



Sustainable Development for Road Traffic Control

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Abstract:

Sustainability can be defined as the practice of maintaining processes of productivity indefinitely natural or human made by replacing resources used with resources of equal or greater value without degrading or endangering natural biotic systems. Sustainable development ties together concern for the carrying capacity of natural systems with the social, political, and economic challenges faced by humanity. Sustainability science is the study of the concepts of sustainable development and environmental science. Construction of a new traffic should consider its effect on the road network around the construction. Effect on the road network seen by the size of the building will be planned. Assessment is done by looking at whether the development affects the access roads around the building affecting access roads and intersections in one direction around or to affect the road network in the city that need consideration to change the city development master plan. This paper aims to set a framework for traffic management and ITS applications in urban areas to help address the traffic problems at regional level.

Keywords: Traffic System; Sustainable Development Traffic Control Systems, Road Network Capacity Traffic Detectors; Environment; Strategic Planning; Road Infrastructure.

Introduction:

Road transport is considered to be one of the cost effective and preferred modes of transport for both freight and passengers. India has an extensive road network of 4.24 million km– the second largest in the world (MoRTH, 2005). The National Highways have a total length of 70,934 km and serve as the arterial road network of the country. It is estimated that more than 70 per cent of freight and 85 per cent of passenger traffic in the country is being handled by roads. While Highways/ Expressways constitute only about 2percent of the length of all roads, rest are state highway, major district road, district roads and rural and other road which is consider as low volume road. Growing public awareness of climate change requires transportation professionals to integrate green

concepts into the transportation planning, design. Sustainable transport has many social and economic benefits that can accelerate local sustainable development and transport can help create jobs improve commuter safety through investment in bicycle lanes and pedestrian pathways-make access to employment and social opportunities more affordable and efficient.

Sustainable development is a new concept of scientific development, sustainable development requires us to change not only the concept of economic development, but also requires us to change the concept of social development. Development of the city as a social development and economic development is an important embodiment of the process of sustainable development but also in pursuit of the concept of innovation. Construction of a new

traffic should consider its effect on the road network. In every country, mobility is a major value to the people because economic activities and social welfare depend on it, and people consider it a major asset of their life, as they can move freely, safely, quickly and at a reasonable expense. So it is commonly acknowledged that mobility should not be restricted. In fact, travel or mobility demand usually continues to increase. But the pace of passenger demand growing depends on socio-demographic developments and thus we need to carefully specify it for each region and country. Demand for freight transport usually growing at higher rates and dependent on economic growth. To deal with the transport problems, the first question is always that sufficient infrastructure is important. But providing infrastructure alone cannot solve the problems completely. We must be aware that no country in the world can extend its transport infrastructure to catch up with demand growths. Sustainable development is one of the themes of the world today. Considering growing urban traffic problems and urban environmental problems, developing sustainable transport is particularly important.

Avoiding strategy comprises measures to reduce the total traffic demand in a targeted area. The number of trips per day is one of the main criteria used for evaluating the impact of this strategy. Traffic shifting strategy includes measures to switch traffic demand between different modes, time windows, destinations, and routes. Modal split, demand distribution by time, and changes in origin-destination transport demand are main criteria used for impact evaluation. Traffic Control strategy consists of measures that aim to guide and control the movements of vehicles over time and space with an aim to improve traffic safety and efficiency. A ratio between actual traffic volume and designed capacity, average traffic speed, total vehicle delay

time, frequency of traffic accidents, and accident severity are the main criteria to examine the impact of this strategy. In a basic signal control system (two, three etc. traffic lights in a row) the balancing of the supply with theirs performed only on the basis of the data at the approach of each signal heads in demand signal control system. In the road traffic signal control systems, an organization of traffic over large parts of the network is assumed to take place due to the coordination (progression) of traffic controllers. From this angle point it is interesting to notice that the traffic signal control is achieved over two spaces. In case of the demand measured it is the space of the road network concerned and in case of the supply offered it is the operating time of the road network.

According to their characteristics or should the traffic be organized taking into account the available road network space (network capacity)? In the latter case the problem is the estimation of the available space (capacity) in the road network. Installing traffic detectors along whole length of the traffic lanes and over the whole area of the network is not economically justified. Each road network has a specific road network capacity. The road network capacity may be expressed as a number of vehicles contained (or which may be) at the same time on each available traffic lane and the collision area. Vehicles being parking can also be accounted for (by taking into account the car parks). The magnitude of the road network capacity of a road network is strongly dependent on the communication speed, the total length of all the lanes as well as on such parameters as a average length of vehicles, mean gap between the vehicles, the efficiency of the control system, traffic organization, traffic management, behaviors of drivers (driver model), flow structure, etc. In addition, there are black spots where accidents occurred and safety

countermeasures were implemented repeatedly in a “vicious circle.” For such accident black spots, a more effective traffic safety program is required.

