THE SUB-SAHARAN AFRICA TRANSPORT POLICY PROGRAM

A TRANSPORT DATABASE FOR SUB-SAHARAN AFRICA

REPORT ON STAGE ONE

June 1992

by

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United Nations Development Program
United Nations Economic Commission for Africa
FOREWORD

The shortage of economic data in Africa extends to the transport sector. At the macroeconomic level there is a need for appropriate data to plan, monitor efficiency, identify trends and anticipate emerging problems. Road transport economists are searching for appropriate road traffic surveys and data on origin and destination while transport users would like information on freight, etc. The improvement in transport data is an essential step in building up the indigenous capacity to evaluate and to analyze transport policy. In an effort to correct the situation, the World Bank and the Economic Commission for Africa (ECA) have initiated a comprehensive study on transport data with financial assistance provided by the UNDP, as part of the Sub-Saharan Africa Transport Policy Program (SSATP).

The overall objective of the study is to improve the quality, reliability and relevancy of information on the transport system to provide a basis for better decisions concerning operations and investments. The specific objectives of the present project are: to provide guidance on the development and upkeep of a transport information system at the level of agencies, industries, countries and sub-regions, and to pilot the development of the proposed system in specific countries and organizations and develop transport data systems at ECA to monitor the progress of the Second Transport and Communications Decade. This report highlights the problems faced when collecting, processing and disseminating transport statistics in Africa.

We are now starting the second part of the study. Essentially it will consist in designing and testing efficient demand-driven data systems at the national, sub-regional and regional levels. These data systems will serve as basic tools for managing and monitoring performance in the transport sector.

The project will provide technical guidance and support in a limited number of pilot countries (six or seven), to a limited number of NGOs (three or four), and ECA, in order to assist them with the design and implementation of efficient, consistent and compatible data systems, through a unit team based in Addis Ababa which will work under the aegis of the World Bank in Washington DC. The project will assist these countries/sub-regional organizations in identifying the type of data to be collected and the best ways to collect, process and disseminate it and will also assist in the testing of the effect of a manual for the collection of key data. The unit team will act as an extension/advisory group and will assist these voluntary countries and NGOs as well as ECA in carrying out the transport data systems programs. The national and sub-regional cases will probably be funded by bilateral or multilateral donors that will be associated with the project. These pilot exercises will test various alternatives in different environments and will design systems that could be implemented in a number of countries and NGOs during the second phase of the project.

The World Bank and ECA, in coordination with the team, are expected to organize and conduct a launching seminar in September/October 1992, with the participation of all the relevant agencies, donors and sub-regional organizations. The objectives of the launching seminar are to discuss the guidelines and to reach consensus among the various partners (pilot countries and pilot NGOs, donors, the team unit, ECA, the Bank and the UNDP) on the work to be accomplished and the strategy to use.

The team in Addis Ababa will prepare a detailed work program for the pilot transport data systems at national and sub-regional levels, based on the discussions and recommendations reached during the launching seminar. A working group comprising all the donors participating in the project will regularly meet to exchange information on the on-going pilot exercises.
ACKNOWLEDGEMENTS

The consultants are very appreciative of all the help that they have been given in the course of this study. A full list of persons consulted is contained in Appendix 1, where their assistance is gratefully acknowledged. However, at the beginning of the report, we would wish to give special recognition to Bernard Chatelin, who was our taskmaster on this study; Jean Doyen, Richard Barrett and Ian Heggie of the World Bank, who made their great knowledge available to us on many occasions; Mpekesa Bongoy and Paul Were of the Economic Commission for Africa, who provided information and very useful insights in meetings in three different geographical locations; Joseph Pihi of the University of Bazzaville, who accompanied us on the field visits to Côte d'Ivoire, Burkina Faso and Burundi and provided a special report on transportation on the Zaire River; and our four national consultants, Marcel Rakotomalala in Madagascar, George Banjo in Nigeria, Patrick Traore in Burkina Faso and Godfrey Wandera in Uganda. We have been very fortunate in the assistance received from these people and from all those listed later in the report.
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Chapter 1 examines the need for transport statistics in Sub-Saharan Africa; the background leading to the commissioning of the present study; the work plan and interviewing process followed; a brief listing of other work recently undertaken to establish transport databases for Sub-Saharan Africa; and an outline of the format of the present report.

A. THE NEED FOR TRANSPORT STATISTICS IN SUB-SAHARAN AFRICA

1.01 On 20 December, 1988, the United Nations General Assembly proclaimed the second United Nations Transport and Communications Decade in Africa (UNTACDA II) for the period 1991-2000 to focus African and international attention on the crucial role of the transport and communications sectors in Africa’s economic and social development. The programme document for UNTACDA II highlighted the role of the transport sector:

The success of the efforts to increase production and income growth in Africa is greatly dependent on the efficient performance and effective support of the transport sector. Weaknesses in the transport system greatly constrain economic and social activities as well as efforts towards economic integration and trade.¹

The development of an integrated and efficient transport network is a crucial factor to the rapid economic growth of the African continent. The inadequacy of transport services in the past has considerably limited the development of agriculture, industry and trade and affected the ability of the African countries to effectively and jointly make use of their potential resources. The over-arching objectives for the transport sector can be summarized in three words: efficiency (and thus lower cost), sustainability (maintaining over time the level of efficiency achieved) and integration.²

1.02 There exists a well-founded concern about the adequacy of transport statistics in Africa, both in terms of the scope of available data and the quality and reliability of data collected. It can be easily demonstrated that a large proportion of time, cost and effort of transport studies and project evaluation is spent on ad hoc data collection; furthermore, such efforts are not always consistently followed, requiring subsequent repetition of essentially similar work a few years later. The performance monitoring essential for the development of effective policies and programs in the transport sector has been adversely affected by the lack of reliable data. It is a truism that good decisions are well-informed decisions; thus under conditions of resource stringency the need for the improvement of the information base is particularly pressing.

1.03 Given the key role of transport in the socioeconomic development of Africa, there is an obvious need for transport statistics for planning and evaluation purposes. Without giving a definitive list of specific needs, it is clear that data deficiencies cause major problems in overall planning of transport activities, particularly where the ratio of private/public investment varies significantly between modes and between jurisdictions; in the measurement of the performance of carriers in the various modes; in the evaluation of transport sector investment needs relative to investment needs in non-transport activities; in analysis of transport costs and rates charged

¹ United Nations Economic Commission for Africa, Programme of the Second United Nations Transport and Communications Decade in Africa 1991-2000, Project RAF/88/016, Addis Ababa, March 1991, p. 5. The reference to the communications sector in this quotation has been deleted, as the present study is confined to the transport sector.

² Ibid., p. 95. References to communications have again been deleted from this quotation.
for freight and passengers; and in project evaluation. The problems of data deficiencies are clearly recognized in the UNTACDA II Document and the long-term global thrusts of the program include:

OBJECTIVE 5: Establishment of information systems on transport and communications as a basis for analysis and better planning and management of investments.³

1.04 The other key program directly related to the subject of this study is the Sub-Saharan Africa Transport Program (SSATP), with the objective "to improve transport efficiency and sustainability through major policy reform programs".⁴ The principles adopted to reach this general objective were laid down by the International Advisory Committee of SSATP in Oslo in 1988, summarized in part, below:

- Focus on policy responses to key transport sector issues and strengthening of capability for policy development at the regional and national level.

- Implementation through a series of discrete components in partnership with development agencies and African institutions with participation of African experts and advisors.⁶

1.05 The clearly perceived need to improve the quality of transport statistics led to the adoption of a transport data project as a part of the SSATP:

The shortage of economic data in Africa extends to the transport sector. At the macroeconomic level, there is a need to plan, monitor efficiency, identify trends and anticipate emerging problems. Road transport economists are searching for appropriate road traffic counts and origin/destination data. Transport users are looking for freight information, etc. The transport data component of the SSATP, financed by UNDP, will develop policies and guidelines to establish user-oriented, transport sector related, information systems in Sub-Saharan Africa.

