Evaluationen lokaler Verkehrslösungen: Verträglichkeitsindikatoren unter dem Aspekt der Entwicklung in Richtung Nachhaltigkeit

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Abstract

The impacts of local redevelopments of main roads are still relatively unknown. Few case studies in Switzerland have good data for scientific evaluations. Nevertheless, a lot of projects were realized in the last years, some of them under different philosophies of planning. Nowadays the critical loads (e.g. pollution, true costs, safety etc.) and the standard of participation have to be considered in such projects.

This report shows, on the one hand, possibilities of evaluating the impacts of key-measures, and on the other hand it develops a proposal of a criteria and indicator framework for local use in practice. Some case studies with varying quantity of data show a certain potential of improvements not only in ecological , but also in the two other dimensions of sustainability - the economic and socio-cultural.

Keywords

Evaluation, traffic, criteria, planning – Swiss Transport Research Conference – STRC 2001 – Monte Verità

1. Introduction

This report focuses on the local, municipal level and on the main roads of towns or villages. The report givesa short situation analysis, statements of planning processes, evaluation possibilities and proposals for solutions related to measures.

The following problems are treated:

- (A) Which limited factors exist for main roads within settlements?
- (B) Is the method of supply-oriented planning suitable to break the spiral of increasing volume of traffic?
- (C) Which evaluation methods are suitable to give evidence to the conditions and the development of essential parameters in these areas?
- (D) With which criterion systems can the evaluation be realized in practice?
- (E) Which measures seem suitable for the solution of some of the central problems?

This report is based on a current research project of the SVI[1] and the final analysis of impacts of the Seftigenstrasse in Wabern near Berne[2].

1.1 Load factors in central places whithin settlements

In the cities, the suburbs/agglomerations and the villages the traffic loads accumulate themselves along roads with high traffic volumes. Different effects influence the road area and its environment negatively:

- excessive emissions of the motorized private traffic and the heavy traffic above all applied to the sectors noise and air
- high separation efficiency due to a high traffic volume, driving speeds and broad lanes

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1 Forschungsauftrag 44/99 auf Antrag der Vereinigung Schweizerischer Verkehrsingenieure (in work)

2 cp. Haefeli, U., D. Matti, U. Seewer (2000)

- insufficient residence quality by dominance of motorized traffic and insufficient structure of the road area
- insufficient social and road safety by faults of design and one-sided use structure
- weak retailers' sales by unattractive designs and bad shopping atmosphere
- operational problems with the flow of traffic
- etc.

Centrally located main streets are especially problematic. They have several functions as regional axis of traffic (with passage -, source- and destination-traffic), as location of local purchase-, working places-, spare time or residential area. Those areas were built and arranged predominantly some decades ago, when the traffic function was regarded as the most important function of road area. Only recently further/additional requests to centrally located road areas became important.

However, years or even decades passed until a reorganization of the road areas took place. Due to functional or formative / infrastructural faults or simply general discontent a structural intervention in road areas becomes necessary. Then it often comes to expensive reorganization or transformation work, which will fix the face and the identity of an area or a place for decades again.

1.2 'Supply-oriented' philosophy of planning

Since a few years another planning philosophy is applied to road construction and the associated redevelopment of some places. The compatibility of the road area for different user categories is to be improved by a better coexistence of different requirements and requests. A basis for this is the ‚Berner Modell'[3], an approach that "takes care to the repair and the provision of development scope"[4] and that calls for a broad participation in the planning process.

[3] cp. Haefeli, U. (1997)

[4] cp. Tiefbauamt des Kantons Bern, Oberingenieurkreis II (Hg.) (1997)

This planning philosophy is designed as a supply-oriented one. It takes over the controlling of the supply of traffic infrastructures. It defines this supply in accordance with the legally determined or participativ negotiated critical load for the appropriate road area. This is a rejection of the demand-oriented provision of new traffic infrastructures in accordance with the current trend of the traffic volume for the next decades. Objective of planning is a coexistence of the different requests and groups of users.

As critical loads, emissions or other negatively perceptible parameters are not to be exceeded in the road area on a long-term basis.

The definition of the critical loads is important in the research presented here (cp. chapter 3). Based on already known criteria of national or international level[5], we have to define a framework of criteria, easy in use and for a concrete local application.

[5] cp. Ernst Basler + Partner AG, IKAÖ (2000); Communities, S.O.i.t.E. (1997)

2. Evaluations of road redevelopments

2.1 Use of evaluations

Today the effects of redevelopments and their measures are only rarely examined. And if they are, the data are based on predominantly technical parameters (noise, air, traffic volume), they focus on the individual auto-passenger traffic, or they are from insufficient spatial or temporal density and accuracy. The (modest) data determines nowadays too often the selection of the evaluation criteria, instead of doing it vice versa.

