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TITLE: Urban transport performance indicators

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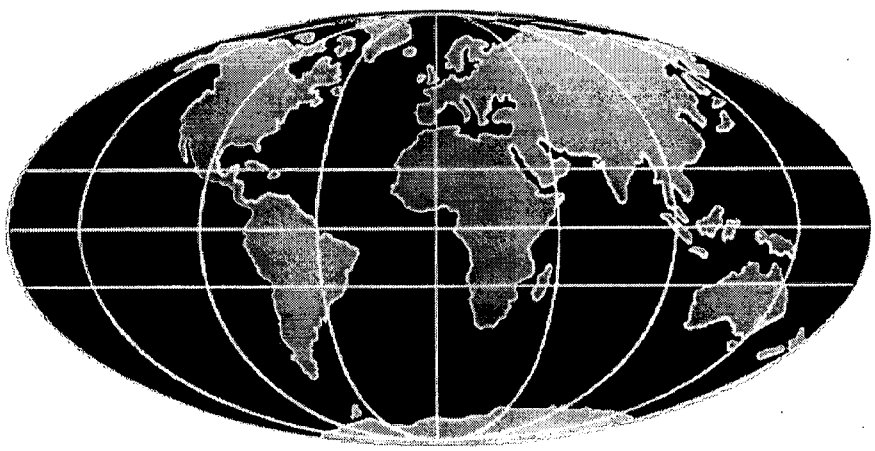

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Urban transport performance indicators
Indicateurs d'évaluation de déplacements urbains

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ABSTRACT: A small set of performance indicators, which use information from sample surveys, can be used to track development such as overall growth in traffic and changes in traffic speeds, and hence provide a basis for up-dating historic transport information, and for identifying the need for more detailed studies on specific issues.

RESUMÉ: Une petite série dindicateurs dévaluation de déplacements urbains qui utilise linformation denquêtes par sondage, tel que peut être utilisée pour surveiller le développement tel que laugmentation et les changements de la vitesse de la circulation et donc fournir une base afin de mettre à jour les renseignements recueillis jusquici sur les transports, et afin didentifier le besoin détudes plus détaillées sur des sujets précis.

1. TRANSPORT INFORMATION NEEDS

While the problems of travel, congestion and pollution are tangible and quite apparent to transport operators and users alike, there is often little objective measurement of the nature and impact of these problems. The need for such a quantitative assessment is important for the following reasons:-

1. To clearly establish the performance of the transport system, and in particular where, how and why it is failing.
2. To help identify possible remedial actions and priorities for implementation.
3. To provide a base-line against which to monitor the impact of remedial actions in particular, and trends in general.
4. To provide basic data for longer term strategic planning.

To furnish this information on a comprehensive basis requires major survey work which is likely to involve significant consumption of resources. These cannot be mobilised on a regular and frequent basis; the periodicity of a major transport study for a city may be as low as every 10-15 years, with perhaps small ad-hoc studies addressing particular transport issues at irregular intervals between. These circumstances dictate that the maximum use is made of the available information which is collected through these studies. This can be achieved through two related paths:-

1. Collating the existing information by means of a comprehensive urban transport database.
2. "Infilling" the irregular survey material with performance data collected through small-scale sample surveys undertaken at regular and frequent intervals, and on a consistent basis.

While the latter sample surveys cannot provide the basis for developing specific remedial actions, they do fulfil the need to monitor general trends in transport performance. A small set of performance indicators, which use information from the sample surveys, can be used to track development (overall growth in traffic, changes in traffic speeds, etc.) and hence provide a basis for up-dating historic transport information, and for identifying the need for more detailed studies on specific issues.

This paper describes the compilation of an urban transport database, and its application to an audit of urban transport performance, using key performance indicators and targets, in Ghana's main cities. It is based on work carried out in Ghana as part of its Urban Transport Project.

2. DATA SOURCES

Urban transport data of varying adequacy are likely to be available which covers:-

1. Road safety
2. Roads provision
3. Vehicular fleet
4. Transport prices
5. Public transport output

The sources for these data will vary according to institutional practices within a particular city, but could include Central Government, Local Government (ie.Metropolitan, Municipal and District Assemblies), Police Authorities, Vehicle Licensing Authorities and Public Transport operators. In a deregulated environment some of these data may be unavailable without surveys; these include vehicle prices and public transport output.

