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TITLE:

THE EFFECTS OF TRAFFIC MANAGEMENT ON AIR POLLUTION IN THE TOWN OF BRASOV

Topic:

- ○ FUTURE AUTOMOTIVE TECHNOLOGY
- ○ USER FRIENDLY AUTOMOBILE
- ● VEHICLES & THE ENVIRONMENT
- ○ INTELLIGENT TRANSPORTATION SYSTEMS
- ○ ADVANCED PRODUCTION AND LOGISTICS

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Abstract:

From the measurements we made and the obtained results, the BRASOV city belongs to the city zones category with medium level of pollution.

General description about the air pollution in Brasov:

- The effects of the city traffic on the air pollution;
- The level of noise pollution;
- The green zones in Brasov;
- The level of health and comfort of the population.

The effects of traffic transportation about the level of air pollution in Brasov:

- The influence of the traffic management in the city about the air pollution;
- The issue of the heavy traffic on the main streets in Brasov;

The issue of the traffic in the historic center of the city.

Place / Date:

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THE EFFECTS OF TRAFFIC MANAGEMENT ON AIR POLLUTION IN THE TOWN OF BRASOV

1. DESCRIPTION ABOUT THE AIR POLLUTION IN BRASOV

1.1. The effects of the city traffic on the air pollution

From the measurements we made and the obtained results, the BRASOV city belongs to the city zones category with medium level of pollution.These allowed for the identification of three main categories of traffic, which are specific for Romania, each of them with a different impact in terms of pollution:

- low traffic – less than 20,000 vehicles/24h - in the uptown urban areas and transit roadways;
- average traffic – 20,000-40,000 vehicles/24h – in between downtown and uptown urban areas;
- intense traffic – more than 40,000 vehicles/24h – within downtown urban areas.

There is a problem of transportation, both of the cost upon the environment and the cost of time and life caused by congestion and accidents, and even the cost upon the consumer of the vehicle, fuel, and increase of interest; all of which are a burden upon the environment, society, and the economy. The cost to the environment, which has not been accounted for properly and is incurred freely, comes in the form of pollution, noise, and a drain of resources. The cost to society is that of traffic jams and loss of time and life, which cannot be overlooked, for the effects are great in all human factors.The solution to these problems demands an improved public transportation system, for all who lack one, and either the phasing out of cars or the improvement of automotive design.It should be noted that clean forms of public transportation can be cheaper for the consumer and thus more easily accessible to the public, as well as safer, faster, and more friendly, not to mention the benefit to the environment.

Vehicle emissions:

The emissions from a petrol engine contain carbon monoxide (CO), carbon dioxide (CO_2), hydrocarbons (HC), oxides of nitrogen (NO_x) and lead (if the vehicle runs on leaded petrol). Diesel exhaust contains CO, HC, NO_x, oxides of sulphur and particulate matter.

The gases:

a.Carbon Monoxide (CO) – A poisonous gas, highly toxic to human beings by reducing the ability of the blood to carry oxygen. The gas is also flammable. The use of a catalytic converter in a vehicles exhaust system, if fitted, speeds up the conversion process that would normally occur naturally in the atmosphere, of changing this poisonous gas into much less harmful CO_2.

b. Carbon Dioxide (CO_2) – Despite being a naturally occurring gas which is crucial to some of the most basic, life-sustaining chemical reactions such as photosynthesis.

c. Nitrogen Oxides (NO_x) – A product from the reaction of nitrogen and oxygen in the air at very high temperatures in the combustion engine. They Contribute to acid rain by dissolving in water to form nitric and nitrous acids. Also contributes to low level ozone and smog, leading to respiratory problems. NOx are greenhouse gases and are linked to the

destruction of the stratospheric ozone. Between 1970 and 1989 NO_x emissions more than doubled, and in 1993 road vehicles in the UK produced 49 per cent of all NO_x emissions.

d. Hydrocarbons (HC) – have an unpleasant smell and are involved in the formation of smog.

e. Particulates (soot) – The biggest health worry, containing compounds known for causing cancer and particles, less than 10 thousandths of a millimetre in diameter.

f. Sulphur oxides – Contribute to the formation of particulate, and acid rain as sulphuric acid. Diesel fuel sold now has ultra-low sulphur content and in the very near future sulphur free diesel is likely to be sold, eliminating sulphur oxides and sulphur by-products.

g. Lead – It is believed that lead compounds added to fuel have detrimental effects on children's health and mental development. Vehicles running on leaded fuels are uncommon due to regulations imposed in the past 20 years.