Through the conduct of six to eight national case studies, the preliminary phase will focus on the sector and the best data collection methods at the national and regional levels. The project will also develop a computerized database for multimodal transport statistics at ECA.⁸

1.06 A program to improve the quality of transport statistics in Sub-Saharan Africa must clearly be demand-driven by users needs and not supply-driven by the availability of existing transport data. User needs are addressed in Section B of Chapter 2.

³ Ibid., p. 19.


⁶ Ibid., p. 1.

B. BACKGROUND

1.07 The Conference of African Ministers of Transport, Communications and Planning is the policy-making body for the planning, implementation and monitoring of the UNTACDA II programme. The United Nations Economic Commission for Africa (ECA) was nominated as the lead agency responsible, in cooperation with other agencies, for the preparation of the program and the harmonization, coordination and monitoring of UNTACDA II activities.⁷

1.08 Accordingly, a Project Document was developed under the United Nations Development Programme (UNDP) with the title "Development of a Transport Database in Sub-Saharan Africa". A Steering Committee was set up consisting of ECA, UNDP and the World Bank, and the first meeting took place in Washington, DC, on April 4-5, 1991, under the chairmanship of Mr. Pierre Ly of UNDP. Representatives of the Steering Committee were in frequent contact with the consultants during the progress of the study and the Committee met with the consultants in Abidjan, February 1-3, 1992, to review the draft report.

1.09 The project "Development of a Transport Database in Sub-Saharan Africa" was divided into two phases:

The first phase would identify a set of core data necessary for monitoring and operating the transport sector, identify reasons why transport data are not properly collected at the national and sub-regional level and make recommendations on the set of data to be collected, the best ways to collect and disseminate the data, and on the policy reforms necessary to improve national database systems. The second phase will focus on the implementation of transport database systems at national, sub-regional and regional levels.⁸

1.10 Thus, the project included three interrelated objectives, envisaged in the SSATP Progress Report:

(a) determination of uses and users of different types of transport statistics;
(b) examination of the existing data collection systems, identification of major gaps and recommendations for simple, feasible improvements; and
(c) developing the guidelines for the establishment of a regional transport database at ECA.

C. WORK PLAN AND INTERVIEWING PROCESS

1.11 Implementation arrangements for Phase 1 of the project were agreed at the Steering Committee Meeting of April 4-5, 1991. Dr. John Heads and Dr. Konrad W. Studnicki-Gizbert were retained as the consultants to carry out the first phase of the project and were asked to prepare a draft paper on "Transport Key Indicators". This was discussed at meetings with World Bank staff May 8-15, 1991, and distributed to other members of the Steering Committee.

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⁷ UNTACDA II Programme, op.cit., pp.93-4. In addition, under the Addis Ababa Plan of Action for Statistical Development in Africa in the 1990s, adopted by the African Ministers responsible for economic planning and development in May 1990, the ECA was to be recognized "as the key regional institution responsible for the development and promotion of statistics in Africa" (p.2), with this covering all statistics and not only the transport area.

1.12 The list of countries to be visited by the consultants was initially selected by World Bank staff, subsequently amended mainly to accommodate visits to subregional organizations and approved by the Steering Committee on April 4-5. The mission overseas to Europe and Africa took place May 28 - August 3, 1991. A full list of those interviewed is given in Appendix 1 of this report. Interviews with producers and users of transport statistics were carried out in all countries listed, except Ethiopia, and visits were made to subregional organizations as indicated. The list of visits was as follows:

<table>
<thead>
<tr>
<th>Date</th>
<th>Country</th>
<th>Visits additional to producers and users of transport statistics</th>
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<tr>
<td>May 28-31</td>
<td>Switzerland</td>
<td>United Nations Conference on Trade and Development (UNCTAD) Economic Commission for Europe (ECE)</td>
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<tr>
<td>June 3-4</td>
<td>Belgium</td>
<td>European Communities Commission (ECC)</td>
</tr>
<tr>
<td>June 3-4</td>
<td>France</td>
<td>Ministère de la Coopération et de Développement</td>
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<tr>
<td>June 5-16</td>
<td>Kenya</td>
<td>ECA, UNCTAD - Mombassa</td>
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<tr>
<td>June 16-23</td>
<td>Madagascar</td>
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<tr>
<td>June 24-30</td>
<td>Zambia</td>
<td>ECA-MULPOC, Lusaka Preferential Trade Area (PTA)</td>
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<tr>
<td>July 1-7</td>
<td>Nigeria</td>
<td>Economic Community of West African States (ECOWAS)</td>
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<tr>
<td>July 8-11</td>
<td>Côte d’Ivoire</td>
<td>UNCTAD - Abidjan, African Development Bank</td>
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<tr>
<td>July 12-20</td>
<td>Burkina Faso</td>
<td>Communauté Economique de l’Afrique de l’Ouest (CEAO)</td>
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<tr>
<td>July 22-31</td>
<td>Uganda</td>
<td></td>
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<tr>
<td>July 22-31</td>
<td>Burundi</td>
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<tr>
<td>August 1-3</td>
<td>Ethiopia</td>
<td>ECA</td>
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The two consultants visited all countries except for France and Burundi (Dr. Studnicki-Gizbert only), and Belgium and Uganda (Dr. Heads only). Dr. Joseph Pihi of the University of Brazzaville, Congo, accompanied the mission to Côte d’Ivoire, Burkina Faso and Burundi.

1.13 A sample of eight countries cannot hope to be fully representative of the 45 countries that comprise Sub-Saharan Africa, but an attempt was made to ensure maximum coverage through the countries selected. Thus, four countries were francophone and four anglophone; four countries were landlocked, one was an island, and the other three had extensive coastline and a port of first rank importance. The initial list of countries had included Ethiopia but, due to the political situation which existed at that time, Kenya was chosen as a late substitution for Ethiopia. The consultants were fortunate to have had the opportunity to meet with ECA in Nairobi early in the mission on June 15, 1991, and again in Addis Ababa at the end of the overseas mission, as indicated above.

1.14 The intention was to provide national consultants to assist the mission in the various countries visited, but for a variety of reasons this was not always possible. The consultants appreciated the expert assistance provided where national consultants were appointed and would like to acknowledge with gratitude the assistance provided by Mr. Marcel Rakotomalala.
in Madagascar; Dr. George Banjo in Nigeria; Mr. Patrick K. Traore in Burkina Faso; and Mr. Godfrey Wandera in Uganda. The offices of the World Bank were also very helpful in the countries visited and this was much appreciated.

D. OTHER TRANSPORT DATABASES FOR SUB-SAHARAN AFRICA

1.15 The present exercise is not, of course, the first attempt to compile transport statistics for Sub-Saharan Africa. The consultants are appreciative of the generosity shown by the staff of the World Bank and of subregional organizations in Africa in making data collection formats available to the consultants. The individual African countries visited during the course of the field work were also very cooperative.

1.16 The two major exercises in starting databases for transport in Sub-Saharan Africa were the ECA publication of March 1989 entitled "Key Development Indicators in Transport and Communications Sector", compiled from the relevant statistical series contained in the ECA Statistics Division’s database, and the "Transportation Database" currently being developed by the Transport Division of the World Bank. These organizations kindly made their work and their insights available to the consultants. The data collection activities of specialized modal organizations, such as the International Civil Aviation Organization (ICAO) and the Union of African Railways (UAR), are also very important to the present project and are addressed later in the report.

1.17 Transport database material produced by the Economic Commission for Europe and the European Communities Commission is also examined. While this material relates to Europe and not to Africa, it was useful in the context of the present study to examine the comprehensiveness and the limitations of a transport database produced for developed economies. The substance of this examination appears later in Chapter 3.

