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THE INTEGRATION OF THE NOISE CRITERIA INTO THE URBAN TRANSPORTATION PLANNING

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ABSTRACT
Noise caused by transport, and particularly that due to road traffic, represents a prime concern for the population. When defining a plan for urban development transportation, the noise factor must be taken into account in a new organisation of town transportation. The communication intends to present the original approach adopted by Transitec in the past few years in many Swiss, French and Belgian towns, in relation to transportation. This presentation sets out the methodological approach adopted, and further illustrates it through concrete examples taken from recent studies concerning traffic plans in Swiss and French towns, respectively Geneva and Grenoble.

1 - ISSUE FRAMEWORK

Protection against traffic-induced noise is mainly and systematically structured on two kinds of actions:

- source-related actions,
- actions undertaken on a road affected by noise propagation.

On the basis of several experiences carried out by Transitec, the latter has come to the following conclusions:
Source-related actions: it is difficult to implement measures that directly act upon vehicles' emissions. Indeed, the Authorities have little or no command over the development of a fight against noise in relation to the mechanical noise of vehicles. It is therefore rather rash to base noise prevention strategies on such a prospect. The installation of less noisy pavement surfacing (drain surfacing) unfortunately comes up against several restraints or contraindications, and namely that surfacing is relatively ineffective in a low speed urban context. The latter gets rapidly "blocked up", thereby reducing its effectiveness in the long run.
It is therefore absolutely essential to base a prevention strategy against noise caused by traffic on the reorganisation of the latter by adopting a multimodal transportation approach. This is one of the goals of a Transportation Plan, and the actual implementing of a new transportation policy, of a traffic plan linked to the former, represents an indispensable and priority measure against noise produced by urban area transport. The "noise" criterion must be seen as one of the criteria that should be taken into account when drawing up a Transportation Plan, much in the same way as the quality of the urban area and the multimodal accessibility to the centre of the built-up area.
A methodology is given in Chapter 2.
Measures taken on the road affected by noise propagation should be envisaged solely as a last resort, being somewhat synonymous with a failure of the "strategic" fight against noise. It is nevertheless advisable to take into account these possibilities whenever source-related actions and transportation reorganisation measures cannot succeed in ameliorating the critical situation.

2 - RECOMMENDED METHODOLOGY

Faced with the legal obligation (particularly in Switzerland, since 1987 via the Federal Order concerning noise protection; translator's note: Ordonnance Fédérale sur la protection contre le bruit (OPB)) to

actively prevent source-related traffic noise, the Authorities have very little will or occasion to reflect upon this issue. It is therefore advisable to seize every available opportunity given by the several town-planning studies in order to pursue this fight. The implementation of a plan for urban transportation is one of these opportunities.
The method developed by Transitec considers the noise engendered by traffic as one of the main restraints for the **definition of a future road network** . This method is illustrated by examples taken from two important studies in which noise was one of the main parameters:

- *Geneva, traffic study 2005* [1]: This study concentrated on further specifying the traffic organisation defined in the C2005 transportation plan drawn up in 1993, in order to determine a road network hierarchy:
- *Grenoble, draft project of the transportation general scheme* [2]: This study concentrated on defining a transportation scheme in the built-up area of Grenoble, by taking into account the possibility of realising a new important road infrastructure, i.e. the Tunnel under Bastille.

The methodology adopted for these two studies is the following:
1° Analysis of the available network
This is constituted by the existing network, which is often not extensible inside towns, and by eventual projects concerning additional implementations for the same network. This is the basic offer.
2° Definition of sectoral aims and restraints
It entails the listing of, along the axes included in the study:

- sectors to protect from traffic (e.g. residential areas);
- collective transport axes to favour;
- pedestrians or two-wheels to safeguard and favour;
- public land to valorise;
- nuisances to clear (air pollution, noise).