1.2. The level of health and comfort of the population

The following list describes the potential health risks associated with these emissions:

Carbon Monoxide (CO): An odorless and colorless gas which is highly poisonous. CO can reduce the blood's ability to carry oxygen and can aggravate lung and heart disease. Exposure to high concentrations can cause headaches, fatigue and dizziness.

Sulfur Oxides (SO_x) and Sulfur Dioxide (SO_2): When combined with water vapor in the air, SO2 is the main contributor to acid rain. Gasoline typically contains 0,03 percent sulfur.

Nitrogen Oxides (NO_x) and Nitrogen Dioxide (NO_2): These chemicals form the yellowish-brown haze seen over dirty cities. When combined with oxygen from the atmosphere, NO becomes NO_2, a poisonous gas that can damage lung tissue.

Hydrocarbons (HC): This is a group of pollutants containing hydrogen and carbon. Hydrocarbons can react to form ozone. Some are carcinogenic and other can irritate mucous membranes. Hydrocarbons include:

- Volatile organic compounds (VOC)
- Volatile organic gases (VOG)
- Reactive organic gases (ROG)
- Reactive organic compounds (ROC)
- Non-methane hydrocarbons (NMHC)
- Non-methane organic gases (NMOG)

Ozone (O_3): This is the white haze or smog seen over many cities. Ozone is formed in the lower atmosphere when NMOG and NOx react with heat and sunlight. Ozone can irritate the respiratory system, decrease lung function and aggravate chronic lung disease such as asthma.

Carbon Dioxide (CO_2): CO_2 is a naturally occurring gas in the atmosphere and is a necessary ingredient of the ecosystem. However, in large quantities, it can allow more solar radiation to enter the atmosphere than can escape. The excess heat from the trapped solar radiation can lead to the "greenhouse effect" and global warming.

Photochemical smog:

In bright sunlight, nitrogen oxides, hydrocarbons, oxygen, interact chemically to produce powerful oxidants like ozone (O_3) and peroxyacetyl nitrate (PAN).

These secondary pollutants are damaging to plant life and lead to the formation of photochemical smog. PAN is primarily responsible for the eye irritation so characteristic of this type of smog.

1.3. The level of noise pollution

At low speeds, similar to the speed used for vehicle noise testing, the noise from the engine, gearbox and exhaust will generally predominate over the noise associated with the tyre/road surface. On dry roads and at a constant speed engine noise generally predominates for speeds up to 50km/hr. Above this speed tyre noise becomes the dominant source of noise.

This particular pollution is ever increasing with due to the rise in the utilization of heavy duty machineries of industrial facilities and vehicles, synonymous to the increase in the standard of living in most countries. These are the few examples of threshold decibels of noises made:

Table 1

Threshold of hearing	0 dB
Rustling leaves	20 dB
Quiet whisper (1 m)	30 dB
Quiet home	40 dB
Quiet street	50 dB
Normal conversation	60 dB
Inside car	70 dB
Automobile (8 m)	80 dB
Motorcycle (10 m)	88 dB
Diesel truck (10 m)	100 dB
Jet plane (35 m)	130 dB

The contribution of the auto transportation at environment depletion is shown in the figure below:

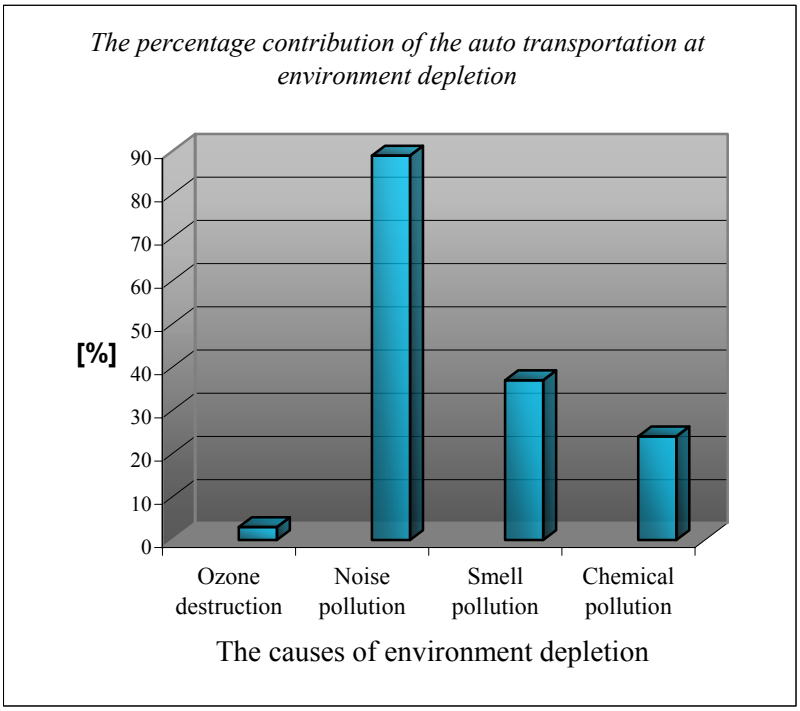

Figure 1

The annual medium levels of day noise pollution in the residences on the main streets in Brasov, frequently pass over the 70 dB limit. One measure of pollution is the danger it poses to health. Noise causes stress, and stress is a leading cause of illness and suicide. Therefore any form of noise can be considered pollution if it causes annoyance, sleeplessness, fright, or any other stress reaction.

The average sound levels emitted by vehicles travelling at 50/60 km/h in a 12-15 m road: (no. vehicles per hour / sound level): 100 v/h (63dB), 500 v/h (70dB), 1000 v/h (73dB), 2000 v/h (76dB).

1.4. The green spaces in Brasov

BRASOV County:
- Area: 5363 km^2;
- Towns: 9;
- Communes: 43;
- Inhabitants: 650,000;
- County seat: Brasov.

The green spaces in Brasov district in 1998:

Tabel 2

District	The area of green spaces ($10^4 m^2$)
Braşov	324

The much the green spaces occupies a bigger area, the smaller the chemical pollution impact over the environment is. For this, we must enlarge the green spaces area.

2. THE EFFECTS OF TRAFFIC TRANSPORTATION ABOUT THE LEVEL OF AIR POLLUTION IN BRASOV

2.1. The influence of the traffic management in the city about the air pollution

The region of Brasov is situated in a mountainous area in the centre of Romania. Brasov has been a point of passage for many centuries since it is located at the crossing of important trade routes. Two thirds of the population live in highly urbanised areas, mainly in the city of Brasov, which is the administrative, cultural and commercial centre of the region. The region's economy is still predominantly industrial with half of the active population working in state-owned and private industries. The service sector and agriculture contribute to regional employment to a lesser yet important degree. Tourism, especially in the winter sport resorts of the Carpathian mountains but also in the rest of the region, is of growing importance.

As with many former communist countries, the region of Brasov is faced with the transition from planned to market economy. Non-performing technologies have to be upgraded involving great public or private financial investments. The installation of less labour-intensive modern production capacities and the closing of old ones has led to more and more unemployment. As a consequence of its high degree of urbanisation, the region has to come to terms with significant pollution levels. This is partly due to industry branches such as

chemical and paper industries still lacking state-of-the-art technologies. Furthermore, the economic transition needs to be accompanied by structural changes within the regional administration and institutions. This entails, for example, the re-orientation and reorganisation of the education system. Of elementary concern to the region is the repair and modernisation of its infrastructure such as water treatment plants, sewage systems, landfills sites and roads. It is hoped that the improvement of the existing transport system, and possibly the construction of an airport, will enhance the strategic location of the region. Beyond structural change and modernisation, the Brasov region seeks to implement more sustainable forms of development. Of great potential in this respect is the presence of large areas of unspoiled natural landscapes, which in certain parts of the region have been turned into protected areas, nature monuments and national parks. The region will continue to protect these landscapes while promoting rural and eco-tourism.

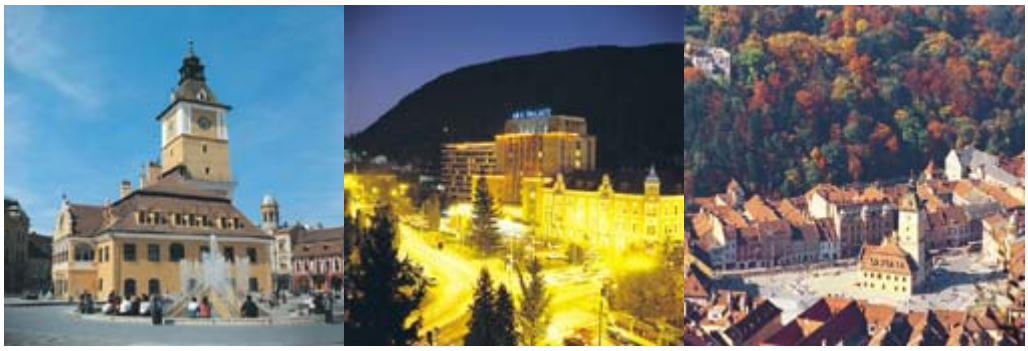

Figure 2 – The town of Brasov

The Brasov region strives to achieve European environmental quality standards concerning air, water and soil. As a means to reach these standards, the region considers the clean-up of polluted areas, the monitoring of pollution levels and the treatment of liquid and solid, domestic and industrial wastes. Installation of clean technologies is thought to improve the state of the region's environment. Furthermore, the preservation of eco-systems in the natural parks and several protected areas of the region, will be accomplished by sustainable management projects. The region of Brasov seeks to build on the largely unspoiled character of its rural landscapes by developing and diversifying tourism, especially ecologically sound tourism.

