NON-MOTORISED TRANSPORT – EFFICIENCY, POTENTIAL AND NEED OF ACTION

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1 ABSTRACT

Wile public transport (PT) and motorised individual transport (MIT) have much increased in the last decades and infrastructure has constantly been improved, there is need for action in the Non-motorised transport NMT (walking and cycling traffic). NMT investments per capita does only represent a fraction, compared with PT and MIT investments, what contrasts with the substantial part of walking and cycling traffic (nearly 50% of all trips in the year 2000).

On the other hand non-motorised transport has clearly ecological and economical advantages. Therefore recent planning processes – namely the Swiss "Agglomerationsprogramme" – postulate an intensifying of NMT promotion.

My contribution illustrate the specific economical and ecological advantages of NMT compared with other mode of transport – on the basis of self produced and other selected studies. Further more the potential of changing mode of transport on short trips (from MIT to NMT) is discussed.

Many of the NMT advantages are beyond controversy, yet there is a lack of data basis and methodological consensus of providing evidence, e.g. comparing measures between different modes of transport. The contribution illustrates these part as well.

Finally the contribution gives a short overview of institutional barriers, which interfere with a bride promotion of NMT measures in Switzerland.

2 INTRODUCTION

In the next 10 to 20 years traffic demand in Switzerland will increase constantly. In the same time road and rail capacities come up to their limits. Further extensions of the transport infrastructure need an efficient contribution of the short financial resources. With nearly 50% of all trips (ARE/BFS 2001) the Non-motorised transport has a high relevance in the overall transport system. Yet the actual investments per capita contrasts strongly between non-motorised transport on the one hand and motorised individual transport and public transport on the other hand. Although the data basis for NMT-investments in Switzerland is very small, an estimation is given in Netzwerk Langsamverkehr (1999). Only 2-4% of the total direct investments per capita and year benefits the non-motorised transport:

	Walking	Cycling	Road	Rail	Air
Direct investments	6 – 15	12 – 25	500 – 550	300 – 350	>30
Total investments, incl. external costs	7 – 16	14 – 28	1200 – 1250	820 – 860	n.i.

Table 1 : Estimation of investments per capita and year for different mode of transport (Netzwerk Langsamverkehr 1999)

In the near future the Federal government wants to push the NMT and therefore worked out a conceptual paper (UVEK 2002: "Departementales Leitbild zur Förderung des Langsamverkehrs"). More activities in this transport sector is based manly on two theses: a) NMT-investments are economically more efficient and b) the potential of changing mode of transport, especially from motorised transport, is important. In the following sections these two theses are further discussed and illustrated.

3 EFFICIENCY OF NON-MOTORISED TRANSPORT

A recent Swiss study (INFRAS 2003) examines the thesis that investment in Non-Motorised Transport (NMT) (walking/cycling) is more economically efficient than other forms of transport investment. Seven examples of NMT, taken mostly

from urban agglomerations, and two reference examples each from Motorised Individual Transport (MIT) and Public Transport (PT) have been analysed in terms of their gross cost-benefit. The quantitative calculations have been restricted to the efficiency indicator "public costs per transport unit concerned". In addition, qualitative judgements have been made with regard to other economically relevant benefit factors. The cost efficiency and the added benefit of the examples studied may be summarised as follows:

