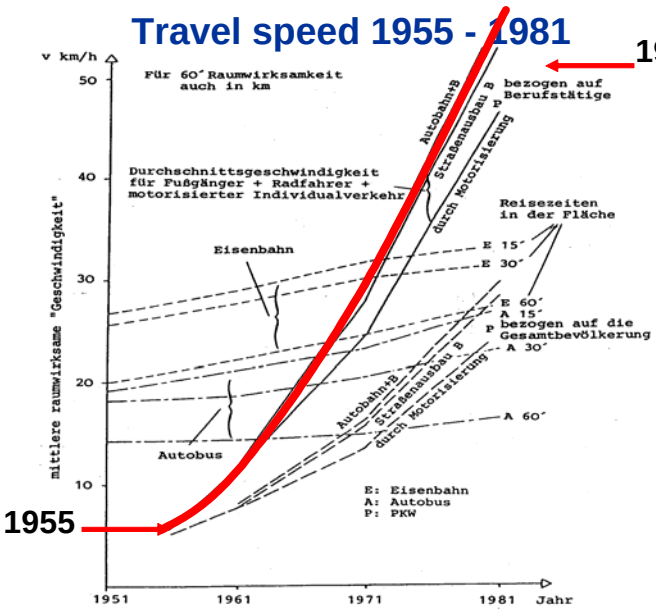


Abb. 12: Vergleich der Entwicklung der räumlichen „wirksamen" mittleren Reisegeschwindigkeiten von Bahn, Bus, Pkw (Reisegeschwindigkeiten der Gemeinden; aus KNOFLACHER, H., GATTERER, W., GROSS, R., WINKELBAUER, S., und ZUKAL, H., 1985)

Entwicklung der „flächenwirksamen" Geschwindigkeiten für den Individualverkehr, die Eisenbahn und den Busverkehr.

In 30 years ten times faster ...

H. Knoflacher

But this was not the case. If we analyze the travel time distribution of different transport system users, we have to recognize, that all individual transport system users - this are pedestrians, cyclists, motorcyclists and car-drivers - have not only the same total travel time, they have also the same travel time distribution, although car-drivers are six times faster than pedestrians, they cannot save any second of time in the system.

But no difference in travel time distribution between slow and fast system users

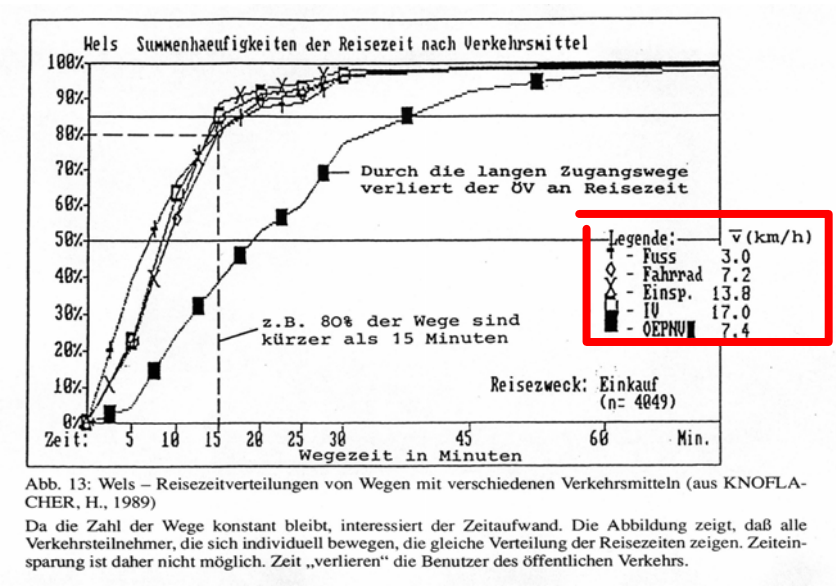


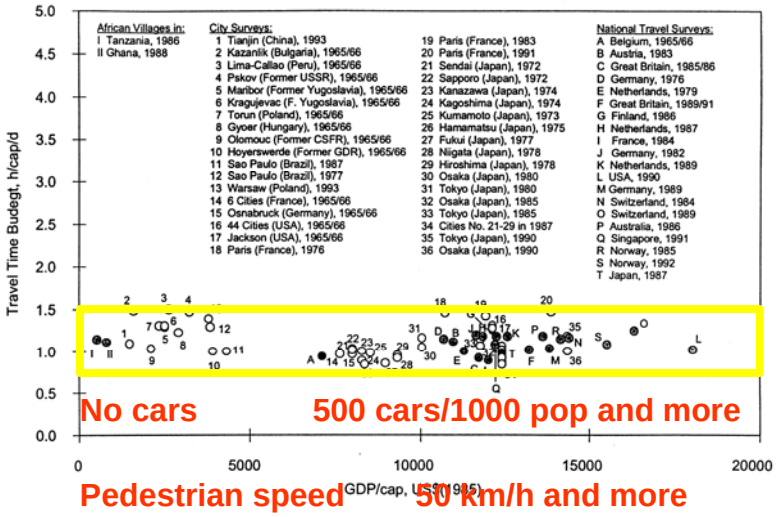
Abb. 13: Wels – Reisezeitverteilungen von Wegen mit verschiedenen Verkehrsmitteln (aus KNOFLACHER, H., 1989)

Da die Zahl der Wege konstant bleibt, interessiert der Zeitaufwand. Die Abbildung zeigt, daß alle Verkehrsteilnehmer, die sich individuell bewegen, die gleiche Verteilung der Reisezeiten zeigen. Zeiteinsparung ist daher nicht möglich. Zeit „verlieren" die Benutzer des öffentlichen Verkehrs.