E. FORMAT OF THE REPORT

1.18 Following this introductory chapter which briefly reviews the structure of the report, Chapter 2 examines the conceptual framework of transport statistics, namely the elements of a statistical program, user needs, the disaggregation problem, data sustainability, user liaison, and centralized and decentralized systems of data collection. Chapter 3 examines the concept of key indicators, which are mainly statistics derived from the more basic measures of transport activity, together with their selection and their uses. The establishment of key indicators in an African context is compared with what is presently developed from European transport statistics. A list of key indicators is not given in Chapter 3, as these are developed in later chapters of the report.

1.19 Chapters 4-10 relate to specific transport modes. This modal analysis is more appropriate than a country-by-country presentation of findings, as the eight countries visited during the course of the study were selected for illustrative purposes. The approach in each chapter is to examine user requirements, data supply and key statistical indicators. Because of the importance and complexity of road transport, this is covered in two chapters: Chapter 4 relating to roads and Chapter 5 to vehicles. Chapters 6, 7 and 8 relate, respectively, to urban, railway and air transport. Chapter 9 covers ports, shipping and inland waterways. While it could be argued that these subjects should be covered in separate chapters, the main data collected in the present study has related to ports, with very little information on shipping and inland waterways. There is a precedent for this consolidation in the subsectoral working groups established for UNTACDA II, where there are only five groups for transport, with one group
combining maritime, inland water and multimodal transport. Nevertheless, Chapter 10 includes some examination of multimodal transport, because of the importance of this to so many landlocked countries in Africa, which was stressed most forcibly by all the subregional organizations visited.

1.20 Chapter 11 examines organizational issues relating to the roles of ECA, specialized modal organizations, subregional organizations and member states. Chapter 12 consists of recommendations on the long-term implementation of the program for the improvement in transport statistics and the establishment of a transport database, together with more detailed suggestions on the next stage in the development of this project.

UNTACDA II Programme, *op.cit.*, p. 38.
CHAPTER 2: CONCEPTUAL FRAMEWORK

Chapter 2 describes the principal elements of a statistical program and outlines the needs of different classes of users. The discussion then proceeds to the degree of aggregation of data required to meet the needs of different users, the problems of sustaining the collection of reliable and useful data over time, and relations between the users and suppliers of data. The issue of centralized versus decentralized systems of data collection is discussed, and the chapter concludes with some comments on the costing of programs to improve data. The purpose of this chapter is to provide a general framework for the analysis of the use of transport data, collection methods, problems of subsectoral statistics and subsequent recommendations.

A. ELEMENTS OF A STATISTICAL PROGRAM

2.01 The principal elements of a statistical program are:

(a) Specification of data to be collected;
(b) Organization and execution of data collection;
(c) Processing and storing of data; and
(d) Dissemination of data to users.

2.02 Specification of data includes the following subelements:

(i) establishing user needs, which requires the identification of different user groups and of the level of detail, periodicity and timeliness required by each group;

(ii) establishment of definitions and norms to be used in the data collection; and

(iii) selection and specification of a collection of methods, that is, determination of the methodology of data collection and selection of data sources.

2.03 Organization and execution of data collection requires the establishment and maintaining of an organization capable of executing the data collection and dissemination program. This includes:

(i) an administrative structure with well-defined responsibilities and reporting relations;

(ii) assignment of adequately qualified staff and, when necessary, a staff training program;

(iii) the necessary logistics support and data collection capacity;

(iv) in the case of the "administrative" or "operational" statistics (that is statistics generated as a by-product of administrative or operations control activities), the capacity to receive the data, to check the data for accuracy, consistency and conformity with the established norms of definitions, and to cooperate with data supplying organizations in designing forms, reporting systems and data transmission; and

(v) in the case of special surveys, the capacity to design surveys, to train and supervise the survey personnel, to impose the necessary quality control and process the data.
and, when necessary, to obtain the services of outside specialists responsible for surveying requirements and supervising the tasks to be performed.

2.04 Processing and storing of data constitutes a "link activity" between data collection and data dissemination. It includes both manual and machine systems of data manipulation and storage and, almost always, involves an element of data aggregation. In addition to data processing decisions regarding coding and storage, important decisions regarding the levels of data aggregation need to be taken at this stage.

2.05 Dissemination of data is making information available to the users in the format and at the levels of disaggregation required by them. The related task is advising the users on the limitations of data and problems arising from changes of scope or methods of collection. This element may also include calculation of derived statistics and statistical indicators, and compilation of time series, including deseasonalization routines and adjustments for inflation and changes in exchange rates. The principal methods of statistical dissemination are:

(i) standard publications (monthly, quarterly, annually);
(ii) special tabulations and reports; and
(iii) organized "machine to machine" or "computer to computer" access.

2.06 The above elements are arranged in a sequence starting from the determination of the statistics required, to the stage where they are made available to users. In practice, a statistical system design requires numerous reiterations: the requirements may be adjusted and scaled down after a careful consideration of costs and difficulties involved at subsequent stages. In spite of obvious simplifications the above presented scheme appears useful as a device to organize the analysis of existing systems.

B. USER NEEDS

2.07 Different user groups require a different degree of detail or disaggregation level. For the purpose of a general exposition four users groups are identified: operational management, sector or subsector management, national authorities and international organizations.

2.08 Operational management requires detailed data for the monitoring and control of operations, the preparation of budget submissions and project investment identification. In many cases, such users are also producers of basic data. Because of their direct involvement with operations and/or collection of data, they are able to exercise effective, although often informal, quality control. In many cases data collection and analysis are carried out within a framework of "Management Information Systems" (MIS), which are defined as comprehensively designed systems including data collection, processing and preliminary analysis to meet the well-defined needs of the operational management. In addition to formally designed MIS, many management information systems have developed in an evolutionary manner to meet implicit, but nonetheless real and important, management information needs.

2.09 Sector and subsector management are mainly the responsibilities of ministries and directorates of governments. The primary interest of this group is monitoring sector performance and sector needs in order to make resource allocation and planning decisions, as well as to monitor and control the performance of operational entities. The level of aggregation is higher (fewer details are needed) and greater use is made of key statistical indicators. Intelligent monitoring and performance assessment require the use of comparative data and historical series. This, in turn, implies strict adherence to the common rules and definitions. In order to
satisfy the information needs of this group of users, the statistical system will work with data generated at the operational level and with data obtained through special surveys.

2.10 At the level of national authorities, the principal data needs relate to monitoring the performance and needs of different sectors and subsectors as an aid to decision-making on intersectoral allocations and national policy development. At this level the volume of data needed is smaller and a higher level of aggregation is usually required. This also implies greater selectivity of data. For many uses, data related to one sector may have to be supplemented or combined with data related to other sectors, as well as with data on the performance of the economy as a whole. An important interrelationship between sectoral and macroeconomic statistics should be noted. Some sectoral data serve as an input to macroeconomic statistics (e.g., value added and inputs consumed by the transport sector). This implies that the requirements of national accounts compilers have to be taken into account in designing a transport statistics system.10

2.11 The need for international compilation of transport statistics stems from several factors:

(i) international comparisons are useful as instruments of experience transfer;

(ii) an overall assessment of regional requirements and problems is needed to serve as an input for regional studies and development of regional programs;

(iii) some transport problems, for example transport services to landlocked countries, are inherently international in scope and require performance comparisons of different national systems; and

(iv) internationally comparable data are often required for market research and planning.

2.12 With few exceptions international transport statistics are created by compiling national statistics. (The principal exception to this generalization relates to civil aviation statistics of the International Civil Aviation Organization.) However, if international comparative studies are to be valid, there exists a strict requirement of data comparability, which highlights the need for standardization of norms and definitions.

2.13 This general listing of different uses and users can be represented as a pyramid, with a wide base of detailed operational uses and an increasing level of aggregation at the higher levels. At each successive level of aggregation the operational or administrative data generated at a lower level are generally supplemented by special surveys, by combinations of data coming from different sectors, and by compilations of new statistical indicators calculated on a more aggregated basis. The "pyramid" structure draws attention to a very important fact: quality, accuracy and reliability of major aggregates and performance indicators depends on the quality of disaggregated operational statistics and the methodology applied at the basic collection stage.

