

URBAN TRANSPORT PLANNING AS A SUPPORT TO AIR POLLUTION CONTROL

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Abstract: *A significant part of air pollution control strategy can be achieved through measures in urban transport planning. The need for this analysis is based on the fact that transport planning decisions are often made without proper consideration of their air pollution consequences [1]. This inevitably deteriorates air quality in urban areas, particularly in those areas which already have problem with urban air pollution. The paper deals with transport planning approach towards reducing air pollution and this approach is analyzed through short-term and long-term measures, recommended for Bitola. Implementation of these measures has a potential to contribute for improvement of the current problem with air pollution.*

KEYWORDS: TRANSPORT PLANNING, MEASURES, AIR POLLUTION, BITOLA

1. Introduction

Urban transport is a source of wide range of environmental issues like air pollution, noise, acidification and global warming. Air pollutant concentrations caused by urban transport, accumulated along high-volume freeways and arterials are widely recognized as severe health hazards [1].

Under circumstances where the effective control of vehicle air pollution immediately at the source is not technologically or economically feasible, the emphasis should be placed on an improved traffic management program and better transport planning and design. It is important that a transport decision be made not only on the basis of cost savings, increased safety, and improved traffic performance, but also on such aspects as reduced energy requirements and improved quality of environment [2].

The role of transport planner should be concerned that the transport plan, design and operational alternatives selected are sensitive to air quality criteria [1].

Among all the measures available to the transport planner, several of them which offer a number of possibilities, individually or in a combination, are included in this analysis for Bitola. Depending on how it is applied, transport planning can improve air quality in the short and long run by strategic measures, encouraging minimization of pollution emissions. Activities in these short- and long- term measures are further sub-categorized as follows: planned unit development, regulation & pricing policy, planning of urban journeys and monitoring and forecasting. Presented in this way, they offer a significant direction towards the surpassing the current air pollution problem in Bitola.

2. Transport and environmental impacts

Transport plays a key role in affecting air quality and environmental degradation. The delays and frustrations caused by urban traffic congestion can reduce human productivity and quality of life, thus possibly reducing the potential gross domestic product. The noise produced by various types of vehicles raises the level of ambient noise, increases stress and reduces the quality of life. Transport can also contribute to the physical and social isolation of certain vulnerable segments of society, such as the poor, children and the elderly [3]. Both short- and long- term exposure to air pollutants can affect people's health. Hence, air pollution causes significant harm to health and the environment and, as a result, has an adverse impact on the economy [4].

Air pollution control should not be the only important and current priority in the local context, having also a significant potential to control greenhouse gas emissions [5]. Climate change is one of the most important issues on the world agenda; while national governments reached an agreement in Paris in December 2015 on limiting climate change, regional and local government – along with a wide range of public and private sector organizations – have a responsibility to tackle carbon emissions [4].

The contribution from motor vehicles in urban air pollution in Bitola is significant. The economic situation in the town of Bitola

and in the country in general defines the average age of the urban vehicle fleet. Therefore, the biggest part of the vehicles - around 47% (approximately 10.000 vehicles) are older, ranging from 14-20 years and above 20 years [6]. At the same time, exhaust emissions from these vehicles are higher, caused by obsolete technical characteristic and out-of date equipment for exhaust gasses treatment (or its total absence). Being frequently used on everyday level, these vehicles realize significant part of passenger kilometers in the town [6].

The amount of air pollution generated by urban transport depends not only on the type of vehicles, but also on the length, speed and number of motorized trips [7]. Hence this effort to emphasize the importance of transport planning contributing in that way for the direct control of urban air pollution.

3. Transport planning and air quality

In dealing with air pollution at both local and regional level, it is important to recognize the significance of transport in urban planning [1].

Transport planning should be considered in conjunction with urban planning, since each of them have a significant contribution in reducing air pollution and its harmful effects.

The role of urban planning is to manage the spatial organization for efficient allocation of urban infrastructure and land use [7]. Urban plans that locate jobs, housing, and recreation in close proximity increase the use of alternative forms of travel, such as walking, biking and mass transit. Alternative forms of travel reduce the number of vehicles on the road, reduce the amount of pollution emitted by vehicles, and improve air quality [7].

This means that air pollution consideration should be incorporated and evaluated in the process of developing land use and transport plans [1]. When needed, research should be conducted and supported in order to better understand current ambient air quality and pollution sources. Also, encouragement should be given for new legislation which would allow urban planning programs and pollution control programs to better meet air pollution abatement goals [1].