2.2. The issue of the heavy traffic on the main streets in Brasov

Even if Brasov is considered a road junction, it doesn't have a road diversion, which means that the whole traffic volume on the E60 road passes through the town. This will influence in a negative way the traffic in the city. The town is the intersection point of more national and district roads: D.N. 11 – E527 to Hărman, D.N.13 – E60 to Bod, D.N. 73 – E578 to Cristian, E64 to Făgăraş. The absence of road diversion for Brasov determines the leading of the heavy traffic through town as it follows: Saturn Boulevard, Alexandru Vlahuţă Street, Gării Boulevard, Aurel Vlaicu Street, Griviţei Boulevard.The impact of the heavy traffic on the pollution level is bigger than the light traffic one, because the motors majority of the vehicles are Diesel. The heavy vehicles (over 3 tones) are major sources of chemical (hydrocarbons, particulates) and noise pollution, also being important smell pollution sources.

As a result of the measurements effectuated on the above route it was descovered a big percentage of heavy vehicles on the analized traffic volume.The following intersections were analized:

- Gării Boulevard & Alexandru Vlahuță Street Intersection (figure 3):
Light vehicles = 2106;
Urban passengers transport= 96;
Heavy vehicles = 564;

- Gării Boulevard & Victoriei Boulevard Intersection:
Light vehicles = 1878;
Urban passengers transport = 90;
Heavy vehicles = 264;
- Gării Boulevard & 13 Decembrie Street & Aurel Vlaicu Street Intersection:
Light vehicles =2460;
Urban passengers transport = 96;
Heavy vehicles = 306;

The percentage of the various vehicles from the analized traffic volume (figure 4):
Light vehicles =53.3%;
Urban passengers transport = 7.4%;
Heavy vehicles = 39.3%.

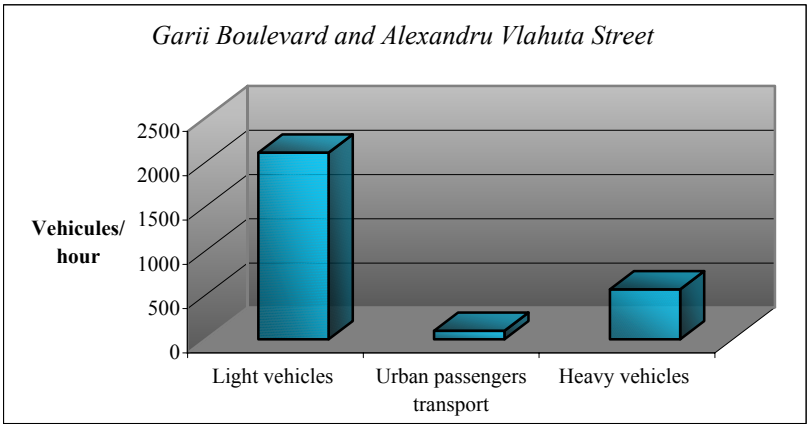

Figure 3 – Traffic volume

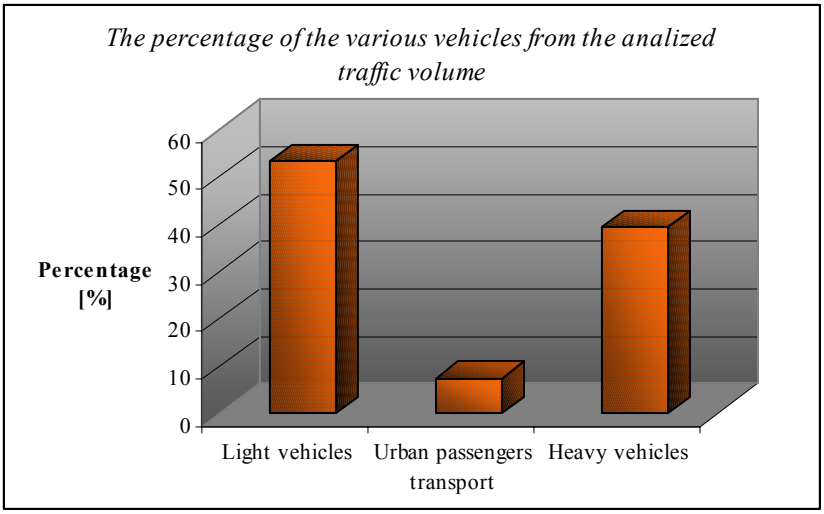

Figure 4 - Percentage

As we can see the heavy vehicles represets 39.3% from the analized traffic volume. In this case the chemical and noise pollution can reach bigger values than the normal admitted level.