These data sources, even where they exist, largely provide information only on the inventory of transport facilities; there is no information on the quality or level of service being provided. It is in this context that surveys are necessary.

Data can be captured through bus and car journey time and loading surveys, passenger and driver interviews, passenger waiting time surveys, traffic counts, and the monitoring of prices. Each survey can yield information for more than one performance indicator and conversely, some performance indicators may be a composite from different survey types. For example, transport prices could be determined from driver interviews or passenger surveys, it may need information from both surveys to give a complete picture of fare structures, including any informal aspects of pricing policy.

3. URBAN TRANSPORT PERFORMANCE INDICATORS

The indicators proposed for tracking urban transport performance should have the following purpose:

1. To indicate the scale of road accidents;
2. To indicate the quality, quantity and trend in use of public transport
3. To indicate levels of congestion
4. To indicate growth in demand for urban transport
5. To indicate trends in urban transport costs.
6. To indicate the relative importance and development in different modes.

These are the basic minimum, and for the most part can be developed from simple surveys. Targets for improved performance can be set for some of these indicators. These should be based on a realistic assessment of what is achievable. In the first instance the indicator should have a value which is broadly comparable with other cities at a similar stage of development. Beyond that, the trend should be positive (in the sense of improved performance), and at worst show no decline in performance.

For some of the indicators no sensible targets can be set unless specific policies are being promoted. For example, a bicycle ownership target will be appropriate if cycle use is being encouraged as a matter of policy. If there is no policy on cycle use then there is no value in a target, though there is still value in monitoring trends in use.

Other indicators may be appropriate in particular situations. In Ghanaian cities the performance of transport terminals is the subject of much controversy. Two indicators can be used to monitor their performance, namely average turn-round time of vehicles and revenue generated at the terminals. If measures to improve the output of the terminals are successful, then turn-round times will be reduced, and revenues will be raised.

Other cities may be concerned with pollution, the impact of transport development on specific population groups (eg. women, children, the poor) and the performance of specific modes (eg. rail-based systems as opposed to road-based transport). It may also be of value to monitor the scale of resources devoted to urban transport: for example, the level of annual investment, subsidy to operators, manpower employed in the sector, etc.

Suggested target values for these indicators are discussed below.

3.1 *Road accidents.*

Accident statistics for individual cities are not readily available, and hence comparative material may have to be based on nationally reported data. Country fatality data have a very wide range, partly reflecting real differences, as well as differences due to the

problems of accurate record keeping. In 1989-90 the range of road accident fatalities in developing countries was from as high as 200 per 10,000 registered vehicles in Ethiopia to as low as 5 per 10,000 vehicles in S.Africa. The majority of developing countries probably have fatality rates which lie within the range of 10 to 100 fatalities per 10,000 vehicles, while most developed countries have fatality rates which lie within the range 1 to 10 fatalities per 10,000 vehicles.

Research in UK suggests that fatality rates will decline with increasing vehicle ownership, but this relationship is less certain in developing countries (Ghee et al, 1997). Even so, it might be expected that the inverse relationship, though less stable, still applies. Thus countries with low vehicle ownership levels (say below 100 vehicles per 10,000 population) will be likely to have the highest fatality rates. As an initial benchmark, which requires further refinement, the following norms are suggested. Where vehicle ownership is less than 100 vehicles per 10,000 population, then the expected fatality rate will be between 50-100 deaths per 10,000 vehicles. For higher vehicle ownership, the expected death rate will be between 10-50 per 10,000 vehicles.

Analysis also shows that countries should expect a 6 - 7% reduction in fatality rate for a 10% increase in vehicle ownership. This 'natural' improvement in fatality rates can be taken as the minimum level of improvement that should be targeted.

3.2 *Public transport.*

The amount of public transport in use in a city may be measured by the numbers of vehicles providing public transport service, or to take account of the varying size of vehicles, the number of spaces on offer. These indicators of provision should be normalised with respect to population. Both of these indicators vary with city size, and there is some evidence that larger cities have disproportionately higher provision of public transport per head of population.