The treatment of the air pollution problem through urban and transport planning is a complex process, as illustrated in figure 1 below.

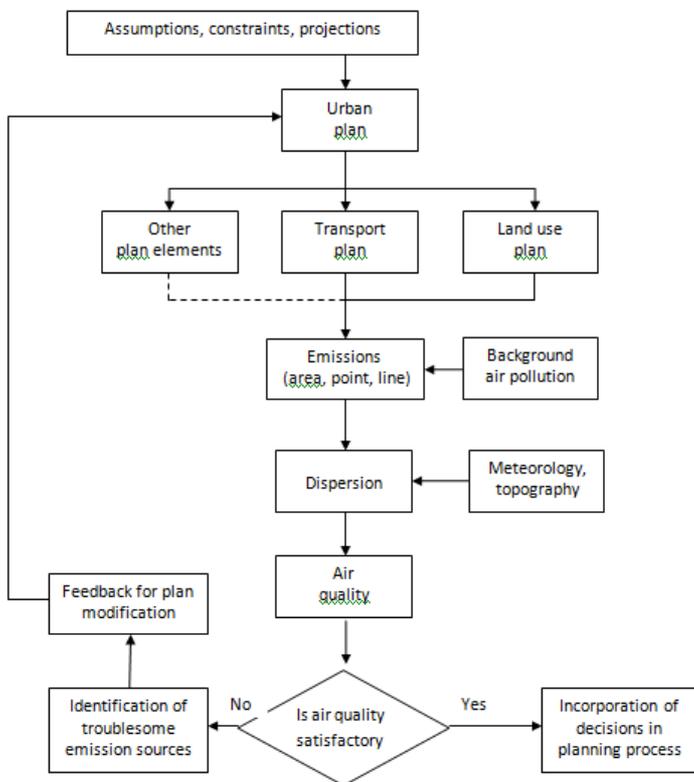


Fig. 1: Air quality considerations in the planning process
Source: [1]

However, there aren't easy answers for the urban and transport planners: many actions that will be beneficial will also have harmful effects [1]. For example, increasing the average speed of traffic will reduce the concentrations of hydrocarbons and carbon monoxide, but probably increase the concentration of nitrogen oxides. Increased travel speed also tends to lengthen trips; thus resulting in increased use of vehicles. Decreasing the density of

land development reduces concentrations of air pollution but increases dependence of the vehicle as a transportation mode. Such trade-offs require close study in light of each urban area's unique conditions and priorities [1].

3.1. Strategic approach in transport planning for emission reduction

The development of a strategy involves the selection and categorization of a coherent set of measures which, taken together, will reduce the emissions of transport pollutants [3].

There are a number of feasible transport measures which may have varying levels of environmental impact [1].

Both long-range and short-term measures can be undertaken to improve the air quality in urban areas [2]. Long-range planning actions involving proper arrangement of land uses will ensure desirable allocation of urban activities. Within the framework of area wide land-use planning, effective measures can be taken in laying out streets and buildings properly so that the air pollution effects can be minimized. Long-range, land-use-transport planning will also make it possible to develop transport systems in which the amount of vehicular travel as well as the lengths of trips can be reduced considerably and thus limit air pollution effects [2].

In addition to long-range measures, which can be applied only in case of new developments and in case of implemented air quality management system, several short-term measures can be undertaken in existing urban areas in order to improve the air quality [2]. These short-term measures can be undertaken to reduce the amount of traffic in an urban street network, in addition to the measures directed to improving the quality of traffic flow.

In table 1 is listed a series of measures that can be undertaken in order to minimize the effect of traffic-generated emissions [2], [8]. As measures for both short- and long-term transport planning, design and operation for the purpose of air pollution control, the following measures can be included:

Table 1: Long- and short- term measures in transport planning

Long-term measures	Type of measure	Outcome					
		reducing need to make trip	reducing length trip	promote non-motorized transport	promoting public transport	shift trips from congested locations	reduce traffic/ traveler delays
1. Urban and development planning.		✓	✓	✓	✓		
	2. Advice and warnings for the public and people at particular risk.	✓		✓	✓	✓	
Short-term measures	3. Traffic management and enforcement, and financial incentives and disincentives.	✓	✓	✓	✓	✓	✓
	4. Initiatives providing information, advice and education.	✓		✓	✓	✓	

It may be noted that, in general, that measures which are associated with effective regulation are more likely to accomplish the desired results than the changes in urban transport pricing policy or other measures [2].