This basic findings from the 70ies have been shown in the 90ies by Schafer et. al. by analyzing data from travel surveys from different countries of the world (Goodwin, 1981, Zahavi, 1979, Schafer, 1998, Schafer, 2000). Peoples living in society without any car have to walk, compared to the people living in the northern hemisphere - Europeans and

Americans or Japanese - having 500 cars and more per 1.000 population. But everywhere on the world travel time budget is the same.

Nowhere on the globe a saving of travel time has been observed so far



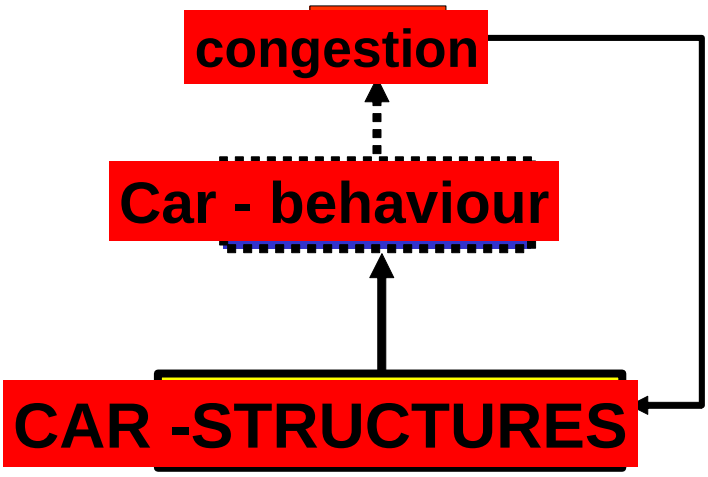
Travel Time Budget is everywhere the same

This has been already shown in the mid seventy. If house to house speed is increasing, the travel distance is also inreasing and this changes all human structures. Two effects happen:

- first urban sprawl for housing and
- second concentration of business and shopping activities along of motorways and on the fringes of the city.

Structures are changing the behaviors

Traditional transport experts have traffic data in their mind - traffic data means car data. So the convert transport system structures into car structures and this structure produce a car oriented behavior - and this produces of course more data for cars.



The so called “transport growth” is the logical outcome of this kind of measures. Congestion is produced inevitable by this procedure. Traditional demand-oriented transport engineering is a profession to produce and maximise congestion. At the same time it produce also city sprawl on the one side and on the other side the concentration of business activities.

The result of the work of this kind of urban planning, transportation planning and transport economy, indicate that this professions are not based on a background, which can be called scientific.

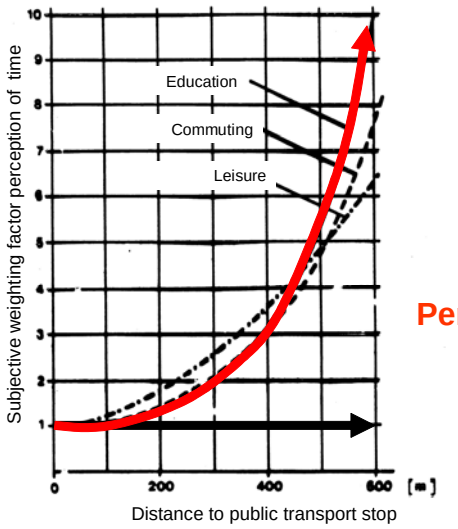
Dogma No three, the wrong image of the man

Since the man has invented new transport modes, he is also able to control and master them. This is the basic assumption of our society. And this assumption leads to the expectation, that we have an unlimited freedom of modal choice.

Time is not time. Walter observed in 1974 that different time component on a trip are estimated in different ways.

What is the decisive time?

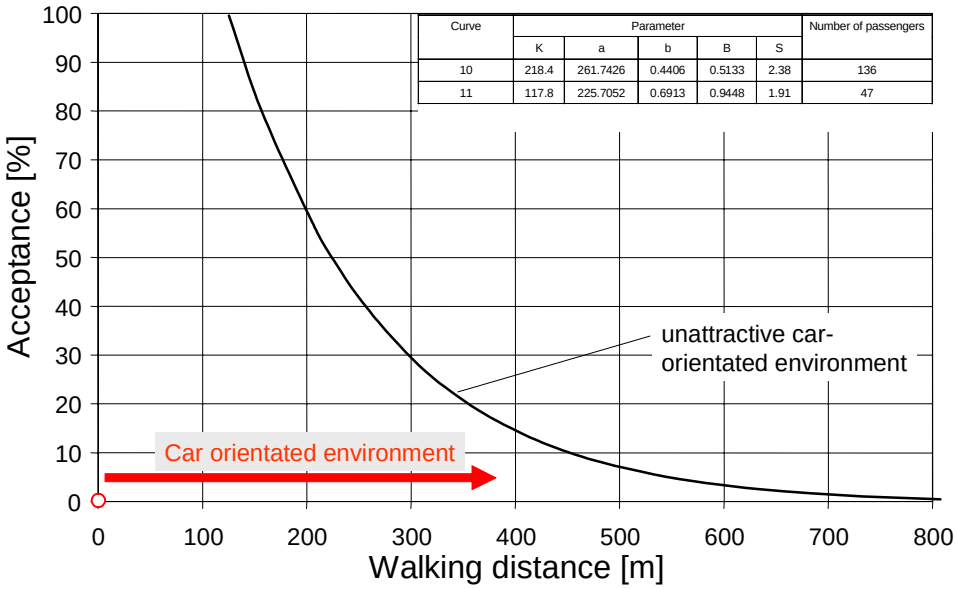
Measured?



Perceived?