C. DISAGGREGATION PROBLEM

2.14 Appropriate solutions to the disaggregation problem are of key importance in designing statistical systems. Statistical compilations always involve aggregation of individual

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10 See S.L. Mozes, The Canadian National Transportation System, a paper presented to Economic Commission for Europe working group in November 1989 (processed). Although the paper deals with the Canadian situation, the discussion of the inter-relationship between a National Transportation Statistics System and the framework adopted by the System of National Accounts are generally valid.
observations. Aggregation problems have been explored in the literature on mathematical economics; in the context of the present report, only general, commonsense observations are offered.

2.15 As a general rule, meaningful aggregation should group together units which are homogeneous with respect to the characteristics to be measured. In other words, the information lost on individual units through grouping of observations should not affect the results of the measurement of the relevant characteristics of the aggregate. This ideal can be only approximated. The key problem in practice is to determine the relevant characteristics of the data which should not be lost through the aggregation process. This depends on the uses of the data. From the pragmatic point of view, one cannot consider meaningful aggregations without considering the use of data. This can be illustrated by two examples, the first relating to road monitoring, and the second to the operations of a bus company.

2.16 The OECD manual Road Monitoring for Maintenance Management makes the following point:

Data aggregation
A global index of conditions that combines the values of various condition parameters, is often desired to represent the overall condition of a road or the network. While such a summary index can be useful for reporting at a network level, it has been found inadequate for scheduling maintenance work because it is inadequate to distinguish between functional and structural, or corrective and preventative, needs....

In the framework of this manual, three distinct levels of aggregation can be selected:

-- That required by decision-makers who have a use for general indicators by which to monitor pavement quality, mainly in order to assess the service provided or, in some cases, the value of the existing infrastructure;

-- That required by a centralized agency that needs to assess long-term maintenance requirements, to draw up general work schedules and allocate funds where they are needed, and to rank work proposals by order of priority or urgency; and

-- That required by field engineers who have to produce detailed work plans. 11

2.17 In the case of performance indicators, the same rule applies. At different levels, different performance indicators need to be employed. Let us consider a bus company as an example:

- At the level of operational management, daily fuel consumption and daily kilometrage by individual bus, driver and route are compiled and deviations from established norms are calculated. These indicators are used to identify exceptions which require immediate remedial actions (vehicle inspection, correction of driver's habits etc.).

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At the company management level, traffic, revenues and operating costs by routes are compiled. Service availability, utilization and required maintenance levels by type of buses and type of operation are analyzed. This implies aggregation of individual data into a set of physical and financial indicators required for planning and programming decisions.

At the national level, still more aggregated performance indicators are required to monitor the operation, such as: traffic data aggregated by groups of service (urban, inter-urban or rural), total fleet utilization (service km., total km., km. per vehicle), equipment availability, and total sector costs and revenues, together with basic balance sheet figures.

2.18 The system just described corresponds to the one in operation in Burundi, where the basic, operating level indicators are daily compiled and employed in daily control and management. Because of the direct and continuous use of the basic indicators, recording of data is accurate and precise; this, in turn, assures the accuracy of more aggregate indicators.

2.19 Among better operated entities (e.g., Burundi Bus Company, Air Madagascar, etc.), there is a keen interest in obtaining international comparative data, especially for other African countries. In this respect, better African operators are no different from their counterparts in OECD countries, where comparative performance statistics are compiled and extensively used. For example, airlines compile and exchange hourly cost data by aircraft type which are related to other standard physical measurements, such as average daily utilization, stage length, fuel consumption per hour etc. The basic condition which has to be met if such international comparative data are exchanged is uniformity of definitions and reliability of data collected and compiled.

2.20 In sum: the necessary level of aggregation has to be specified according to the use of data and homogeneity of groups in terms of characteristics to be measured. Although the aggregation process may eliminate some random errors, the validity of aggregated data depends on the accuracy of the basic observations and consistency of the data collection methodologies.

D. SUSTAINABILITY OF STATISTICAL PROGRAMS

2.21 The efficiency of a statistical program depends on:

(i) proper design of programs which match the need for information, methodological requirements and resources available;

(ii) existence of an adequate organization with sufficient professional and material resources;

(iii) discipline in data collection and strong quality control; and

(iv) continuity of operations which enables accumulation of experience or "learning by doing". As a general rule, costs of statistical programs decrease and quality of data improves over time as the result of "learning by doing".

2.22 It appears clear that the efficiency of statistical systems requires continuity and planned evolution. Yet, at times of resource stringency, statistical operations and information systems are often the first to suffer. In many cases a vicious circle tends to develop: inadequacy of
resources leads to a decline in the quality and availability of data resulting in a decrease in user confidence in the system; lack of user support leads to a further decrease of resources available for data collection and dissemination; the decrease of resources leads to further deterioration of the system, etc.

2.23 Ideally one would hope for the establishment of a "virtuous cycle": users acquire confidence in the accuracy of data, they use statistical information in an increasingly meaningful way in the decision making and monitoring processes, the resources used by information systems are protected, and the scope of data collection and analysis increases; this, in turn, leads to further quality improvements, increases in the system's usefulness, etc.

2.24 Unfortunately it takes time to restore user confidence and to move from a "vicious" to a "virtuous" cycle. There are no simple solutions to this problem; however, a well designed system which meets basic user needs is likely to survive better than an overambitious system, which cannot be sustained in the long run given available resources. Sticking to the basics, avoiding complexity (often, mistakenly confused with sophistication) and planning for gradual evolution rather than spectacular expansions, are likely to be helpful. International assistance in improving the quality and making more efficient system design should be most useful, provided that it does not create an over-dependence on expatriate personnel. Most important, however, are patience, discipline and a good perception of user requirements.

E. USER LIAISON

2.25 Statistics have no inherent value in themselves; their value depends on the applications. This simple statement of the obvious has important implications. The users and the potential users should be drawn into the design of the system and establishment of priorities. The statisticians should be involved in advising users on data uses, pointing out data limitations and suggesting alternative methods of obtaining information. In short, close, continuing liaison between the providers and users of data is essential for the sustainability and development of a statistical system.

2.26 In this context the Symposium of Producers and Users of Statistics organized in November 1990 by the Kenya Central Bureau of Statistics should be noted.

The objective of the Symposium was to provide a forum of discussion or dialogue between the producers and users of statistics regarding the following issues: (a) what data are collected? (b) what statistics are produced? (c) what statistics are required? (d) who should be responsible for collection, processing and dissemination of each type of data or statistics?

Some findings and recommendations, especially those regarding user-producers relations are of a general nature and are worth reproducing here as an example of the potential value of the initiatives of this type.

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The Government should consider setting up a Statistical Commission as an advisory body to the Government and the Director of Statistics.  

(General recommendation (a))

The Bureau should be preparing a four- or five-year work plan:  

(General recommendation (g))

Users should participate in meeting the cost of some of the surveys conducted by the Bureau. The Bureau should investigate the possibility of being hired as a consultant.  

(General recommendation (h))

The Bureau should establish the Post of Public Relations Officer.  

(General recommendation (j))

2.27 The Symposium also produced a number of important observations. For example, it noted that "most users do not know what statistics exist" (Issue (ii)) and that "frequent losses of staff affect the performance of the Bureau" (Issue (ki)). Survey non-response is partly because "questionnaires sent are very complex and beyond the comprehension of the respondents" (Issue (gl)); a review of a recently approved questionnaire for a survey of transport operators supports this contention. Undoubtedly, the Symposium was useful, but it is disturbing that it was the first symposium of that type in Kenya and that it required international assistance.

2.28 It appears clear that the creation of a permanent advisory mechanism to assist the development of the national statistical system as a whole, as well as more specialized, sectoral advisory groups, should make an important contribution to the improvement of the usefulness and sustainability of statistical programs. Such advisory groups or organisms exist, formally or informally, in OECD countries. Given the present precarious position of many African statistical programs and not always adequate user-producer collaboration, a strong case can be made for institutionalizing user-producer relations.