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Principle of Sustainability:

1. To reduce/not to increase the impact of climate change:

The emissions, which cause greenhouse effect and climate changes, should be reduced by decreasing fuel consumption. This task may be implemented by road engineering measures: building bypasses, reconstructing streets and roads as well as paving gravel roads. Having diverted the transit transport to bypasses, capacity of streets and roads increased, gravel roads paved and driving conditions improved (eliminated traffic jams, speeds increased up to optimal level regarding pollution, smoother driving) effects fuel consumption as well as the emission of gas causing greenhouse effect.

2. Bypasses increase the driving speed and fuel consumption significantly:

Average speed on bypass is 90 km/hour, meanwhile in the city it is about 30–40 km/hour or less. The optimal fuel consumption is while driving 60-90 km/hour. Driving on bypass is smoother. It was determined that in case of the same average speed, fuel consumption is 24 percent higher while driving in the city rather than driving in suburbs Ford Motor Company (2008). When the bypass makes the travel route shorter, the travel time saved, the economy of car mileage received and it result in high pollution and fuel consumption. However most often when bypassing the city the route does not get shorter but even longer. Even in such cases, the building of bypasses may be useful and the total consumption of fuel gets lower due to the optic On average, construction of 1 km of bypasses results in 1060 thousands liters of fuel saved and 2700 t of GCGE (CO₂ gases emission) reduced within 25 years; Reconstruction of 1 km of urban roads (with capacity improvement) results in 680 thousands liters of fuel saved and 1700 t of CO₂ gases emission reduced within 25 years; Rehabilitation and strengthening of 1 km of urban roads result in 200 thousands liters of fuel saved and 500 t of CO₂ gases emission reduced within 25 years; Reconstruction of 1 km of rural roads (with capacity improvement) results in 300 thousands liters of fuel saved and 700 t of CO₂ gasses emission reduced within 25 years; Rehabilitation and strengthening of 1 km of rural roads result in 200 thousands liters of fuel saved and 500 t of CO₂ gases emission reduced within 25 years; Paving of 1 km of gravel roads results in 230 thousands liters of fuel saved and 580 t of CO₂ gases.

3. To reduce or stabilize the impact on human health:

The main factors of transport impact on human health are pollution, noise and traffic

safety. These factors also may be managed by road engineering measures: building bypasses, reconstructing roads and streets and asphaltting gravel roads. An average car in the city, which has burnt 1 l of petrol, emits about 50 grams of carbon monoxide, 4 grams of volatile organic compounds, and 6 grams of nitrogen oxides. Whereas an average truck which has burnt 1 l of diesel fuel emits about 22 grams of carbon monoxide, 15 grams of volatile organic compounds, 27 grams of nitrogen oxides, 3 grams of solid particles Web Air (2011). The building of bypasses has rather significant impact on the pollution change in the city streets as well as the whole region. After diverted transit and heavy vehicles flow in to bypass, the total emission and pollution level decreases due to new traffic condition.

On a gravel road of medium traffic flow, 1–2 cm thick layer of gravel lost off over the period of one year, which in a form of dust or in other shape settles on nearby fields, plants and living environment of the people. The most effective measure to avoid this pollution is to pave the gravel road. Transport is the main source of noise pollution. Noise measured by decibels (dB). Human ear feels noise of different frequency unequally. Low frequencies are felt the least, and medium frequencies are felt stronger. Audibility limit is 0 dB; it depends on health, age etc., pain threshold is 120–140 dB. The most specific noise levels are: 10 meters from a fast going light duty vehicle is 75 dB; 10 meters from a fast-going truck is 85 dB.

Human being reacts to noise in most general cases in the following way: the least change (alteration) in noise level that a human ear can feel is 1 dB, 5 dB change is definitely audible; noise level change from 8 to 10 dB is sensed as redoubling or halving of noise level. The principle of sustainability – to reduce the effect to biological diversity. Road reconstruction

could help reduce the negative impact to biological diversity and a new road construction could help to avoid the negative impact. The most significant effects of road infrastructure and transport to biological diversity.

Barrier effect is the biggest and the most frequent negative ecological effect of the road. The road becomes barrier for the animals if it makes migration difficult and demographic pit if crossing it could cause the death of an individual. Most of the animals die on the roads with the traffic flow of 2500–10000 vehicles per day. When such intensity exists, animals try to cross the road, but about 60% of them killed and they in some way get into the traps. When the traffic flow is less than 2500 vehicles per day, ” 35% of the animals trying to cross the road die. Huge traffic flow (10000 vehicles per day) frightens the animals and they try to cross the road.

Conclusions:

Sustainable development of road network has to content three main principles of sustainability, without limiting mobility of people and products, to reduce the effect for the climate change, health of people and biological diversity. The first objective of sustainable development of the road network is to reduce the usage of natural resources, fuel consumption, in this way reducing the greenhouse effect and the emission of gasses, which cause the climate change. The second objective of sustainable development of the road network is to reduce the negative effect on the health of the people and it can be reached by reducing the amounts of pollutants and noise in the living environment and by increasing the safety on the roads. The third objective of sustainable development of the road network is to reduce the negative impact on the biological diversity. Sustainable development of the road network does not put limitations on mobility of

people and goods and at the same time it allows reducing the pollution, saves the environment and road users.

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