Time is overestimated with increasing walking distance. The reciprocal is the so called deterrence function and the deterrence of walking distances is decreasing exponentially with increasing length of the way. (Knoflacher, 1987)

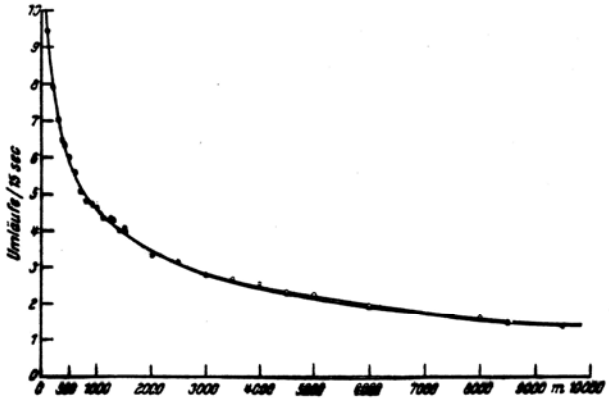
Distance and Acceptance



Curve	Parameter					Number of passengers
	K	a	b	B	S	
10	218.4	261.7426	0.4406	0.5133	2.38	136
11	117.8	225.7052	0.6913	0.9448	1.91	47

This negative exponential function was found some decades before by Karl von Frisch by analyzing and discovering the "language of bees" (Lill, 1889). The frequency of dances of bees in the hive is a scale for the distance to the feeding place.(Frisch, 1977)

What is the cause for this phenomenon?

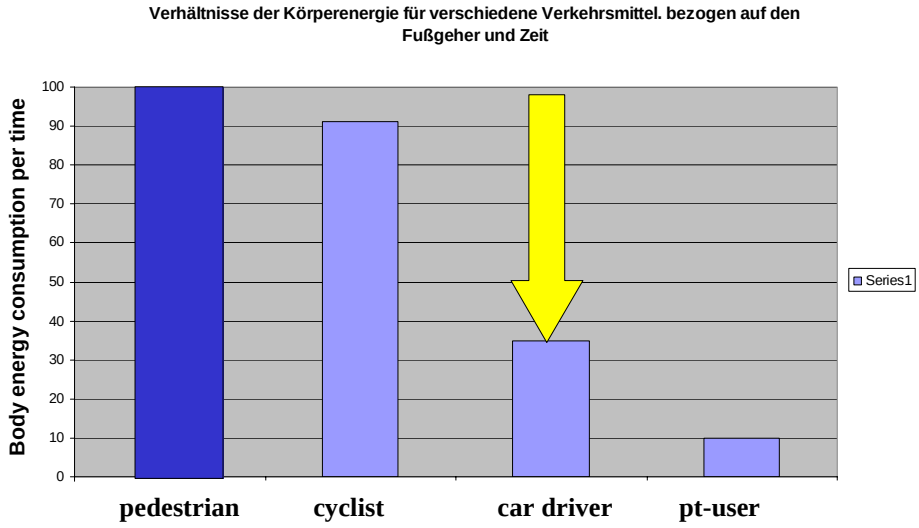


Distance to feeding place

What is the cause for this phenomenon? The cause for this phenomenon must be a so called homology. Homology means, that the same cause is producing the same effects in different species. The key element was the finding of Karl von Frisch about the content of information about distance for the bees is not the distance itself, it is the energy consumption the bees needs to fly over certain distance. By comparing the information observing bees flying to the feeding place and bees forced to walk through a channel to their feeding place Frisch discovered that not the distance was the content of the information, but the amount of body energy.

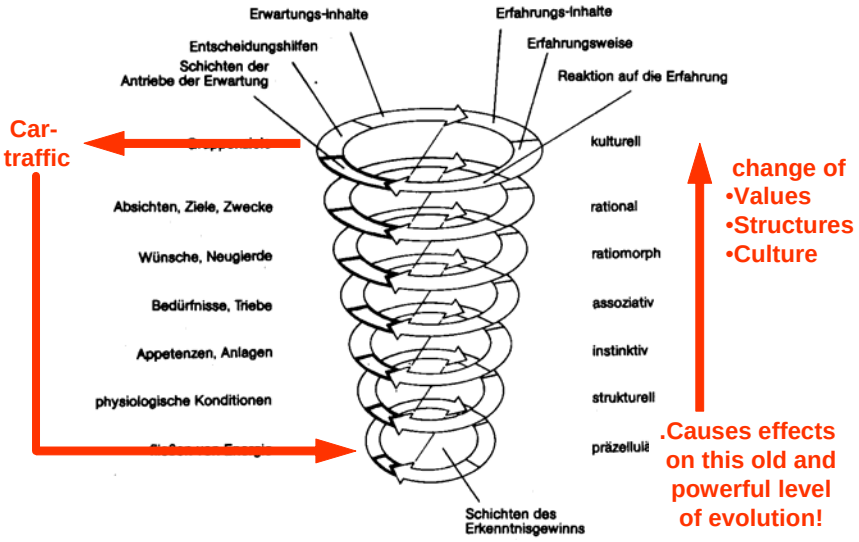
So, in analyzing human behavior based on energy consumption, it was not astonishing, to find that, according to ergonomic studies, the car driver use only a fraction of the body energy per time compared with the pedestrian (Hettinger, 1989, Spitzer et al., 1982).

Body energy – the decisive factor for our behaviour



This means, that the car gets in contact with the man on the evolutionary level. The car is the result of our technical civilization. But it goes in contact with the individual on his maybe oldest evolutionary level, which is the energetic level (Riedl, 1981, Riedl, 1985, Lorenz, 1977).