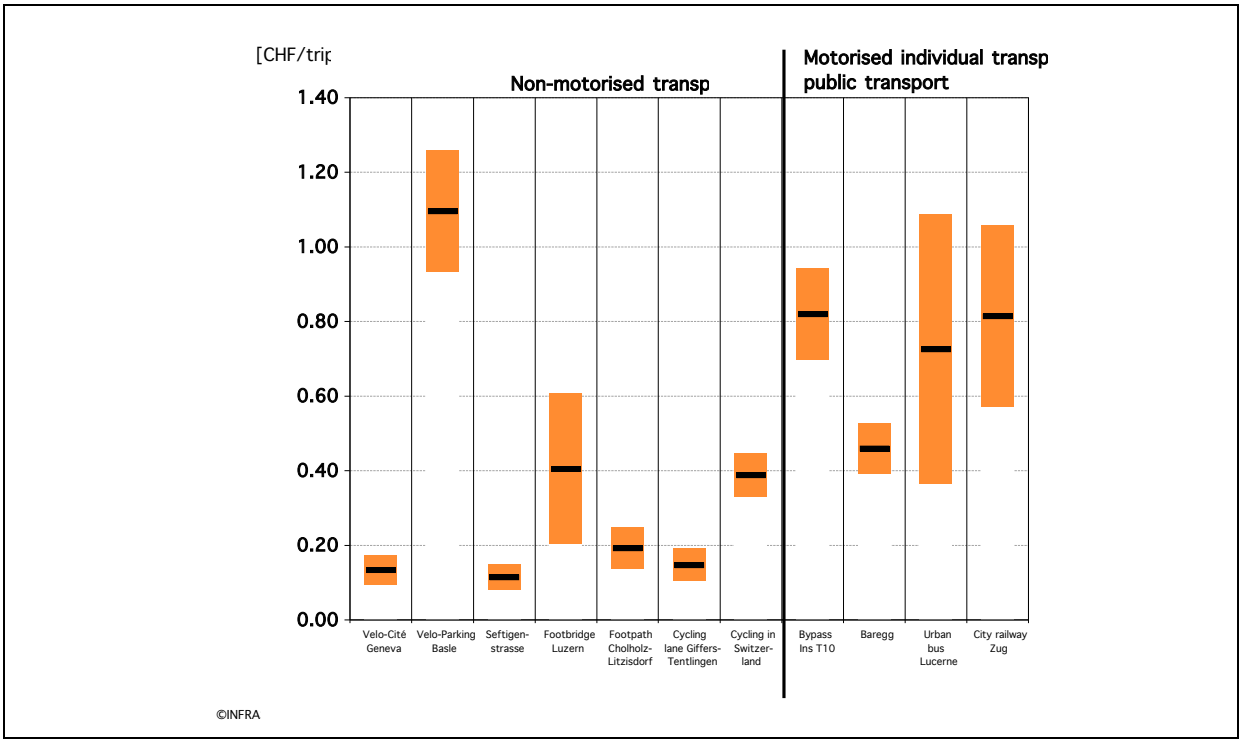

Fig. 1 Cost efficiency with data quality range (dependent on data quality)

Overall, the **cost-efficiency** of the NMT measures is distinctly better than that of the MIT / PT reference examples. The range extends from 10 to 40 centimes per trip (exception: Velo-Parking, Basle), as compared with 40 to 80 centimes with the reference examples. In general, the NMT measures are low cost measures (often simply additions to the existing road network) and they reach a significant number of users. Costly and capital intensive projects like the Velo-Parking, Basle are exceptions to this rule. Since, with such costly measures, there is other commercial potential in addition to parking and as transport companies draw benefit, it is necessary to work out an appropriate means of allocating costs between the public purse and the private operators. Apart from construction work, extensive accompanying measures are needed for the successful implementation of NMT projects (public relations, marketing, etc). With NMT, these costs are largely supported out of the public purse, which creates an imbalance in relation to MIT and PT.

Apart from the yardstick of direct efficiency per franc invested, NMT measures offer a number of **other economic benefits**. Yet in this study these other benefits have been illustrated only in a qualitative manner:

	Environmental impact (energy, air pollution, noise)	Accident prevention	Individual health	Reduced traffic congestion	Social networking	Regional economic significance
Examples of non-motorised transport						
Vélo-Cité Geneva	●●	●●	Against the basically positive effects of NMT, we have to set the negative aspects in heavily used city centres (air pollutants, risk of accidents)	●	●●	●
Velo-Parking Basle	●	●		●	●	o
Seftigenstrasse Wabern	●●	●●		●●	●●●	●
Footbridge Lucerne	●	●		o	●	o
Footpath Cholholz-Litzisdorf	●●●	●●●		o	●	o
Cycling lane Giffers-Tentlingen	●●●	●●		o	●	o
Cycling in Switzerland	●●●	●●		o	●●	●●●
MIT/PT reference examples						
Bypass T10 Ins	●	●●	o	●	●	●
Third tunnel tube Baregg	●	●	o	●●●	o	●●●
Urban Bus Lucerne	●●	●	o	o	●	o
City railway Zug	●●●	●●	o	●●●	●●	●●

Table 1 : Qualitative Assessment of Additional benefits
Legend: ●●●: high benefit, ●●: average benefit, ●: low benefit, o: no significant benefit.

• Optimising the overall transport system: In those areas of Switzerland with the highest concentrations of traffic – especially the urban agglomerations and city centres – NMT permits journeys to be made in combination with other modes of transport (above all PT), thus relieving some of the pressure on a road transport system already stretched to its limits.