Meaningful analysis of effects of new local traffic solutions cause preliminary and after-investigations. Where they are missing, the modification must be assessed with retrospective methods. It appears substantial that the analysis of effects is already established in the planning phase of local redevelopment projects. In Switzerland such a systematic methodology for the analysis of the various effects of traffic projects is missing. Different preparatory work exists, which is however not systematically used in practice so far[6].

In the author‘s opinion, evaluations of the local traffic sector are meaningful, because the scale is still concrete and thus the results have a direct influence[7], the invested resources are locally substantial and should be evaluated anyway, the redevelopment concerns the quality of life in a place and influences it for a longer period. Scientific evaluations of road projects contribute to optimize the objectives of succeeding projects. If a project is investigated up to the level of the specific measures, the results can also cause improvements of the project[8]. By judging also the planning process (participation, information), analysis of effects can motivate planners for an active communication policy and it can cause the the desired citizens participation.

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6 cp. e.g. national level: BUWAL, Bundesamt für Umwelt, Wald und Landschaft (Ed.) (1997); EVED, Eidgenössisches Verkehrs- und Energiedepartement, Bundesamt für Strassenbau (Ed.) (1997). Cp. e.g. cantonal level: Strassen- und Brückenbaudepartement des Kantons Freiburg (1993)

7 cp. Ernst Basler + Partner AG, IKAÖ (2000) (15)

8 cp. Forschungsgesellschaft für Strassen- und Verkehrswesen, Arbeitsgruppe Strassenentwurf (1996) (8f)

Evaluation can therefore be applied to the three fields:

- Analysis of problems and preliminary investigation (deficits of the existing traffic infrastructures and organization of the road area have to be clarified)
- Accompany the planning process and the phase of construction (monitoring and warning system)
- Analysis of impacts / after-investigation (degree of correspondence to the objectives)

From the point of view of the use in practice it is helpful to investigate all those fields with the same basic structure of evaluation criteria.

The evaluation can include different fields of local road redevelopments: the process of planning and communication, the development of the use of all means of transportation and the effects on user categories concerned by the redevelopment (such as residents or retailers).

2.2 Aims

On the one hand an evaluation of a road area has to give information about the modifications (analysis of impacts), on the other hand it should point out the degree of correspondence to the objectives of the project. By using the criteria system it is possible to assess the direction and order of magnitude towards sustainable development. Before the start of the project and the evaluation, the planning and the implementation of objectives must be politically determined. They should be clear and locally wide accepted. The objectives are values of reference. Thus, the necessary preliminary investigations can be made and the effects of the project can be judged afterwards.

3. Locally usable framework of criteria and indicators

The UVEK demands a sustainable development in transportation policies[9]. Therefore the acquired criteria system for local use is also based on the three dimensions of sustainability - ecological, economic and socio-cultural (Table 1). It's not possible to draw a clear dividing line between the affiliation of each criteria with one of the dimensions of sustainability[10].

A set of assessment criteria should comprehensively examine the process and the impacts of the road redevelopment. The approach of analysing the impacts is based on criteria of the critical loads.

9 cp. UVEK (2000)

10 cp. Ernst Basler + Partner AG (1998)

Table 1 System of criteria and targets

Dimension of sus-tainability	Ecological dimension	Economic dimension	socio-cultural dimension
Objective	pay attention to critial loads	Enable economic trading / transportation	Enable concerted access to road area for all users
Criteria and partial objectives	Noise: compliance with emission limits	Costs (project, operation): Efficient use of finances	Solidarity: access and use
	Air pollution: compliance with pollution limits	Improving efficiency of the flow of traffic	Improving safety and security
	Climate: reduce CO_2-Emissions	Making available future potential	Guarantee of individuality
	Land use: Reduction		aim at coexistence
			Guarantee of participation
			Guarantee of the quality of planning
			Reducing effects of spatial partition
			Improving spacial qualities

Source: Matti, D.,/ IKAÖ/ BHP, SVI-Forschungsauftrag 44/99 (2001): not yet published

Evaluation methodology is to be made locally usable: In order to guarantee the applicability among local specialists, scientists and also laymen, different indicators are offered. This permits different points of view for the development of the criteria (*Table 2*). The selection and the weighting of an indicator must take place specifically for a project and is a product of the local political discourse. The presence of data may not be leading during the composition of the indicator system[11]. However the data has an influence on the effective use of an indicator in practice. Several indicators at different collection expenditure may be chosen to judge the development of a criterion, and therefore it is to be prevented that the focus of sustainable development is given up due to data position lacking.