The **noise restraint** is usually determined by the extent of the sound emissions along the axes, on the basis of existing noise registers and according to the clearing priorities (e.g. with regard to Swiss legislation, exceeding danger values, non-respected immission values). Two examples drawn from recent studies illustrate various ways of taking into account this restraint:
Geneva
Concerning the taking into account of noise-related aims and restraints, all thought based itself on the sound immissions register drawn up by the State of Geneva's Division of Ecotoxicology. A weighting was carried out of the places where danger levels (according to the OPB) were reached, according to population area and jobs per area, in order to underline the main sensitive points. Of these aims which rest upon "solid" bases, three levels of priority were determined for the clearing of the major roads of Geneva (axes to clear in 1st, 2nd and 3rd priority), and reported on the aims and restraints maps for each of the studied sectors (see Figure 2).
Grenoble
The noise restraint may base itself on the ranking of the land transport infrastructures (January 9th 1995 n° 95-21 order and May 30th 1996 order). As regards Grenoble, the same restraint has been defined (by Ecoscan Environmental Consultants in Lausanne and Transitec) according to traffic load and population density along the axes.
The mapping of this axis ranking revealed that the centre of Grenoble was in a particularly deteriorated state, with very high traffic loads and a strong population density, which therefore entailed severe restraints regarding the planning of transport networks.
A map has been done on the basis of the synthesis of these aims and restraints (for each study), as shown in Figure 2 below, on the example of Geneva.
3° Available offer: network use potential
The superposition of an available road network and of sectional aims and restraints determined for this network leads to the definition of **network use potential. Contrary to most studies where the offer taken into account is simply the physical offer (number of lanes, intersection capacity, ...), this approach consists in integrating right from the start the "global" offer, thus integrating the set of parameters connected with urban life**.
The result is expressed by means of a map of the area studied which displays:

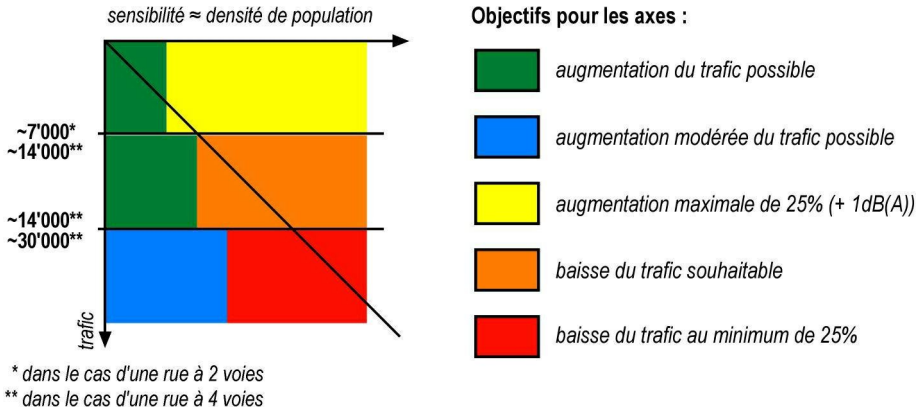

Figure 1: Noise sensitiveness analysis.

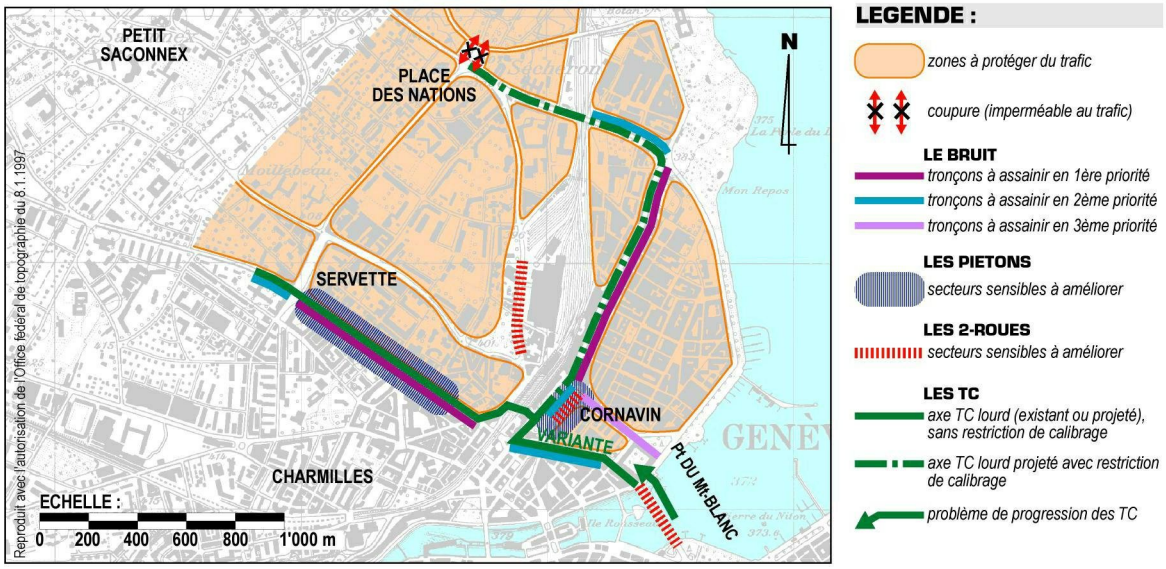

Figure 2: Actual and future aims and restraints (*Geneva, C2005*).