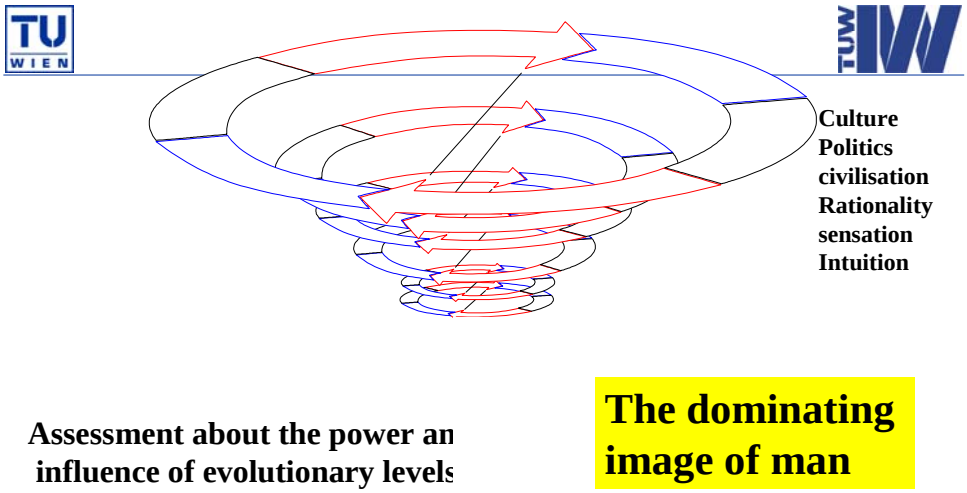
Innovation of our civilisation cause effects on our oldest and most powerful levels of evolution



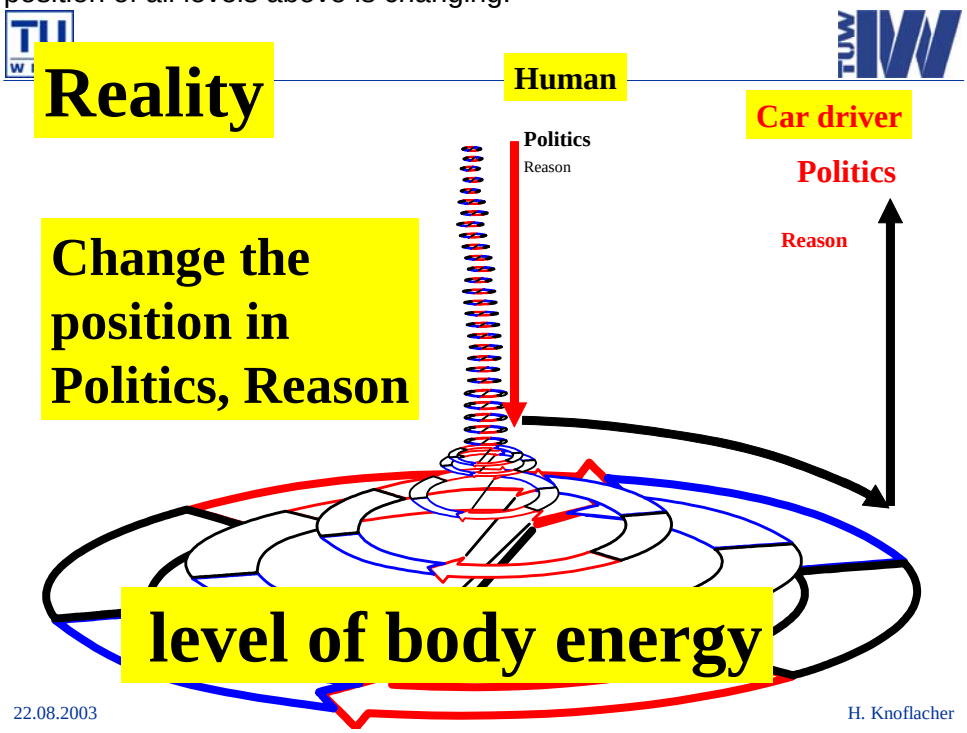
Source: Die Spaltung des Weltbilds, R. Riedl, 1985

This changes everything above this level. It changes values, structures, cultures and so on. This has tremendous effects on the whole society: a new species appeared ➔ the CAR USERS. And this was not understood very well or not at all by all the disciplines. The dominating image of the man is, that he lives in a culture with politics, civilization, nationality,

maybe with some sensations and irritations. We tend to ovberestimate our youngest and recent evolutionary levels. We tend to forget all our evolutionary history.

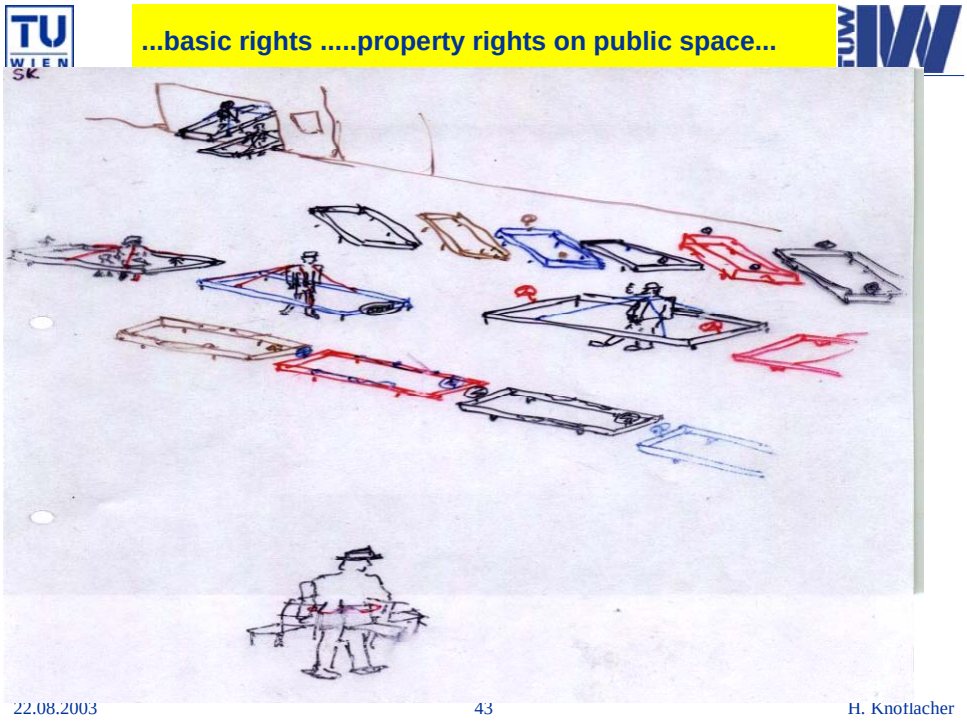


Reality is quite opposite. The level of body energy is much stronger than politics reasons and whatever we are dealing with our rational brain. If the level of body energy is changing, the position of all levels above is changing.