3.2. Measures and their activities: summary tables

All these long- and short- term measures are further sub-categorized in additional 4 categories:

1. planned unit development,
2. regulation & pricing policy
3. planning of urban journeys
4. monitoring, information and forecasting.

This sub-categorization is given in summary tables (2-5), where every measure is presented with several activities defining that measure [8].

Hence, a brief explanation of every of the measure from the table 1 together with its activities is given in the following summary tables.

Table 2: Planned unit development

Urban and development planning
- Land use planning, development control and planning decisions, urban space and building design, improved network configuration.
- Incorporation of sustainable transport principles into the urban design of new settlements.
- Developing multimodal transport infrastructure to support low emission modes of transport: <ul style="list-style-type: none"> o public transport routes and services, including developing bus lanes, improving service quality and cost reduction o cycle routes and pedestrian areas o park & ride facilities.
- Reducing travel demand.

Table 3: Regulation/pricing policy

Traffic management and enforcement, and financial incentives and disincentives
- Traffic management systems and signal coordination: <ul style="list-style-type: none"> o road signs, traffic signals and road markings o lane control o traffic calming measures o vehicle bans or restrictions o elements of routes (such as positioning of traffic lights) o roadside emission testing.
- Zoning, including low emission zones: <ul style="list-style-type: none"> o congestion charging o cordons or zones o distance-based charging o speed management zones o clear zones (vehicle free zones) o time-based charging o toll road charging.
- Parking restrictions and charges: <ul style="list-style-type: none"> o restricted parking zones (including low emission vehicles and electric vehicle recharging points) o higher parking charges.
- Vehicle 'idling' restriction and charges including waiting and loading restrictions.
- Charges of fuel, engine size, vehicle registration, emission taxes.
- Taxi licensing – standardization of the minimum emission requirements for taxis.

Table 4: Planning of urban journeys

Initiatives providing information, advice, education or to develop skills for:
- Travel planning (awareness raising and education to encourage people to use alternatives to a car).
- Settings-based travel planning (such as in workplaces, new residential developments or schools): <ul style="list-style-type: none"> o traffic-free routes and route design to reduce exposure

- o improved facilities to **encourage cycling or other non-motorized travel**
- o cycle-to-work schemes
- o policies relating to **business travel, including using public transport rather than driving, or incentives for businesses to promote cycling at work**
- o management of deliveries and products to minimize air pollution
- o signage and cycle parking
- o lighting and planting.

- Personalized travel planning to provide individuals with information, education, incentives and motivation to support low emission travel choices.

- Information, education and training on driving styles, including the need to avoid heavy acceleration and minimize braking and excessive speed.

Table 5: Monitoring, information and forecasting

Advice and warnings for the public and people at particular risk:
- Air pollution forecasts and real time data.
- Air quality monitoring database.
- Air pollution early warning alerts via text or email.
- Air pollution early warning or monitoring information via web- or app- based geographical systems.

Implementation of these measures is often difficult. Yet, the difficulty barriers should be considered as motivation for their choice and support.

4. Conclusion

Transport planning should be used as a support for the development of urban pollution control programs. Its major contribution lies in evaluating, proposing and implementing measures which help disperse pollutant concentrations, reduce exposure to pollutants and improve efficiency of urban travel [1]. Decisions from transport planners can limit negative impacts from transport upon the environment and contribute for better life quality.

The quality of urban air can be improved through implementation of short- and long-term measures for transport planning [2]. Short-term measures have potential not only to minimize traffic congestion and delays and thus reduce stop-and-go operation which is responsible for a large part of vehicle emissions; at the same time, these measures reduce the traffic volume on the network, inducing less usage of the vehicles through effective traffic regulation, efficient pricing policy, and improved planning of urban journeys. This is further supported by initiatives providing information, advice and education. On the other side, long-range measures related to area wide population, as public warnings and also careful planning of building arrangements and street layout will add to the overall reduction of the adverse effects of vehicle-related air pollution in urban areas [2].

The effective implementation of these recommended measures for Bitola can be of significant benefit in terms of improved traffic flow, support of non-motorized travel and thus reduced air pollution from vehicle emissions. For their success, cooperation is needed between transport and urban planners, supported by local authorities and by the public. Although the rate of the changes could be slow, the most important is that this analysis gives the starting point in transport needed for dealing with the problem of urban air pollution.

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