• Improving the environment situation: Walking and cycling are well known to be the most environmentally friendly forms of travel. These advantages become most apparent where it is possible to increase the share of NMT in short distance travel of up to 5 km (see next section). The prerequisite here is a safe and attractive framework for NMT.

• Improving health: Walking and cycling promote individual health. There is less argument about the benefits in the countryside than in the polluted air of congested city centres. This shows that the promotion of NMT needs to be accompanied by traffic calming measures for MIT.

• Boosting leisure and tourism: Finally, NMT measures make locations more attractive for leisure purposes and so contribute to regional wealth creation. Peaceful pedestrian zones encourage people to stroll about and do their shopping, while attractive networks of cycle paths open up new opportunities for tourism in both town and countryside.

The weighting attributed to these measures is a political question. In individual cases, particular criteria may play a predominant role (e.g. quality of transport services in public transport projects). Accordingly, the cost-benefit considerations referred to here must be understood as a tentative reply to the thesis of the efficiency of NMT investment. With NMT and MIT/PT infrastructures, it is rarely an either/or question but rather an integrated optimisation of the overall transport system.

4 POTENTIAL OF NON-MOTORISED TRANSPORT

There exists numerous foreign studies, estimating the potential of NMT (overview in Netzwerk Langsamverkehr 1999), but rarely one has done this for Switzerland yet. As per the CO2 law, by the year 2010 Switzerland is obliged to reduce CO2 emissions by 10% overall compared with 1990 (combustibles -15%, fuels -8%). The current deficit in traffic is around 2.6 million tonnes of CO2 compared with the target. Within the scope of the "Communication for the approval of the C02 emission level for combustibles", the Federal Council explains how this gap is to be closed. In addition to the proposed principle measures of C02 tax (combustibles) and climate cent (fuels), significant CO2 contributions can also be expected from promotional measures in non-motorised transport in the longer term. Therefore a study was launched (INFRAS 2005), quantifying this C02 potential of non-motorised transport.

The study restricts itself to the potential of changing short motorised individual transport journeys to non-motorised transport. Changing from public transport to non-motorised transport (not necessarily energy-relevant) as well as changing from long motorised individual transport routes to combined public transport - non-motorised transport routes (primarily a public transport – motorised individual transport discussion) are excluded. From a methodical point of view, a distinction is made between "technical" and "realisable" potential.

• The **"Technical potential"** takes account of external hindrances, such as weather, topography, settlement density, traffic purpose (e.g. luggage/accompanying transport) or complexity of the mobility chains. It is assumed that the other framework conditions (e.g. the available non-motorised transport infrastructure) are optimal for changing potential. The technical (theoretical) potential is derived in a quantitative-analytical manner. The data basis is the Microcensus on Travel Behaviour 2000. Here, only motorised individual transport trips ("Etappen") up to 5 km and excursions ("Ausgänge") up to 10 km are taken into consideration (or 15 km in the sensitivity calculation), on the assumption that the direct changing potential is likely to be marginal with greater distances. The assumptions on which the potential calculations have been based have deliberately been chosen conservatively, because various influence factors cannot be operationalised on the basis of the data basis (e.g. precise topographic facts or luggage transport).

• The **"Realisable" potential** also takes into account effective hindrance factors of an economic, social, individual nature, as well as those resulting from (transport) political framework conditions. Three future scenarios of differing transport-political levels of intervention are formulated ("reference", "NMT+" and "NMT+/MIT-"). From a methodical point of view, exploitation factors are derived from the "technical" potential on the basis of argumentative-qualitative considerations – based on observations at home and abroad.

Depending on the assumption in terms of the reasonable maximum length of an excursion, a **technical potential** of 17-20% of all MIT-trips (traffic volume) results. This corresponds to around 3-4% of the motorised individual transport – personal kilometres (traffic capacity) or savings of 0.4-0.5 million tonnes of CO2.

Depending on the future scenario and assumptions in terms of reasonable maximum excursion length, **realisable potential** of 6% to 15% of all MIT-trips by 2030 results. This corresponds to around 1% to 3% of the motorised individual transport (personal kilometres) or savings of around 0.1 to 0.35 million tonnes CO2. On the other hand, the potential short-term contributions up until 2010 (Kyoto protocol) are negligible, because the implementation of the underlying measures is only realistic in the medium to long term.