[11] cp. Möller, J. (2000)

Table 2 Examples of indicators

e.g. Noise	e.g. Effect of spatial partition	e.g. Safety and security	e.g. Spatial qualities
Indicators			
Noise pollution Road traffic volume rate of heavy load vehicles Noise reduction of road surface Behaviour behind the wheel/ traffic flow Accelerations/ delays Stops / traffic jams Speed of motor vehicles	volume of road-crossing traffic (above all: pedestrians) Waiting time for crossings (slow traffic and motor vehicles) Existence of direct and save possibilities for crossings Speed of motor vehicles Road traffic volume	Road casualities (number/ severity/ density/ rate) estimated degree of social security in public area Speed of motor vehicles	estimated degree of attractiveness of road area revaluation with natural elements Integration of buildings in local context Interlocking building and road Structuring in compartments Noise pollution Frequency of going shopping mixture of business/ shop sectors

Source: Matti, D.,/ IKAÖ/ BHP, SVI-Forschungsauftrag 44/99 (2001): not yet published

3.1 Methods of data acquisition

The analysis of the impacts is an interdisciplinary process: The method is based on scientific and sociological methodologies. In order to obtain more reliable results, criteria are often determined by indicators raised with different methods. Thus a type of ‚triangulation' results. Numerous point of views improve the quality of the evaluation. Apart from conventional measurements of traffic volumes or noise pollution, questionnaires, source studies, expert interviews or local observations are also concerned.

3.2 Data evaluation

The crucial statement in the evaluation is the direction and strength of the modification of the defined criteria. Therefore qualitative results must often be sufficient. Another possibility is a quantitative result, whose contribution is not objectively and accurately assigned for the modification of the criterion. Here, a political evaluation and a weighting will help.

3.3 Recommendations for an application in local practice

The systems-inherent ‚inexactness' of the assessment of the indicators because of conflicting aims is not really a disadvantage in the local practice. Using the criteria system is still reasonable. It seems to be more important whether - and in which direction and order of magnitude - a modification took place or not and whether one of the most substantial criteria got lost. Due to the consideration of all three dimensions of sustainability the conflicting aims have already been revealed. This is in an early stage a useful side effect of such an analysis of impacts. The management of conflicting aims takes place in a participatory way on the political level.

Firstly, all the selection of the indicators - which were sometimes more auxiliary variables than indicators leading to the target - always depends on the possibilities and feasibilities. Secondly the selection has to follow the political priorities and objectives of the road project.

4. Evaluated case studies

The team of the IKAÖ has already gained certain experiences evaluating different case studies. Among these examples is the Seftigenstrasse in Wabern[12], known for the planning philosophy ‚Berner Modell'[13]. On the one hand the interesting question was how a multidimensional point of view of a main road can influence an evaluation. And on the other hand there was the question of the effects of road redevelopments in accordance with the supply-oriented philosophy of planning.

The project team can present comparative data of case studies both in the temporal as well as in the spatial comparison. Some exemplary results are briefly brought up for discussion in the following chapters.

4.1 Impacts after redevelopments

Only few Swiss examples of redevelopped roads within settlements were evaluated in their temporal development. A well-documented example is the main road in Wabern near Berne (Seftigenstrasse). La Tour-de-Trême (FR) was investigated in the context of the current SVI research project.

4.1.1 High acceptance of the redevelopment in Wabern

The redevelopment of the Seftigenstrasse in 1996/97 had the following objectives: taking up the requests of all residents and user groups, guarantee a sufficient traffic flow, improvements for pedestrians and cyclists and their possibilities to cross the road, constructing attractive multiproposal surfaces as well as improvements of the environmental situation (above all: air pollution and noise). The key-measures of the redevelopment were a reduction of the road-surface to only one lane per direction, a continuous central strip, the removal of most traffic

[12] cp. Haefeli, U., D. Matti, U. Seewer (2000)

[13] cp. Haefeli, U. (1997); Tiefbauamt des Kantons Bern, Oberingenieurkreis II (Ed.) (1997)

lights, the construction of a lane for cyclists and the regulation of motor vehicle volume by using traffic lights at both ends of the area.