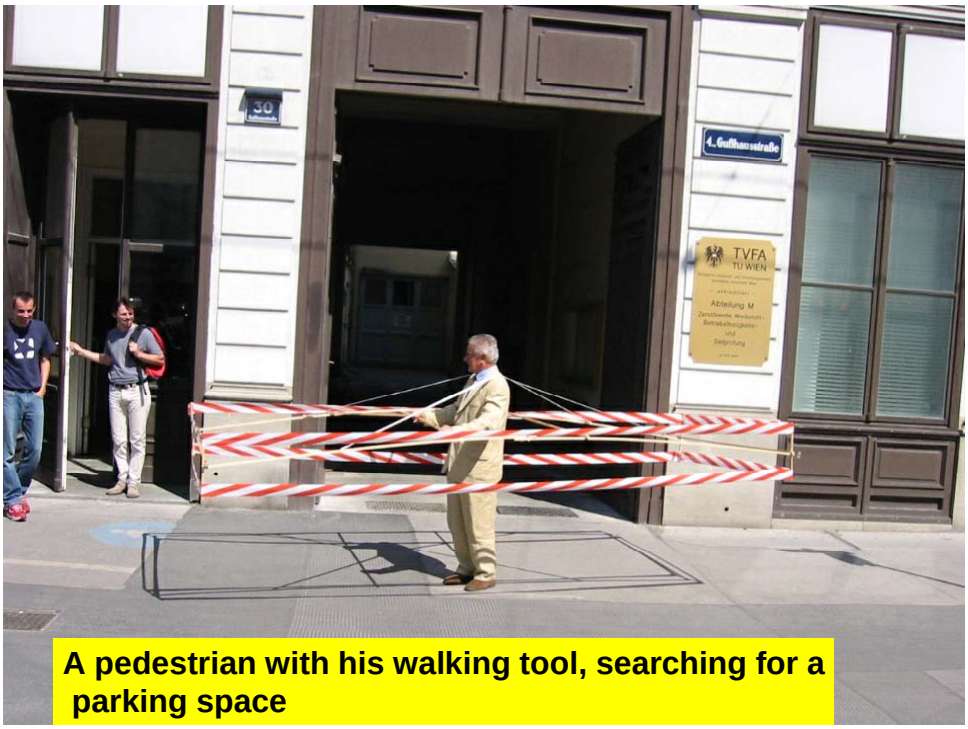
So politics start to make a human policy and finally they come out with the policy for car drivers. This can be easily demonstrated by comparing basic rights. If we compare property rights on public space between car drivers and pedestrians and let the pedestrian move

around with the so called walking tool, a frame, which has the size of a car. If they would be blocked in a queue, nobody would take care on them, nobody would see this as a problem, every body would say "Well, this is a totally crazy behavior". But if car drivers stuck in the system, then we have the so called congestion problem.



THE KEY FOR A SUCCESSFUL SUSTAINABLE CITY OF THE FUTURE

All values of the society and the culture of man have changed due to the new species: the car-driver.

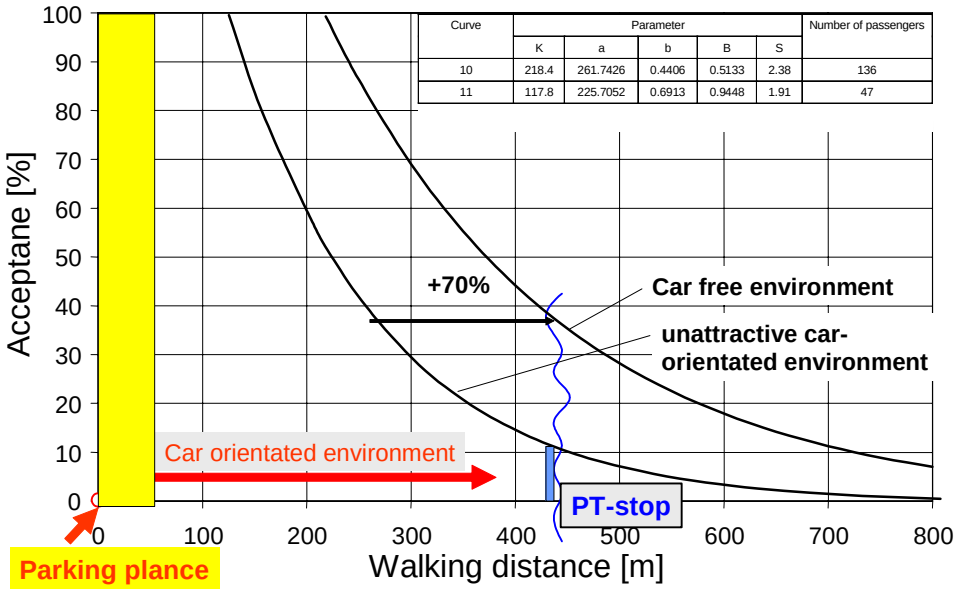


A pedestrian with his walking tool, searching for a parking space

But it is recognized by everybody as a kind of unsocial behavior. But if car-drivers are doing the same, everybody accept this as a kind of real need of this new species. There are a lot of other examples, which show these basic and fundamental changes in our habits, the society and our culture.