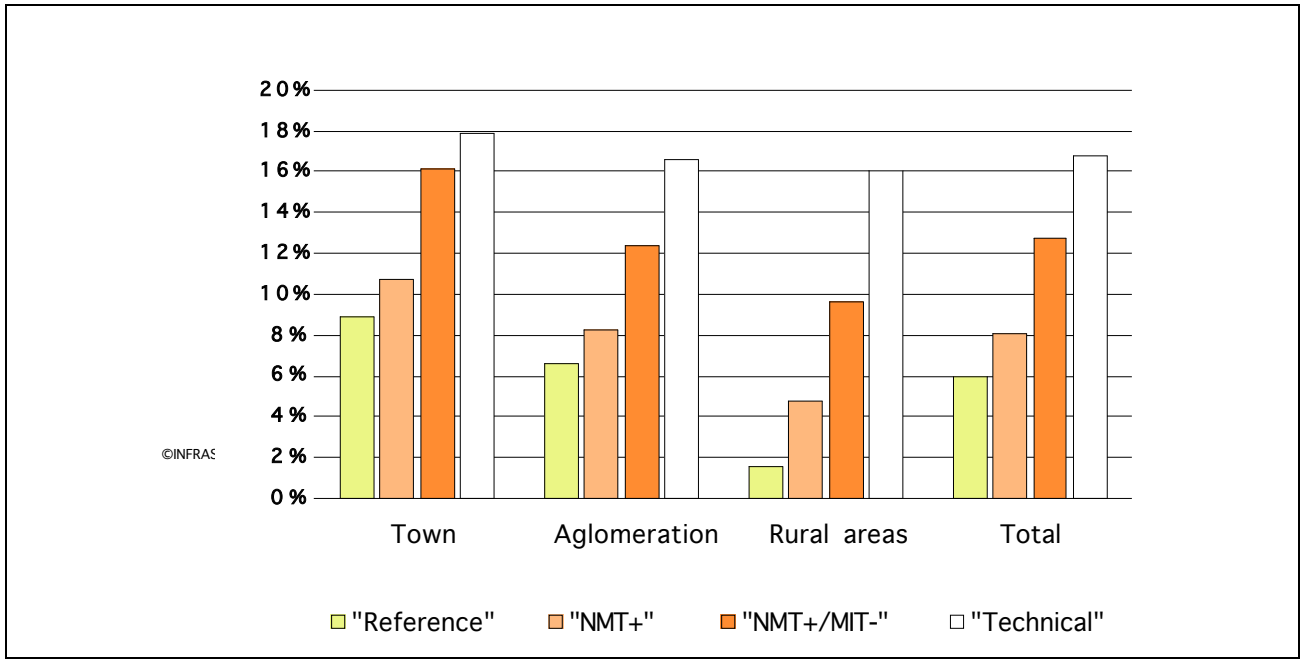

Fig. 2 Trips rearranged from motorised individual transport to non-motorised transport as % of the entirety of the motorised individual transport trips, shown by future scenarios of the "realisable" potential, and comparison with the "technical" potential; basis calculation up to 10 km excursion length (data basis Microcensus on Travel Behaviour 2000: 58,277 motorised individual transport trips).

The results show the following:

• Without special measures ("reference") only around half of the technical potential is likely to be achievable by 2030 even in urban areas, even less in rural areas. By themselves, the socio-economic developments, forecast elsewhere, will probably hardly increase the achievable potential for non-motorised transport compared with today; the opposite is more likely: individual measures promoting non-motorised transport (e.g. increasing capacity bottlenecks on the roads as a result of reduced public investment levels, increasing numbers of mobile pensioners) are countered by weighty factors hindering non-motorised transport (e.g. a lasting trend towards over-development, decreasing distance to places of education/learning).

• With specific measures promoting non-motorised transport ("NMT+"), it is possible to achieve a certain amount in specific areas; however, international examples and examinations show that, without parallel measures hindering motorised individual transport, the effects are severely restricted.

• Given a time horizon up until 2030 and simultaneous measures promoting non-motorised transport and hindering motorised individual transport ("NMT+/MIT-"; e.g. performance-related charges, access restrictions within towns or re-designation of traffic areas), we assume that it would be reasonable to expect practically complete realisation of the technical potential in urban areas and implementation to a major extent in rural areas. The measures reducing motorised individual transport are likely to have a far greater influence on the realisable transfer conduct than pure measures promoting non-motorised transport. the measures have a more direct effect on today's motorised individual transport journeys (push-measures) than the indirect measures promoting non-motorised transport for motorised individual transport (pull-measures).

• The realisable potential is almost twice as high for bicycle traffic than for pedestrian traffic. This is particularly so because bicycles cover the greater distance-related stage spectrum and because infrastructure measures can be implemented in a more concrete and thus better perceivable manner.