F.  CENTRALIZED AND DECENTRALIZED SYSTEMS

2.29 In the field of transport statistics, much of the information is generated as "administrative statistics", that is data collected to serve particular managerial needs of operating entities, such as railways, ports and road departments, or as a by-product of administrative activities, for example, vehicle registrations. As already observed, data derived directly from clearly recognized user needs have some inherent advantages; transport enterprises produce such data consistently for monitoring and control of their own operations. If monitoring and control of operations are taken seriously - that is, the users actually employ the data in discharging their managerial responsibilities - there is a virtually automatic system of quality control. On the other hand, a decentralized system has some inherent disadvantages, namely: (a) design of special surveys requires specialized knowledge, which may not be available within an operating entity, and (b) coordination and setting of overall priorities can become more difficult.

2.30 The coordination issue is also related to the adequacy and comprehensiveness of statistical information required for planning and decision-making at a senior level. As previously noted, statistics required at a senior national level are often the product of successive aggregation of more detailed data collected at the level of operational management, that is, "building the system from the bottom up". However, occasions may arise where the key data necessary for the general overview of the transport system is not collected due to conflicting priorities at the operational level or organizational arrangements which divide the responsibility for the collection of such data. (An example of this situation is vehicle registration statistics in many African countries.) It appears clear, therefore, that a coordination system is necessary to assure the proper organization of transport statistics.
2.31 Elements which require coordination are:

(a) the users must be assured that their basic requirements are met; and

(b) the government, especially the ministry responsible for transport policy, must be assured that all the basic data required for monitoring the condition and performance of the transport system are collected in a satisfactory manner from the point of view of methodology, quality assurance, continuity and cost effectiveness.

2.32 Under conditions generally prevailing in Africa, it appears to be of the utmost importance that proper institutional arrangements be established for coordination of the transport statistics system and for the maintenance of a useful dialogue between users and producers. Appropriate institutional arrangements are also important for a sustained program for upgrading of transport statistics, as well as for transfer of data to an appropriate international agency charged with the responsibility of providing technical assistance and operating the transport data bank.

2.33 From an institutional standpoint, the following issues are important:

(a) the relationship between data collection and analysis activities in transport agencies (ministries, state corporations, etc.) and the central statistical office;

(b) the relationship within a transport agency between its operating directorates in the production and analysis of transport statistics; and

(c) the relationship between the non-governmental users and/or industry groups and the government agency charged with the duty of collection and dissemination of transport data.

2.34 At the conceptual level, these issues relate to strikings of a proper balance between the advantages of centralized versus decentralized systems and of the potential biases introduced by different systems of organization. Without denying the importance of such issues, one must be skeptical of generalized, a priori solutions. Chapter 11 of this report provides a description of the institutional approach to gathering transport data in the eight countries visited, each one having its own institutional traditions and specific distribution of organizational and professional resources. At the same time, experience clearly indicates that one of the major problems in Africa is the sustainability of existing systems, that is the proper maintenance and improvement of existing systems and the building of confidence between the suppliers and users of transport statistics, which can only be achieved if reliable data are produced in a timely and continuous manner. Under such conditions, the approach adopted by the consultants was to investigate the systems already in place and to suggest economical means for improving collection systems and filling major gaps, while maintaining the integrity of the existing data systems.

G. COSTING OF IMPROVEMENTS

2.35 In view of general resource stringency, data improvement programs have to be submitted to the same cost-effectiveness evaluation discipline as any other government initiatives. Detailed costing of suggested improvements is outside the scope of the present study, but certain general observations are offered which may be useful in conducting country specific analyses and establishing priorities. Resource constraints have also been recognized in framing recommendations regarding desirable improvements, emphasizing the improvement of basic data, key indicators and data systems to establish firm foundations for future development.
2.36 The major benefits of a data system relate to the improvement of the decision-making process. The best data are useful only to the extent they are used; this implies that the potential users must be informed concerning what data are available, the limitations of the data and the prospective practical uses of the data. Such a situation does not necessarily exist. The obvious way to achieve improved understanding is through the introduction of suitable modules or sessions into high-level management and planning seminars.

2.37 The costing of a data collection system must make a distinction between data collection which takes place as a by-product of administrative and operation control activities and special data collection efforts. Some examples of administrative data are described below:

(a) A well designed system of vehicle registration and permit renewals generates a basic set of directly usable statistical material at no additional cost, except the costs of administrative change. Clearly, computerization is required, but these costs should not be allocated to transport data collection. A well-organized, computerized and up-to-date vehicle registration file is the basic instrument for control of vehicle taxes and vehicle inspections, as well as a tool for police activities aimed at recovery of stolen vehicles.

(b) Monitoring of road conditions and road maintenance should be an ongoing activity of a Roads Directorate as an integral part of its line management function. There exist numerous mechanical, semi-computerized and fully automatic systems which assist in gathering and storing this information. The selection of a system requires a careful analysis of the costs, benefits and sustainability of the program. However, even a simple, but well-designed and disciplined system can provide basic information, and generate useful road condition data. Should such a system be costed as a data collection system or as a basic management tool? The answer appears clear: statistical benefits are generated as a by-product of managerial improvements.

(c) Most airline, port and railway data are generated as a by-product of basic managerial control or audit activities.

2.38 In short, many data collection activities should be costed as a by-product of managerial and audit functions. Their usefulness as statistical raw material and the costs of subsequent data processing usually depend on a proper and economical design, where good design both decreases costs and enhances the value of data. This observation is basic for the understanding and evaluation of specific recommendations in the present report.

2.39 In respect of special data collection activities, the costs have to be determined on a case by case basis. The following considerations should be taken into account:

(a) A well-designed, simple survey, not overloaded with difficult questions, is always the most economical. The consultants observed significant differences in survey designs, hence the general recommendation for comparative analysis of survey approaches and the adoption of the "best practices" already existing in Africa.

(b) Costs of collecting data tend to decrease and the quality of data tends to improve with experience on the "learning curve". The
general implication of this observation is that the design of a statistical system should consider carefully the sustainability of the system and the commitment to its continuity.
CHAPTER 3: KEY STATISTICAL INDICATORS

Chapter 3 describes the transport data and key statistical indicators which should form the transport database for Sub-Saharan Africa. The discussion in this chapter is limited to the general approach, with specific data and indicators developed in the later chapters for each transport mode. The approach suggested for Sub-Saharan Africa is then compared with the coverage of transport statistics currently collected for Europe.

A. TRANSPORT DATA REQUIREMENTS

3.01 The conceptual framework for the collection, processing and dissemination of transport statistics was addressed in Chapter 2, and the implications of this framework are explored throughout the report. Chapter 3 is concerned with the type of transport data to be collected and the criteria for compilation of key statistical indicators for the transport sectors. Specific data and indicators for the various transport modes are addressed in the subsequent modal chapters. However, there is little useful purpose served in collecting data and calculating indicators if national transport statistics are not of reasonable quality. Upgrading the quality of transport statistics within the member countries is an important objective in its own right, in addition to being an essential component of the database project. Comments and suggestions on the need for improved data are offered in the modal chapters. The issue is then addressed at length in Chapter 11, which also examines organizational issues and the roles of ECA and subregional organizations.

3.02 Transport data must, of course, be collected on a comparative basis over time to trace the evolution of the transport system. The data requirements for each transport mode can be divided into four categories: physical inputs, physical outputs, financial performance, and transport safety. The discussion in this chapter is confined to the general approach, which is straightforward in comparison with the practical problems of obtaining the necessary data.

3.03 The physical inputs needed for the operation of a transport mode are of three types. Firstly, there is infrastructure, such as length of roads, length of railway track, and number and length of port berths. Secondly, there is equipment, such as vehicles on roads, locomotives and wagons on railways, cranes and forklift trucks in ports. Thirdly, there is the labor input, measured globally in terms of employment.