Traditionally cars are parked directly at the origin or destination of a trip. This has the effect, that the whole public space, which was the former road used by everybody, has to be separated in a privilege space for car-drivers and the rest, which is left for all the other road users. The distance of an accepted walkway is dependent on the quality of the environment. Empirical results have shown, that in the car-free environment people accept the walking-distances which is more than 70 % longer, than in a car orientated environment (Peperna, 1982).

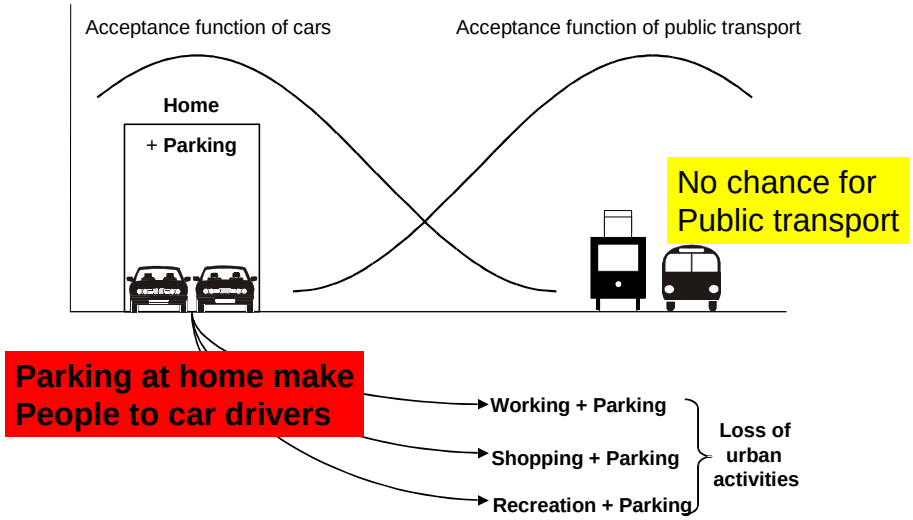
Distance, Quality of Environment and Acceptance



Effects of parking at home or at the destination

If cars are parked at home or in front of the house, due to economic forces of economy of scale and cost advantages functions, no working places are necessary nearby, as well as no shopping places, no recreation facilities are necessary within a walking distance, because all this things can be reached in a concentrated far away located position. Public transport has no chance under these conditions (Knoflacher, 1981).

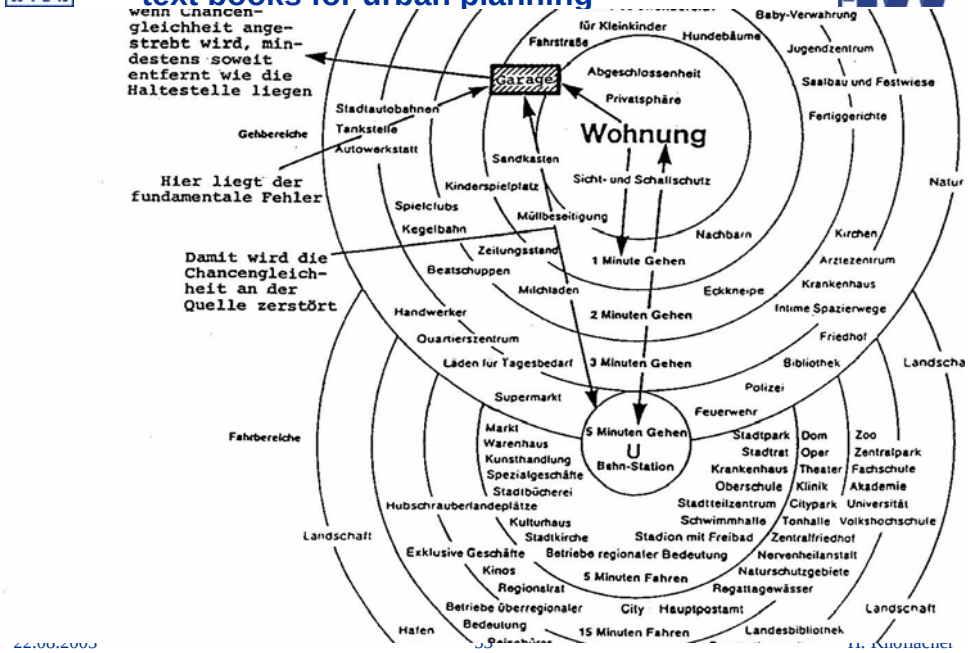
Separation of activities is the result of individual optimsation of parking



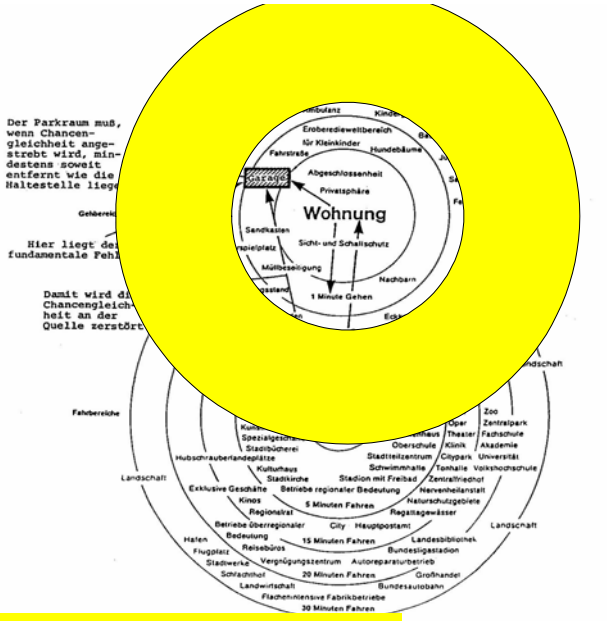
Parking at home and at destinations destroy all human scale structures and activities

Parking at home and at destinations destroy the for all humans skill structures and activities. This has not been understood, even by future and sustainable oriented city planners, which have recommended to develop new sustainable city structures with car parking opportunities adjacent. to housing and working.