2.3. The issue of the traffic in the historic centre of the city

The region of Brasov is situated in a mountainous area in the centre of Romania. Brasov has been a point of passage for many centuries since it is located at the crossing of important trade routes.Because of the geographical positioning Brasov district grown as an important industrial and comercial centre. This fact determined the urban agglomeration and implicit at the growing of the transportation demands (both, of the passengers and of the merchandise).

The route was: Lungă Street, Eroilor Boulevard, Nicolae Bălcescu Street, 15 Noiembrie Street, Castanilor Street, Iuliu Maniu Street, Nicolae Iorga Street.The following intersections were analized:

- Lungă Street, Mureşenilor Street, Eroilor Boulevard Intersection (figure 5):
Light vehicles =1970;
Urban passengers transport =97;
Heavy vehicles =9;

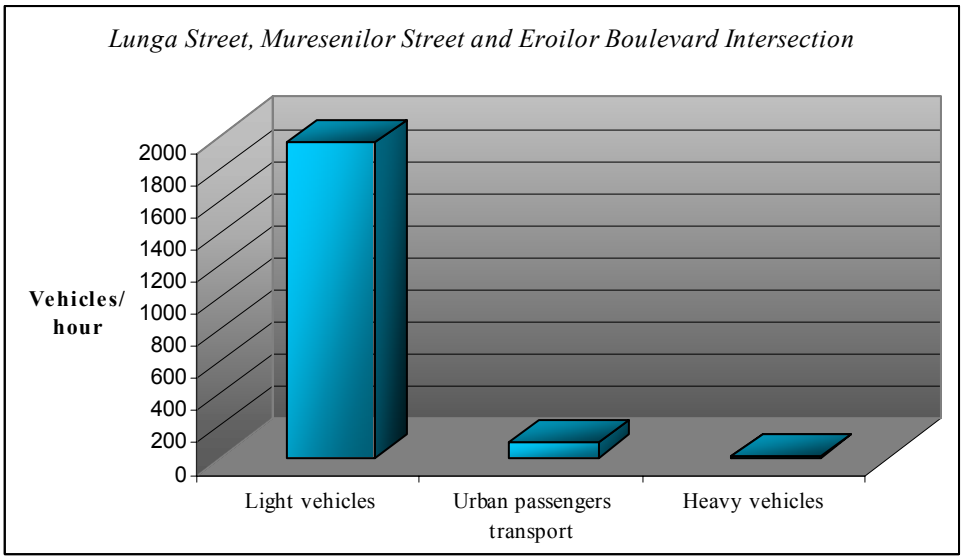

Figure 5 – Traffic volume

- 15 Noiembrie Boulevard, Nicolae Bălcescu Street, Vlad Ţepeş Street Intersection:
Light vehicles =2528;
Urban passengers transport =128;
Heavy vehicles = 11;

- 15 Noiembrie Boulevard, Castanilor Street,. N. Titulescu Street Intersection:
Light vehicles =2843;
Urban passengers transport =126;
Heavy vehicles = 18;

- Iuliu Maniu Street, Castanilor Street, 13 Decembrie Street Intersection:
Light vehicles =2926;

Urban passengers transport =164;
Heavy vehicles = 15;

- Iuliu Maniu Street, Alexandru Ioan Cuza Street, Nicolae Iorga Street Intersection:
Light vehicles =2633;
Urban passengers transport =175;
Heavy vehicles =22;

- Nicolae Iorga Street, Lungă Street Intersection:
Light vehicles =2078;
Urban passengers transport =158;
Heavy vehicles =14;

The emissions resulted from the traffic leads to the degradation of the green spaces, but also they are damaging the buildings near the roads. The vibrations produced by the vehicles damages the historical monuments and buildings.

The noise from the traffic affects residential areas and their buildings: City Hall, "TRANSILVANIA" University building, Capitol and Aro Palace Hotels, and others.That is why it is necessary to reduce the volume of traffic in this area or even to stop it. It is possible to reduce the traffic by optimization of the traffic lights programs.

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