3.04 The physical outputs of a transport mode cover both freight and passenger traffic for the majority of modes. The basic measures for freight traffic are tons of traffic moved and ton-kilometres of work performed, although this second measure is irrelevant for ports, as only the tonnage of traffic handled is meaningful. Passenger traffic is normally measured in terms of passengers carried and passenger-kilometres of work performed. In most modes, the outputs of freight and passenger traffic are to some extent produced jointly, for example the same rail and road infrastructures are used to transport both freight and passengers. As a result of this element of joint production, it is sometimes necessary to produce a combined measure of freight and passenger output for a mode. This is always a difficult task and the problems are discussed further in the modal chapters.

3.05 Data on financial performance of the various transport modes are less comprehensive than the operating statistics relating to physical inputs and outputs. Nevertheless, data are needed on operating income and operating expenses, hopefully distinguishing these by the major income and expense heads. Net operating income is needed, both before and after depreciation. The overall surplus (deficit) after interest payments may then be calculated. Financial ratios are
discussed in the modal chapters under data, although strictly speaking these could be regarded more as indicators. The most important measures are the working ratio, i.e., net operating income before depreciation expressed as a percentage of operating income, and the operating ratio, i.e., net operating income after depreciation expressed on the same basis. The surplus (deficit) figure can also be expressed as a percentage of operating income, but this is not conceptually a well-defined measure. A positive surplus does not mean that a transport mode is necessarily covering its costs, as the surplus should include a return on equity. Equity to debt ratios vary considerably between modes and between different countries and, as the consultants do not consider that it is feasible to calculate the required cost of equity by mode and country, calculations which utilize the measure of surplus are of dubious value.

3.08 Transport safety requires the recording of major accidents, deaths and serious injuries by mode. The problems in standardizing definitions between modes and between countries can be formidable.

3.07 Transport data are addressed in the subsequent modal chapters for roads and vehicles; urban transport; railways; air transport; and ports, shipping and inland waterways. Chapter 10 addresses transport statistics in the context of landlocked countries. Because of the extensive documentation available for railways, air transport and ports, it has been possible to address the data and key indicators at considerable length, with several illustrations from the countries visited during the course of the study. This was less feasible for the other modes and they are thus addressed in less detail.

3.08 The report does not address transport statistics for each country on an overall basis, for example establishing modal shares of transport activities. When transport statistics are well-developed, modal shares of physical output can be made on the basis of tons carried and ton-kilometres for freight traffic and on the basis of passengers carried and passenger-kilometres for passenger traffic. Combined freight and passenger figures can be produced from financial data to show modal shares of transport revenues and modal shares of value added. It is possible to produce some of these breakdowns for some of the national states in Sub-Saharan Africa and the Kenya Central Bureau of Statistics has already published the figures in respect of revenues. However, it did not appear that any of the member states visited in the course of the present study had attempted a modal breakdown based on output statistics. As discussed in Chapter 5, this is mainly the result of large data gaps in road transport, which is often the most important transport mode in Sub-Saharan Africa but typically the least well-documented.

3.09 Estimates of transport’s share of gross domestic product (GDP) could probably be made for a number of African states. The Communauté Économique de l’Afrique de l’Ouest (CEAO) has calculated this figure for the countries of francophone West Africa and estimates were generally within the range of 7% to 10%, with the exception of Mali and Niger which were only at 4%. It was concluded that these values were of the same order as those observed in the countries of Western Europe, namely from 4% to 10%.

3.10 A Transport Statistics Yearbook could include a table showing transport’s share of GDP for each member state, although it may not be worthwhile to update this every year. Transport’s share of GDP changes very gradually and, from experience outside Africa, the consultants conclude that many of the changes recorded in this parameter reflect statistical

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15 B.P. Baystruy, *Enquête sur le secteur des transports dans la région de la CEAO*, CEAO Direction du Développement Industriel, janvier 1991, p. 17. Figures given to the consultants by the Uganda Statistics Department also indicated a low figure of 4%.
reclassification far more than genuine change. Nevertheless, it may be useful to include a
snapshot of transport’s share of GDP by state, together with other basic statistics of population,
area, GDP and GDP per capita, figures already published by the World Bank.\footnote{16}

B. TRANSPORT INDICATOR REQUIREMENTS

3.11 Raw transport data do not allow for measuring of the efficiency and productivity of the
transport modes, primarily because they do not relate outputs to inputs. Transport indicators
attempt to overcome this problem, and they should be calculated on a consistent basis over time
in order to monitor the progress of a transport system. The main transport indicators are derived
from the types of raw data in the previous section of this chapter. For example, when railway
output of ton-kilometres and passenger-kilometres are suitably combined,\footnote{17} a railway labor
productivity index can be obtained by dividing the number of output units by the number of
employees. However, some indicators cannot be calculated directly from raw data. For
example, ports must provide separate data on the average time spent by a ship in port, and
railways must provide separate information on locomotive and wagon availability.

3.12 The statistical indicators for transport were discussed in Section B of Chapter 2 with
reference to the different needs of different users. Obviously, the managers of individual
transport enterprises need detailed performance indicators, which would not be relevant to the
more global indicators used by national transport planners. Nevertheless, transport data and
hence transport indicators are compiled "from the bottom up", and any errors in the basic
indicators used by the managers of transport enterprises are likely to percolate upwards into the
indicators used by transport planners at the macro level.

3.13 The consultants spent considerable time meeting with users to determine their needs.
These meetings covered carriers, transport and central planning departments of government, and
transport users in the private sector. Transport carriers relied heavily on comparisons of actual
performance with forecasts or targets; although the consultants appreciate the value of this
approach in monitoring current operations, this could not be utilized in a transport database given
the differences in methodologies between various transport enterprises. The discussions
produced a number of suggestions, including an original approach for monitoring lapsed time in
transit traffic, but generally the users confirmed the types of indicators already developed in the
literature.

3.14 The most useful approach in developing key statistical indicators for transport flows from
the goals and targets set forth by UNTACDA II.\footnote{18} The program document gives the goals and
targets defined by the project’s subsectoral working groups; many of these goals and targets
have been quantified, but, others "really need to be improved upon and quantified" (p. 79). The
consultants draw heavily on this document in the modal chapters of the report and attempt to
define statistical indicators for transport that will allow measurement of progress towards
achievement of the UNTACDA goals and targets for the decade. The main elements to be
measured by the indicators are:


\footnote{17} The methodology for combining these output units is discussed in Chapter 7.

\footnote{18} United Economic Commission for Africa, \textit{Programme of the Second United Nations Transport and
- rehabilitation of infrastructure;
- increased productivity and availability of equipment;
- increased productivity of labour;
- reduced delays in transit, especially at transport interfaces and in transborder operations;
- improved transport safety and, in the specific case of ports, reduced cargo losses due to damage and pilfering;
- reduced costs for transport services, which would reflect the improvements in efficiency and productivity.

3.15 In addition to the key indicators necessary to monitor the UNTACDA II programme, the consultants also suggest two additional sets of indicators in the modal chapters. The objective of the first set of additional indicators is to show the importance of each mode in each country. For example, road vehicle numbers in each country can be expressed as ratios to road kilometrage and population. Indicators of this type are useful, although they do not measure productivity or efficiency themselves, in that they allow a more ready focus in each country on the relative importance of different modes. The second additional set of indicators relates to financial ratios, already discussed in Section A above. There are problems in using these ratios, but it is necessary that they be included in the list of key statistical indicators to examine the financial viability of the transport modes.

3.16 With the exception of the requirement to measure average cost per unit of output, the UNTACDA II goals and targets avoid two serious problems, namely the problem of inflation, requiring the conversion of money figures to real terms reflecting prices in a base year, and the problem of exchange rates, where official exchange rates may not reflect purchasing power parities or the reality of unofficial markets in foreign exchange.