Indicators of public transport provision may be qualified with indicators of the efficiency of operations and the quality of service.

A World Bank publication (Armstrong-Wright and Thiriez, 1987) has developed both operational performance and service quality indicators for urban public transport service, some of which are reproduced in Table 1. Some additional material has been made to the performance indicators to give information on para-transit.

3.3 *Roads performance.*

Comparative data on urban roads provision is very limited. The first SSATP Report on 'A Transport Database for Sub-Saharan Africa' (Studnicki-Gizbert and Heads, 1992) gives data for four African cities, which present a range of 0.47 - 1.34 kms of urban roads per 1,000 population. Of this amount between 50 - 55% is paved, and between 19 - 26% is in good condition. There is no indication from this evidence as to how roads provision may vary with city size, nor is there any indication of the intensity of roads use which might show, for example, the amount of roads operating at different service levels or vehicle speeds. Another World Bank document (1991) suggests an overall average for Africa of 0.67 kms of urban roads per 1,000 population.

Given the paucity of comparative data, and until further information becomes available, the norms which will be used are as given above by the SSATP Report.

Peak hour vehicle speeds, traffic flows and vehicle:capacity ratios provide measures of the use of and congestion on the roads. For this exercise, vehicle speeds are used. Benchmark speeds for different types of main road are: central area roads 10 -15 kmph, and outer radials 15 - 25 kmph. Speeds which fall below these benchmarks are indicative of poor roads provision, and/or poor traffic control and management.

3.4 *Vehicle fleet.*

Higher per capita incomes are associated with higher vehicle ownership levels. In developing countries we can expect that urban vehicle ownership will be significantly higher than the national average by factors of between 5 to 10. This reflects higher per capita incomes and economic activity levels in cities. Ownership levels may also be related to city size, though the relationship is not clear.

The relationship between road km.per vehicle and city size and per capita income is complex. A low value for road km. per vehicle is likely to indicate high congestion which could equally well be experienced by high vehicle numbers on a good road network or low vehicle numbers on a poor road network.

However, congestion may not be so bad in cities with high vehicle ownership, because of better traffic control and management, better vehicle condition, and higher driving standards.

Suggested norms for vehicle ownership in developing cities are shown in Table 1.

3.5 *Transport prices.*

Public transport fares for a 5km trip length have been recorded for a number of cities (World Bank, 1987), though the data is now somewhat out-dated. The range of values for the 33 cities listed was between 0.01 - 0.4 US$, with an average of 0.15 US$. The highest values were found in the higher income cities, and were charged for the 'higher value' services like those provided by shared taxis. Current norms are likely to be perhaps 50% higher, at between 0.015 - 0.6 US$ per 5km trip. Suggested norms for different categories of developing cities and public transport service shown in Table 1.

The price of petrol is likely to be in the range of $1.00 to $3.00 per gallon (22 - 66 cents per litre), with an average pump price of $1.87 per gallon (41 cents per litre) in 1994. Higher prices are more realistic in view of the fact that the average border price of fuel is $1.00 per gallon.

3.6. *Modal choice.*

In developing cities use of non-motorised transport (particularly walking) is likely to be high, though there is little documentary evidence to demonstrate this. Modal choice data is not easily captured, and at best may show only the choice between vehicular modes. The very large ranges in modal choice values between cities reflect differences in definitions, year of data acquisition, method of data collection, absence of some modes in some cities, as well as policy controls. As such it is difficult to identify benchmarks. In the absence of more rigorous data it can at best be said that for vehicular trips, between 20-40% are likely to be in private vehicle, and 60-80% in some form of public transport (bus, taxi or rail). Public transport use will be higher in larger cities, and less wealthy cities, though no speculation on the magnitude in differences is presented here.

Table 1. Comparative urban transport performance of Ghanian cities.