• The potential is almost twice as high in urban areas than in rural areas. This is because, in particular, the traffic-reducing measures and the measures hindering motorised individual transport are easier to implement in towns. In addition, combined public transport – non-motorised transport investments have greater chances of realisation as a result of the more concentrated traffic demand.

Compared with other domestic and foreign examinations of potential, the present study comes to more cautious estimations of potential. This is above all because a more differentiated methodical approach was chosen. Nevertheless, it can be stated that (realisable) CO2 potential is respectable.

• From a traffic point of view: 6-15% of all motorised individual transport trips are of significance when considered from a Switzerland-wide perspective. Corresponding transfers have been demonstrated in selected towns, however only over a longer period of time in cases of a highly resolute transport policy.

• From an energy point of view: 0.1 to 0.35 million tonnes of CO2 savings correspond to around 4% to 14% of the current Kyoto deficit in the field of transport. These are contributions as are hoped for as per the communication for the approval of the CO2 emissions law, for example from the two "additional" measures (i.e. in addition to C02 charge and climate cent): "Promotion of natural gas and biological fuels" and "Promotion of energy-efficient and environmentally-friendly vehicles via a bonus-premium system". It should be noted that this entire potential applies subject to the (reference) assumption that no fundamental alterations occur in the overriding energy framework conditions (e.g. long-term, lasting energy prices, higher by factors).

5 NEED OF ACTION

In the sections above there was shown that investments in non-motorised transport are a) economically and ecologically efficient and b) there exists a high potential of changing mode of transport. So why recent statistics do not confirm an increase of NMT? Even contrary, the Swiss census 2000 shows for the commuting traffic a further increase of MIT to the disadvantage of NMT. We see different reasons for this situation, mainly the followings:

• **Financing**: Compared with Road and Rail-investments there are uncommitted financial resources for the non-motorised transport. Each little project has to be approved by the authorities. Further more these authorities are (compared with MIT- and PT-investments) more often municipalities then Federal or State authorities, because walking- and cycling networks are especially important on community road networks. Yet decision making processes in municipalities are much longer on a total network point of view. The need of fixed financial resources for the NMT asks for new legal foundations. A good practice in the sense of financing the total transport system integrative rather then a specific mode of transport is the newly introduced "Infrastrukturfonds" for agglomerations.

• **Transport Planning**: Planning of transport infrastructure and public transport supply has to be coordinated consequently in a intermodal sense, including the non-motorised transport. That means, each road traffic project has to be proved for the compatibility to public and non-motorised transport (and vice versa for public transport projects). Therefore is need of adjustments of the legal foundations (e.g. "kantonale Bau- und Planungsgesetze").

• **Spatial Planning**: A main reason for longer and more dispercive trips lay in the uncontrolled spatial development (urban sprawl). The actual planning tools are to be enhanced. Tools like "Kantonale Richtpläne" or "Sachpläne des Bundes" must focus on a more intermodal coordination.

• **Research, data basis**: The unequal treatment of NMT is also apparent from the patchy nature of the data with regard both to costs and transport. A proper comparison of investments in different mode of transport is difficult or only possible in a roughly, less detailed way (as shown in the above presented study). The Swiss federal road authority (ASTRA) has recognized this lack of data and developed a conceptual paper for a extended NMT-Statistic. Yet the implementation of new statistics must be seen in a longer perspective.

6 BIBLIOGRAPHY (ALPHABETIC ORDER)

ARE/BFS, (2001) *Mobilität in der Schweiz – Ergebnisse des Mikrozensus zum Verkehrsverhalten 2000*, Bundesamt für Raumentwicklung ARE und Bundesamt für Statistik BFS, Bern/Neuenburg.

INFRAS, (2003) *Effizienz von öffentlichen Investitionen in den Langsamverkehr*, i.A. Bundesamt für Strassen ASTRA, Bern.

INFRAS, (2005) *CO2-Potenzial des Langsamverkehrs – Verlagerung von kurzen MIV-Fahrten*, i.A. Bundesamt für Strassen ASTRA, Bern.

NETZWERK LANGSAMVERKEHR, (1999) *Die Zukunft gehört dem Fussgänger- und Veloverkehr*, Bericht A9 NFP41, Bern.

UVEK, (2002) *Leitbild Langsamverkehr*, Departement für Umwelt, Verkehr, Energie und Kommunikation, Bundesamt für Strassen ASTRA, Bern.