3.17 The key statistical indicators to be developed in the subsequent chapters of this report will be used to monitor progress towards UNTACDA II goals and targets, requiring year-to-year comparisons within individual states. Changes in transport patterns will not pose much problems in measuring productivity if they are gradual over time, but transport efficiency does fluctuate with macroeconomic conditions in an economy. Key statistical indicators show declining performance in a recession because transport operators cannot immediately adjust inputs to reduced demand; correspondingly, the indicators show improvement as the economy recovers. This is not a major problem if a realistic base period averaged over several years is used in the indicators, and macroeconomic conditions are borne in mind when interpreting current results for each country.

3.18 The more formidable problem is that the production of key statistical indicators will inevitably lead to comparisons between different countries in Sub-Saharan Africa. There can be considerable technical difficulties in ensuring that comparisons are made on the same statistical basis. For example, in comparing cargo throughput per employee in Mombasa and Abidjan, it is necessary to add the employment of outside contractors of dock labor to the direct employment of the port of Abidjan to secure compatibility with Mombasa, where all functions are carried out by port employees. Similarly in the railway mode, it is unrealistic to compare the productivity of the Uganda Railways Corporation with other countries, when so much of the Ugandan system is not operating as a result of civil disturbances in the north.

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For example, if average length of haul increases in a transport mode, this would tend to increase labor productivity measured as output units per employee, as the longer length of haul would increase line-haul costs but not terminal costs. This type of change is normally gradual.
3.19 There is also the major problem of different operating conditions between different countries. For example, if average length of haul in a transport mode is substantially longer in one country than in another, the conventional measure of productivity based on ton-kilometres per employee would tend to be higher for the country with the longer length of haul. Similarly, productivity measures influenced by the type of commodity carried; for example, it is easier to achieve impressive productivity measures in a transport system concentrating on the haulage of mining products than in a system mainly carrying bananas. These problems do not arise significantly in year-to-year comparisons within the same country, but they are a major problem in comparisons between countries.

C. EUROPEAN TRANSPORT STATISTICS

3.20 As background to the transport database for Sub-Saharan Africa, the consultants were asked to assess European experience in this area. Consequently, visits were made to the Economic Commission for Europe (ECE) in Geneva and to the European Communities Commission (ECC) in Brussels. The ECE has an annual publication of European transport statistics. This publication contains general statistics, including modal shares; sections on railways, roads and vehicles, inland waterways and international rivers; a table on ports, which shows only the total tonnages loaded and unloaded for all ports in each country; data on container transport and international transport; and tables on oil pipelines, which are not relevant to the present study. There are three annexes, consisting of definitions, sources of information and publications used. These are useful but, from the consultants' detailed knowledge of Canada, not entirely up-to-date.

3.21 The EEC also publishes annual statistics on transport and communications. In addition to general statistics, railways, roads and inland waterways, this publication gives data on merchant shipping and aviation. ECC also prepares quarterly reports of more recent information and copies of these publications were shown to the consultants.

3.22 The information proposed in the present study for the transport database for Sub-Saharan Africa is rather more ambitious than that produced in the ECA/ECC documents. Firstly, the coverage by mode proposed for Sub-Saharan Africa is more extensive, in that it includes urban transport and considerable information on port operations. Secondly, it is proposed to include data on financial performance, while the European material is confined to physical inputs and outputs and safety. However, in some areas less detail is proposed for Sub-Saharan Africa than is shown by ECE, for example in rail transport, where there is always a temptation to show too much because of the overabundance of available figures. Thirdly, the ECE/ECC data do not include any key statistical indicators for transport of the type developed in this report for Sub-Saharan Africa.

United Nations Economic Commission for Europe, Annual Bulletin of Transport Statistics for Europe, Geneva, 1991. This bulletin is published in the three official languages of ECE - English, French and Russian. Apart from the intrinsic value of the statistics contained in this publication, the simultaneous use of English and French languages could make this a useful translation source for use in production of the ECA Transport Yearbook. (Canadian statistics are also published on a bilingual English/French basis and would be an additional translation source.) This ECE publication does not give data on transport accidents, but there is a separate ECE publication Statistics of Road Traffic Accidents in Europe and ECE refers the reader to International Union of Railways, International Railway Statistics, Paris, for railway accidents. The present study does not review European accident data.

3.23 The EEC has a legal right to demand data from its member states. Three directives were issued over the period 1979 to 1982 to ensure uniform methodologies among the member states in the collection of statistics on roads, inland waterways and railways. However, methodological changes can take a long time to negotiate, within the range of three to five years. Standard methodologies are still under development for deep-sea shipping and aviation; the approach to transborder traffic will presumably have to be re-addressed when the ECC borders between member states are eliminated for transport purposes in 1993.

3.24 The ECE can request statistics but has no powers of legal enforcement. In this respect, its position would seem to be similar to that of ECA in Sub-Saharan Africa. In its annual bulletin ECA states that "the purpose of collecting these statistics is to find opportunities for improving the quality and efficiency of transport operations" (p. 242). However, the ECE mandate is to collect data, not to analyze the figures. There is no analysis in the Annual Bulletin, nor is there any production of what ECE referred to verbally during the consultants' visit as "semi-indicators", giving as an example average distance travelled per locomotive.

3.25 The only methodology the ECE has specified for member states related to road traffic censuses. Otherwise, ECE receives national data from its member states, edits for apparent errors and attempts to encourage standardization of definitions. The ECE Annual Bulletin states:

National transport statistics are to a lesser or greater extent similar throughout the ECE region. However, statistical methodology varies, sometimes widely, according to national circumstances; it is, therefore, very important to take into account any differences of coverage and definition which result (p. 242).

This task is basically left to the reader, although aided by the content of the three ECE annexes. In addition, there are a number of missing figures as ECE has not managed to obtain complete statistics from all its member states.

3.26 ECC does have a mandate to carry out analysis and this is apparent particularly in the quarterly reports. Nevertheless, like ECE, ECC does not produce any key statistical indicators for transport. It is the impression of the consultants that this decision may have been made to avoid cantankerous arguments between member states; this is only an impression, but it must be recorded because of similar problems that may face ECA in the future.

3.27 Resource utilization on the transport database at ECE is modest. The ongoing work uses only one transport statistician and this includes data entry to a mini-computer. ECE pointed out that this low resource utilization applied only to an ongoing system and would not cover development work. In Sub-Saharan Africa, ECA has to develop a database with a more comprehensive coverage, and there will be substantial training and improvement of the quality of transport data in member states. The resource utilization of ECE is therefore only marginally relevant to the transport database project for Sub-Saharan Africa.

D. RECOMMENDATIONS

3.28 The recommendations in this chapter are inevitably general, as they are developed in more detail in subsequent chapters:

1. Transport data are needed for management, monitoring and planning purposes in the transport sector, and it is recommended that these be collected for each transport mode in respect of physical inputs, physical outputs, financial performance and transport safety.
2. In order to measure the efficiency and productivity of the transport modes, transport indicators are required, and it is recommended that these be calculated in respect of infrastructure, equipment, labour, delays in transit, safety, costs and financial performance.

3. In order to monitor the evolution of transport systems, it is recommended that transport data and indicators be compiled on a consistent basis over time, stressing again the need to secure sustainability in the production of such data.

4. In order to collect useful data and calculate meaningful indicators, national transport statistics of member countries must be of reasonable quality. It is recommended that an upgrading in the quality of transport statistics should be an important part of the database exercise and this is pursued further in Chapter 11.

5. For reasons explained mainly in paragraphs 3.16-3.19, it is recommended that considerable care be taken in the interpretation of transport indicators, particularly in inter-country comparisons.
CHAPTER 4: ROADS

Chapter 4 deals with road infrastructure data, while vehicles, fuel and road transport operations are examined in Chapter 5. Chapter 4 starts with user requirements for road infrastructure data and specifies the characteristics of a model system for analysis of the road network. Data availability and needs are examined under the sub-headings of road network, traffic, road maintenance and construction capacity, and costs. Key indicators are then discussed and overall problems of implementing data collection are addressed in the conclusion.