- *axes where traffic volume reductions are necessary;*
- *axes where actual volumes may be maintained;*
- *axes where traffic volumes may be increased.*

4° Transportation request definition

Needless to say, the former relies on:

- actual traffic (actual request satisfied),
- future developments, but also, originality,
- of voluntarist functioning, chiefly based upon a transportation concept.

This concept concentrates on, for e.g., a selective accessibility to districts, a reinforced use of motorway infrastructures, and for a modal transfer of the road towards collective transports.

5° Hierarchy of the future road network

The analysis of the transportation request, voluntarily orientated, and the network potential use previously defined shall indeed lead to a **hierarchy of the future network** in accordance with the transportation multimodal concept, thus enabling the attainment of the various determined aims, namely the clearing of sound nuisances.

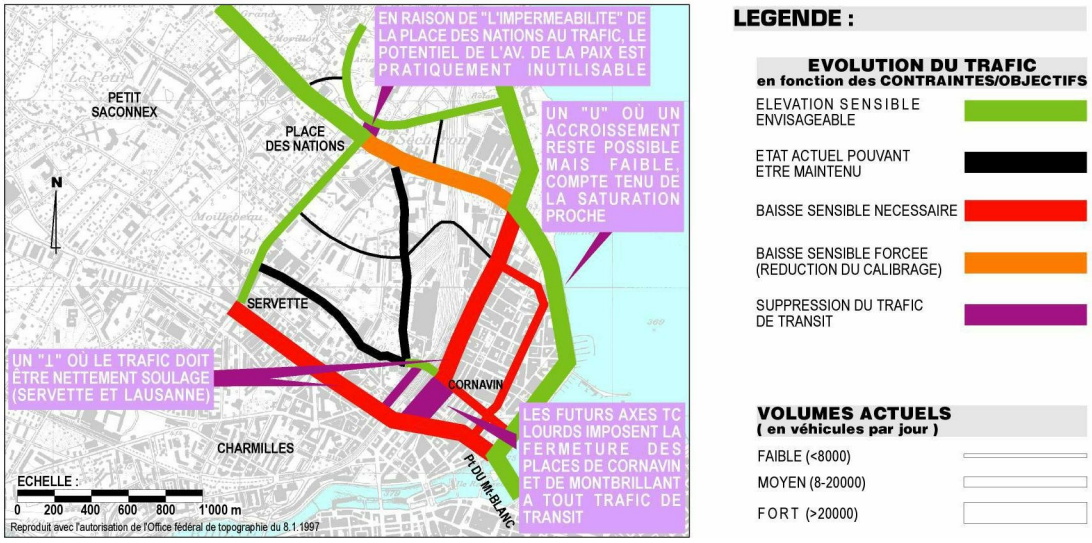

Figure 3: Network use potential (*Geneva, C2005*).

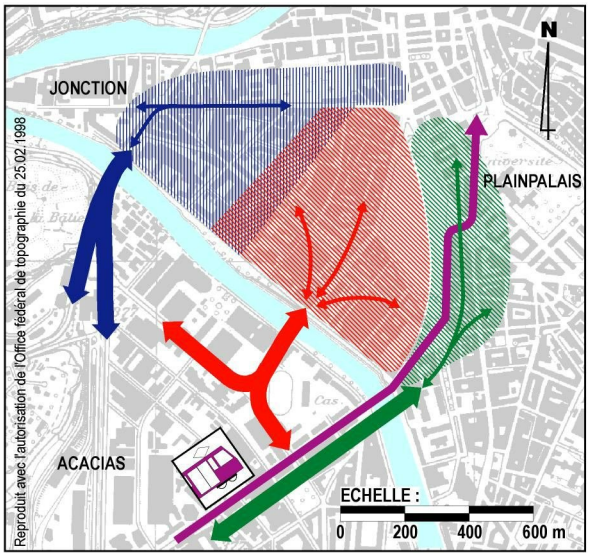

Figure 4: Transportation concept.

3 - CONCLUSIONS

The elaboration of a new traffic plan therefore contributes, to a certain extent, towards the battle against noise in an urban area. This kind of reasoning should be systematically integrated in every single transportation planning approach; the same applies to all the more general aims concerning public land redistribution and quality of life improvement.

In terms of noise, if the measures introduced turn out to be insufficient when dealing with the clearing restraints, other measures may additionally be implemented on the road affected by noise propagation or at the reception of immissions.

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