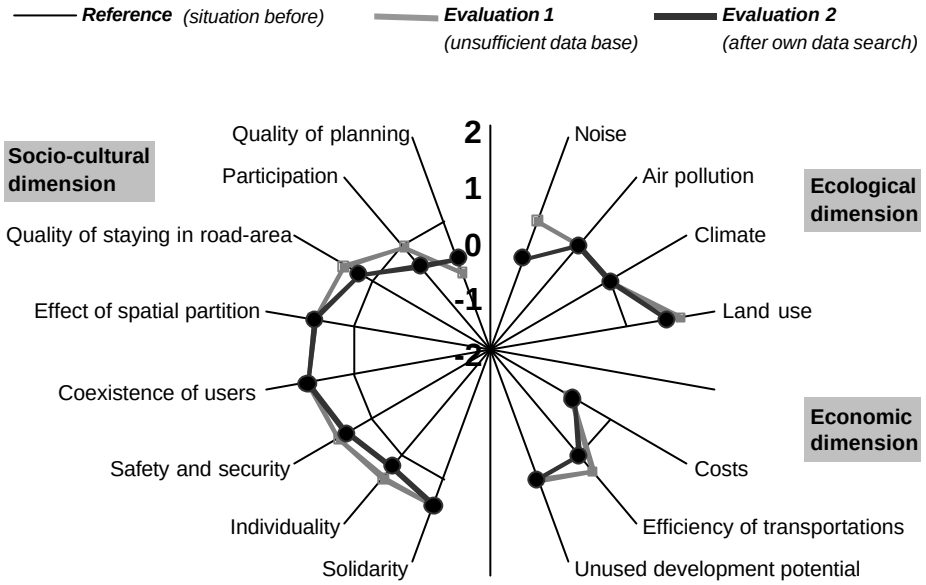
A set of investigations[14] showed the following effects: there are approximately 50% more cyclists on the main road, more direct and safer crossing possibilities, a lightly higher traffic volume, shorter waiting times for crossings, a high contentment of residents (> 90%), shorter total travel time, lower average car speed, fewer stop&goes, a more variable use of means of transportation by the residents as well as a higher attractiveness of the shopping area. The process of participation with different commissions in Wabern was exemplarily and one of the important elements for the success of the redevelopment. It was also a result of the 'Berner Modell'.

4.1.2 Several problems of the redevelopment in La Tour-de-Trême

The changes of the different criteria - caused by a local redevelopment - are presented as a summary in a 'wind-rose diagram' (Figure 1). A graphically visible shift outward in the diagram means thereby a positive and intended modification toward a sustainable development. The value of 'zero' is defined as the initial state before the beginning of redevelopment (cp. 'reference' Figure 1). The evaluation showed some negative modifications in the case study of La Tour-de-Trême: noise, costs, participation and quality of planning. The explanations seem plausible: a special street pavement across the road caused disturbing noise, a badly conceived and rather expensive street lighting of the central square had to be bulid up twice, the participation was limited to the legal minimum and the urgently required by-pass road was still excluded from the actual redevelopment project. Residents and local experts judged positively the gain of safety, an improved coexistence and a reduced spatial partition, particularly as a consequence of the changed distribution of surfaces in road area and the removal of traffic lights (new central roundabout).

[14] cp. Haefeli, U., D. Matti und U. Seewer (2000); Gemeinde Köniz, Tiefbauamt des Kantons Bern - Oberingenieurkreis II, Amt für Gemeinden Raumordnung des Kantons Bern (2000)

Figure 1 Impacts of redevelopment: E.g. La Tour-de-Trême FR



Source: Matti, D.,/ IKAÖ/ BHP, SVI-Forschungsauftrag 44/99 (2001): not yet published

4.2 Comparison of case studies

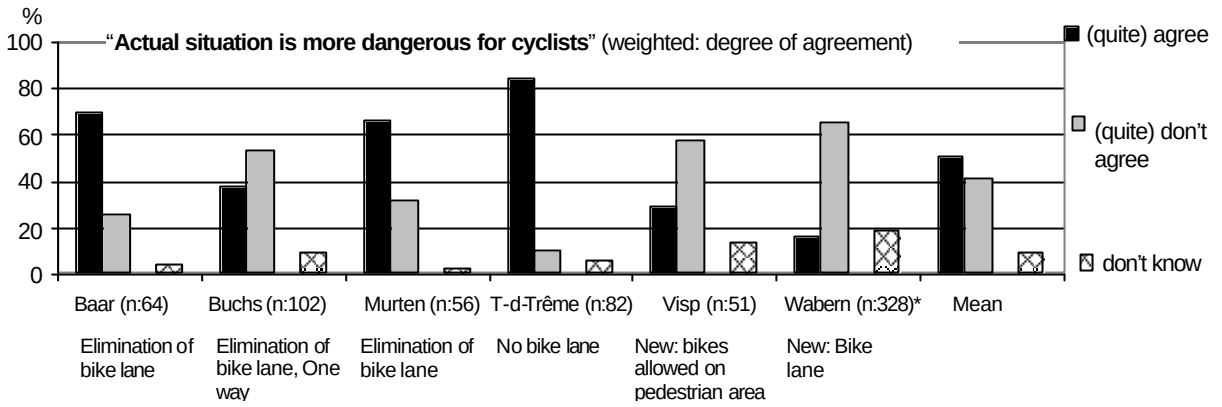
Comparison is made possible by including different Swiss case studies[15]. They permit to receive measure-referred information. The investigation of the SVI research project is not yet finished, nevertheless it is possible to present first results. The following three points are exemplary cited:

- ‚Killing factors' can occur and may influence negatively the perception of an entire project: E.g. noise pollution in La Tour-de-Trême (special street pavements across the road are too noisy).
- Mixed traffic with bicycles on the main road lane is not a solution for everywhere. The examples Murten, La Tour-de-Trême and Baar show limits to the removal of cyclist lanes such as speed, traffic volume and width of lanes.
- The multi-functional central strip can be used specifically, depending upon local situation (Visp, Murten, Wabern, partly La Tour-de-Trême), and reduces the separation impact of the road noticeably. The application of this structural measure is only problematic, if the remaining lanes are narrow.

[15] cp. IKAÖ, BHP (2001) (in work)

In the following the safety feeling of cyclists is used to illustrate the procedure (Figure 2).

Figure 2 Measure "installing or removing lanes for cyclists": Effects of redevelopment to road safety of cyclists.



Source: Matti, D.,/ IKAÖ/ BHP, SVI-Forschungsauftrag 44/99 (2001): not yet published

Methodically regarded analysis of accidents (official statistics) were as well considered as measures of the volume of traffic and questionings of the residents. It was shown that places with lanes for cyclists have a better road safety than such which removed lanes for cyclists to favour a mixed traffic solution. Critical factors are above all the width of the lane and the volume of motor vehicles.

4.3 Impact of some selected measures

Some key-measures for the most important user-groups and residents are listed below. They can lead to a desired positive modification:

Table 3 Functional or infrastructural key-measures for different user-groups

User-group	*Measure*	*Advantage/ Change (e.g.)*	*Case-studies*
Pedestrians	Eliminating traffic light at pedestrian crossings	90% reduction of waiting time for crossings	Wabern
Cyclists	Lanes for cyclists	~50% increase of number of cyclists on main road	Wabern .
		Increasing feeling of safety	Wabern, Visp

Business/ Shops/ Pedestrians	Increasing surfaces for non-car-areas/ pavements	Surfaces for marketing for shops Increasing quality of staying in road-area	Wabern, Buchs, Visp, La Tour-de-Trême
Cars/ Public Transport, Recidents	roundabout replacing traffic lights	Decreasing time for passing, less stop&goes, less noise, better air quality	Wabern, Murten
Public Transport	Bus-/Tramway-stop on road-surface (bus stop on the traffic lane)	Better and faster entry/ exit at bus-/tramway-stop	Wabern, Buchs, Murten, Baar
All users	furnishing/ greenary/ art	Increasing quality of staying in road area, better atmopshere for shopping	Wabern, Buchs, Visp, Baar, Murten

Source: Matti, D.,/ IKAÖ/ BHP, SVI-Forschungsauftrag 44/99 (2001): not yet published

In this sector of the key-measures‘ there is still a need for further synthesis work in the actual research project. The goal is giving a chance for planners and public authorities to use the results of this evaluations for their daily work.

5. Conclusion

The results from the evaluations of the exemplary case studies show a potential of a coherent planning philosophy. There is a chance to revalue the mostly unsufficient quality of staying in road area, the quality of passing the road and the quality of live of the settlement area.

The evaluation within the concept of sustainability is a generally verified method. It's a more or less a simple instrument for assessments with sufficient results. Conflicts of objectives among others are unavoidable. The solution therefore is a political process and depends on political priorities. There is still a need for more research for a useful system of indicators and for the problems of an adequate spatial demarcation. Here it seems to be useful defining separatly the demarcation for each criteria and case study.

There is a strong demand for an institutionalisation of the analysis of the impacts. This means also a demand for better data to improve quality of project assessments like the well examined case study in Wabern.

Last but not least we shouldn't forget to cross sometimes national frontiers. In several different countries villages and cities have begun to create their own local evaluation systems with a strong focus towards sustainable development in transportation.

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