Basic mistake even in sustainable orientated text books for urban planning



Such a structure can never develop a human oriented sustainable city structure. Cars at home replace everything in the neighborhood, shops, recreation, social contacts are disappearing. The urban structure is collapsing.



Cars parked immediately at the objects destroy sustainable structures

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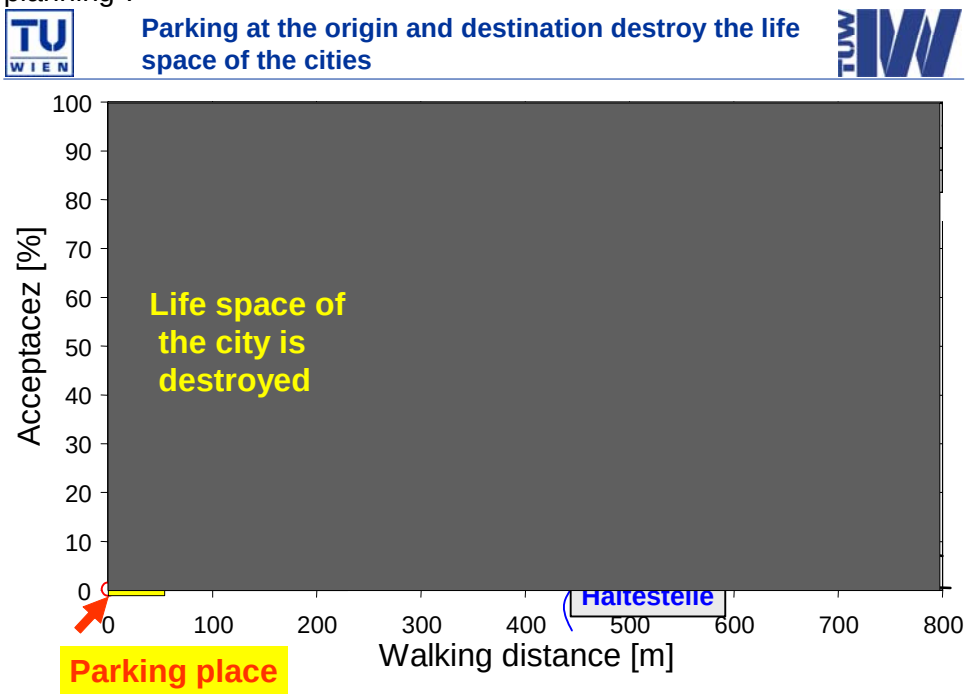
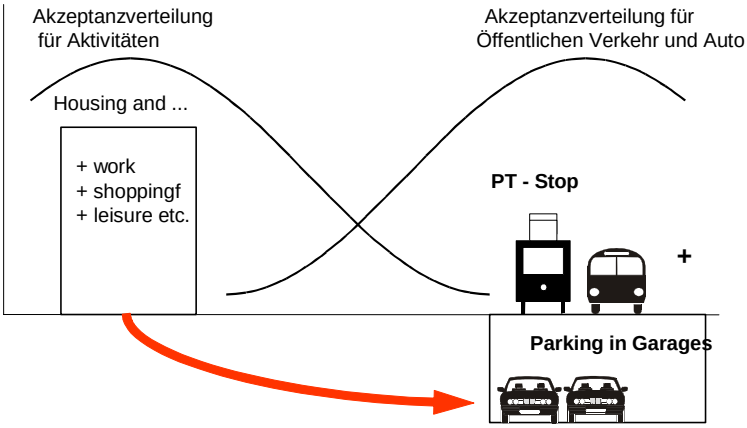
Individually optimized parking places in the area are destroying the live space of the cities. The result is urban sprawl and the effect is, what Prof. Whitelegg call "intelligence free planning".



The solution

The problem has to be solved where it occur. Problems have to be treated and not symptoms. The problem is the man before he is converted into a car-driver.
The solution is intelligent planning, i.e. never the treatment of traffic flow, nor road pricing, not technology in technique of cars and also not the tariffs of public transport (Knoflacher, 1997, Knoflacher, 2002, Knoflacher, 2001).
The *intelligent* solution is the right organization of origin and destination of trips and this means, a future oriented solution for parking management. The key for the solution is a new kind of parking organization. One of the most important goals of transport politic is priorisation of public transport, which don't work in reality. We have now a scientific based answer to this problem: people have only a chance of choice under comparable conditions. If the car is parked in front of the house, or in the garage in the house and the public transport stops is several hundred meters away, everybody will use the car. And if the destination is organized in the same way, public transport will have no chance against car traffic.
Under this condition everybody will try to buy a car and increase the degree of motorization and is therefore enhancing the problem.
Based on real human behavior the solution is a total reorganization of the existing parking situation everywhere (not only in the cities). Instead of individual optimization of human activities and **car parking a system optimization is necessary**, in such a way, that **all parked cars have to be stored in the garages,** which are as good accessible as public transport stops are. This has to be done for all origins and destinations.

Precondition for a liveable city:



Distance equality to the parking place and the public transport stop

The enthusiasm for car traffic in the 20th century has created a kind of planning, which is called by Prof. Whitelegg as *"intelligence free planning".* And this is totally true since this kind of individual optimization of cars and human activities is the main course of a lot of problems - not only transport problems, but also economic, employment and environmental problems - of all societies today. It is no time to switch from *intelligence free planning* to *intelligent* planning taking into account the real system behavior by providing a transport structure where the people have a fair chance of choice between cars and public transport, better environmental conditions, more flexibility and more opportunities for nearby jobs, recreation activities and social contacts. About 70 % of urban space will become car free. This is a tremendous benefit compared to the costs caused by restructuring the existing unsustainable system.