Indicator	Benchmark	Ghanaian performance
Public transport:		
i) Cities < 1 million		
-vehs. per 1,000 pop.	10 - 20	2.6 - 23.4
-spaces per 1,000 pop.	200 - 1000	26.9 - 222.3
ii) Cities 1 - 5 million		
-vehs. per 1,000 pop.	20 - 40	13.9
-spaces per 1,000 pop.	1000- 4000	119.4
Roads performance		
-kms per 1,000 pop.	0.47 - 1.34	0.59 - 1.21
-% paved	50 - 55	41 - 88
-% good	19 - 26	n.a
-speeds kmph		
-central area	10-15	10 - 16.5
-outer radial	15 - 25	9.5 - 29.3
Vehicle fleet		
i) Cities < 1 million		
-vehs. per 1,000 pop.	10 - 40	13.2 - 46.5
-road km. per 1,000 vehs.	10 - 50	9.5 - 30.3
ii) Cities 1 - 5 million		
-vehs. per 1,000 pop.	30 - 60	35.7
-road km. per 1,000 vehs.	10 - 50	13.3
Modal choice		
%vehicular trips by:		
-private vehicle	20 - 40	7 - 27
-public transport	60 - 80	63 - 93
Transport prices:		
5km trip on public transport (US $):		
low quality	0.015 - 0.1	0.06
high quality	0.1 - 0.2	0.14
Fuel price (US cents per litre)	22 - 66	37

4. URBAN TRANSPORT AUDIT

The purpose of an urban transport audit is to establish the current status and performance of the sector, to identify strengths and weaknesses and to determine trends in output and resource consumption. Effectively the performance indicators, generated by the urban transport database, can provide the required information for undertaking an audit. Thus the selected performance indicators provide a basic framework for an audit, and the targets provide the guidance as to necessary developments. As already noted, targets must be

tailored to the individual city. Cross-national and international comparisons provide useful benchmarks, but account has to be taken of local conditions and constraints.

Comparative targets also need to be based on cities of a similar size and state of development. Where targets based on comparative data cannot be established, the audit should try to establish targets which take account of historic data, objectives, and productivity potential.

It was also noted earlier that targets are not always appropriate, particularly if the performance indicator is not "policy-driven". Even in these cases, however, comparative data may be helpful for the audit, showing whether a city has inordinately different urban transport characteristics than its peer group. Such differences may be entirely acceptable and explicable; conversely they may help identify a need to introduce policies for restructuring the urban transport sector.

Apart from the comparative analytical aspect, an audit should also track the performance indicators over time to show whether improvements are being achieved and at what rate. Because a city's characteristics are changing over time (higher population, more wealth, etc.), the target performance will be changing. Some account must be taken of this situation when monitoring trends.

An Urban Transport Audit also requires supplemental information, of a qualitative nature, which describes the institutional and regulatory framework supporting the sector. This information can be stored in the database in the form of short memos attached to appropriate input screens. As more comparative information becomes available it may be possible to develop a rating scale which identifies the level of regulation, and the degree of institutional coordination. Some basic quantifiable data, for example, on the number of professional staff engaged in traffic and safety activities may be useful.

5. COMPARISON OF GHANAIAN CITY TRANSPORT.

Using the above norms it is possible to compare the performance of Ghanaian city transport with its peer group. The key indicators and benchmark values, together with performance data for the five main Ghanaian cities, namely Accra, Kumasi, Tamale, Secondi-Takoradi and Tema are shown in Table 1.

From this Table, and for the indicators presented, it is evident that Ghanaian city transport is broadly functioning within the norms of its peer group cities. The main observations are:

1. Safety is poor, but the values are within the expected range, and show a downward trend.
2. Roads provision, and vehicular speeds are largely within the expected ranges. Major on-going road rehabilitation work in Accra should soon improve further on these performance data.
3. Ghanaian cities have vehicle populations which are within the expected ranges, albeit at the lower end. Vehicle population data has not been well documented in the past, and a recent re-registration exercise gives indications that there has been an underestimate of about one half.
4. Modal choice and transport prices are largely within the expected ranges.
5. The major problem seems to be as regards public transport availability. There is a serious shortfall in public transport vehicles and spaces as compared to the benchmark values.

6. CONCLUSIONS

This paper presents an attempt at defining the values of benchmarks of performance of urban transport in developing cities. These values need further refinement to give more precision. At present many of the values are 'guesstimates' which are based on experience and judgement rather than hard evidence.

There are also many missing indicators which measure, for example, the use of non-motorised transport and the level of pollution attributable to urban transport. These are likely to become increasingly important as greater concern over environmental issues becomes more apparent.

7. REFERENCES

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