Effects

If we calculate the effects on urban structures, the minimum effect is at least 30 % of recovering of urban structures. Activities are coming back into the neighborhood and we have equality of chances between cars and public transport.
If we take real human behaviour into account, the effect is much bigger. About 80 % of the urban structures will become sustainable multifunctional, social and economic sustainable.

This is a precondition for the intelligent transport and urban planning which takes into account that each change in the transport system has effects on nature, culture, economy and urban structure, social structure and chances between different groups.

The way to reach this goal

Now we have a scientific sound bases for restructuring the parking regime. But beside the sound idea, money will be needed to realize the system solution. Today the money is on the road. System supporting behavior has to be supported by financial measures also. The

system violations have to be prosecuted. Today societies are doing exactly the opposite what is needed, recommended and what the societal goals are.
In most countries people have to pay a compensation, if they don't provide enough parking places on their own ground, in the house or closed to the apartments. So they are forced by financial regulations to do the wrong things. This is quite in opposition what politicians in transport aim. They tell the people they should use the public transport and don't use the car. On the other side, they are building structures, which force the people to use the car and neglect public transport. And if they don't built the physical structures for cars, they are punished by financial laws. This creates unsolvable problems for the societies and the cities.

If somebody is parking at home, he produces later on all the problems for the city: transport problems, congestion in car traffic, environmental problems, degradation of city economy, urban sprawl, shopping centers outside of the cities etc. This is totally in contradiction to all political - and professional goals.
The solution is therefore the introduction of a charge in relation to the benefits somebody has. Who parks at home has to pay for the benefits of this exclusive and privileged position. Who parks in a centralized garage, at least as far away as the next public transport stop is, has to pay less, because his behavior under this structure reconditions will be system supported. The charge has to be related to the fares of the public transport and the financial and operation cost of the garage operators. The minimum monthly charge for parking on the right place, which is the centralized garage, has to be a monthly ticket for the public transport system. Who park his car on the right place will also get one ticket for the public transport. People parking at home have to pay three, four times more (dependent on the distance to the public transport stop) for the benefits of their privileged situation. But they get only one monthly ticket for their payment. The same charge has to be introduced for all other opportunities - working, shopping, recreation etc. So the society will have enough money to restructure the system within a relative short time period. When the system is restructured in these sustainable structure, public transport needs no subsidies anymore and the garages can operate on the running costs.

This new structure will create a lot of local jobs in construction, since thousands of garages have to be planned and build, hundred-thousands of kilometers of roads have to be reshaped and a lot of local activities will be established everywhere. And all the costs are paid by the responsible party.

In the transition period money comes from the charge for wrong parking and can be used for the recovery of urban structure, recovery of urban economy construction of garages improving public transport and strengthening the local community and local economy. After reshaping the structures, the system is much cheaper, need more or less no subsidy and is in itself a problem - solving and not a problem - producing structure.

Reference

DETR (1998a) *A New Deal for Transport: Better for Everyone,* TSO, London.
DETR (1998b) *Planning for Sustainable Development: Towards better Practice*. London.
Frisch, K. v. (1977) *Aus dem Leben der Bienen,* Springer-Verlag, Berlin
Heidelberg
New York.
Goodwin, P. B. (1981) The Usefulness of Travel Budgets. **15A,** 97-106.
Hettinger, T. (1989). Physiologische Leistungsgrundlagen. In *Handbuch der Ergonomie*, Vol. 1 (Ed, Schmidke, H.) Carl Hanser Verlag, München - Wien.
Knoflacher, H. (1981) *Human Energy Expenditure in Different Modes: Implications for Town Planning*. In *International Symposium on Surface Transportation System Performance*, Vol. II U.S. Department of Transportation.

Knoflacher, H. (1987) *Verkehrsplanung für den Menschen,* Orac, Vienna.
Knoflacher, H. (1994) Denken - Planen - Entscheiden - Verantworten. *Gemeinde Stadt Land,* **19,** p41-51.
Knoflacher, H. (1997) Landschaft Ohne Autobahnen. Fuer Eine Zukunftsorientierte Verkehrsplanung.
Knoflacher, H. (2001) *Stehzeuge. Der Stau ist kein Verkehrsproblem,* Böhlau Verlag, Wien.
Knoflacher, H. (2002) Wie die Trendumkehr der Verkehrsentwicklung denkbar machen? *Österr. Ingenieur- und Architekten-Zeitschrift (ÖIAZ),* **146**.
Lill, E. (1889) Die Grundgesetze des Personenverkehrs. **35/36**.
Lorenz, K. (1977) *Behind the Mirror,* Methuen & Co Ltd., London.
Peperna, O. (1982) *Die Einzugsbereiche von Haltestellen öffentlicher Nahverkehrsmittel im Strassen- und Busverkehr*. In *Institut für Verkehrsplanung und Verkehrstechnik*TU Vienna, Vienna.
Riedl, R. (1981) *Biologie der Erkenntnis,* Verlag Paul Parey, Berlin und Hamburg.
Riedl, R. (1985) *Die Spaltung des Weltbildes,* Verlag Paul Parey, Berlin und Hamburg.
Schafer, A. (1998) The Global Demand for Motorized Mobility. **32,** 455-477.
Schafer, A. (2000) Regularities in Travel Demand: An International Perspective. *Journal of Transportation and Statistics,* **December 2000**.
Spitzer, H., Hettinger, T. and Kaminsky, G. (1982) *Tafeln für den Energieumsatz be körperlicher Arbeit,* Beuth Verlag GmbH, Berlin - Köln.
Zahavi, Y. (1979) *The UMOT Project*. U.S. Department of Transportation, Research and Special Programs Administration, and the Federal Republic of Germany Ministry of Transport.