A. USER REQUIREMENTS

4.01 The following goals and targets from the UNTACDA II document are relevant to this chapter:22

(a) Construction of 15,000 km of classified main roads;
(b) Rehabilitation of 200,000 km of rural roads;
(c) Rehabilitation of: (i) 85 per cent of paved roads, (ii) 40 per cent of unpaved roads, (iii) 25 per cent of rural roads;
(d) Implementation of efficient maintenance systems covering at least the rehabilitated network, with emphasis on promoting small- and medium-scale indigenous road maintenance enterprises;
(g) Development of local manufacturing industries to be responsible for at least 50 per cent of the rehabilitated road infrastructure;
(h) Development in the majority of countries of efficient axle-load control.

A.1 Context

4.02 During the last three decades considerable effort has been made, assisted by international institutions and bilateral funding, to develop extensive road infrastructure in Africa. Today, in most African countries, road transport has become the principal land transport mode. As is well known, large road investments have been followed by a period of infrastructure deterioration due to the insufficiency of resources available for road maintenance and, in some cases, also due to inadequacies of road maintenance organizations. This turn of events has resulted in large rehabilitation programs, which often include an institutional strengthening component and the introduction of sophisticated road development and maintenance systems (HDM), as well as management information systems (MIS).

4.03 It is generally recognized that effective road system management and planning require an extensive and consistent supply of information. Unfortunately, in many cases the availability of data has neither been consistent nor adequate. A large part of the resources employed in major road studies and road development and rehabilitation plans has been spent on data collection and special surveys. In many cases, the information obtained was not subsequently updated and maintained. As quality of data tends to improve and costs of data collection decrease with experience, the lack of disciplined follow-up on road studies should be considered as disquieting. Furthermore, lack of continuity of effort makes monitoring of the evolution of a road system impossible.

4.04 In addition to the needs of road administrations, there is a growing interest in monitoring the condition and utilization of roads by entities outside the government ministries and authorities directly responsible for planning and management of roads. Specifically:

(a) ministries responsible for national budgets require not only justification for particular projects and programs, but also the extent of current and future financial commitments on roads;

(b) the landlocked countries are vitally interested in the condition and road use (user taxes, weight and axle-load limitations, etc.) policies of transit countries; also, as regional and subregional road networks become more integrated, knowledge of road conditions and traffic of other countries acquires a growing importance.

A.2 Data Uses

4.05 The principal users of road transport data are road departments, economic planning and finance ministries, transport authorities in other countries, regional and subregional organizations, and international agencies.

4.06 Road departments (RDs), existing as independent departments or located within ministries of public works or transport, use road transport data to monitor road conditions, the effectiveness and costs of maintenance operation, and road use. The information required for road planning and road management is at a highly disaggregated level. Standard data used for system monitoring and planning have to be supplemented by special studies for planning of a major project or to investigate special situations. RDs are both the principal producers and users of data; however, production and analysis of information may be assigned to special units, which become de facto departmental statistical or information offices.

4.07 Economic Planning and Finance Ministries use road data to monitor current and expected future commitments and review investment projects to assess budget requests and foreign currency requirements. For example, the Uganda Ministry of Planning and Economic Development reproduces some basic road use data in the "Background to the Budget" document as indicators of demand for roads; similar practices exist in other countries. The data required as this level are significantly more aggregated than data used by RDs. The selection of key indicators most appropriate at this level will be discussed later.

4.08 Transport authorities in landlocked countries, relying on road transit to ports located outside their boundaries, need information relating to the condition of the relevant routes, as well as overall road and traffic management policies.

4.09 Regional and subregional organizations need road information to facilitate traffic movements within their areas of operation.

4.10 International lending agencies and donor countries need road information to monitor and plan road development and rehabilitation programs. For example, the World Bank produces estimates of road length and percentages of the network in "good", "fair" and "poor" condition by countries. In Europe, the ECE compiles road lengths and road expenditures by type of road and the results of traffic counts on major international highways.

A.3 "Model" System

4.11 A "model" statistical system which would meet the basic requirements of the monitoring and analysis of changes of the road network would have the following characteristics:
(a) Information on the current road condition would be available through a regularly updated road inventory. For the purpose of general monitoring, data "quality level IV" would be acceptable, with more precise measurements being undertaken as required.

(b) Road inventory information would be properly coded by road segment (or "link") and stored in an easily accessible manner. The data storage system should permit historical analysis of changing road conditions by segment.

(c) Maintenance tasks performed would be recorded in a manner consistent with the definition of road segments.

(d) Traffic data would be systematically compiled, in order to permit the establishment of road usage by segment. The historical data would be kept in an easily accessible system.

(e) A consistent system of data aggregation would be established to permit production of key indicators for senior management and government.

(f) Maintenance capacity and utilization data would be recorded in a Maintenance Management Information System.

(g) Contractors' capacity would be periodically surveyed and recorded.

(h) Maintenance, reconstruction and construction costs would be recorded; for the purposes of analysis and overtime comparisons, a suitable price index system would be maintained.

4.12 This system would be supplemented, as required, by more detailed Management Information Systems (MIS) geared to specific needs of line management. All the information systems would be coordinated to assure data compatibility and to avoid duplications in data collection.

4.13 The present study has found that important progress is being made in several countries towards development of an information system approaching the above specified "model system". In many cases, specialized, partial MIS exist and are utilized for planning and control purposes. Of course, serious gaps exist and often many elements of a basic system are developed without a clear vision of the final system. Nonetheless, the development of a comprehensive road information system is feasible in a large proportion of African countries and these developments merit assistance and encouragement.

B. **STATISTICAL DATA**

B.1 **Road Network**

4.14 The primary source of data on the extent and condition of the road network is the road inventory, while the basic source of data on road use is provided by traffic counts.

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4.15 The road inventory is an important element of the Road Monitoring System and provides information for the following levels of management:

(a) Maintenance management: assignment of road maintenance resources, control of the results achieved, identification of special problem areas requiring major remedial action;

(b) Road system management (RD): establishing maintenance and rehabilitation programs, preparation of budget estimates, evaluation of priorities, preparation of road maintenance and development plans;

(c) At an aggregate level, the results of road inventories are an important input into an overall monitoring process.

4.16 The basic observation unit or the "building block" for road statistics is a road sector, which should be well defined and properly coded for data storage. From a statistical point of view, it is important that road sectors be reasonably homogeneous in terms of construction standards, major terrain characteristics and traffic carried. From a managerial point of view, road sectors used in the inventory are defined in a manner consistent with territorial divisions of a road authority, i.e. sections or subsections.

4.17 Inventories can be obtained either through periodic reports of local maintenance organizations or through a special road inventory unit. The latter method has the advantage that the crews can be better and more consistently trained and, if a road conditions assessment also serves as an audit instrument of effectiveness of the work performed, potential conflicts of interest between operations and control are avoided. In the countries visited, the use of the former method was observed in only one case; the Director of the Roads Department justified this on the grounds of lack of resources to establish and maintain a special unit.

4.18 Road inventories can be prepared using simple visual observation methods or special recording and measurement equipment. In most of the countries visited, visual observation methods were employed, in some cases enhanced by the use of vehicle mounted microcomputer recording equipment. (For example, in Burundi, the French system DESY 2000 is used to record visual observations and to transfer the data to the road "data bank".)

4.19 The methods of road inventory compilation affect considerably the precision and reliability of the road condition statistics. Although the terms "good", "fair", "poor" are widely used, there appears to be an absence of commonly accepted definitions which would be simple and appropriate when visual observation methods are used (as opposed to more comprehensive definitions usable if sophisticated measurement equipment is employed, which in most African cases it is not). Of course, any general road condition rating represents a simplification or an index comprising observations related to several road elements, e.g., conditions of the surface, structures, etc. In spite of these difficulties, the concept of a general road condition rating is widely accepted and undoubtedly useful for higher-level monitoring. It is evidently sensible, therefore, that a generally acceptable, workable definition be developed. This should be consistent with visual observation methods of conducting road inventory surveys, since visual methods are likely to be the only ones in general use in African countries.

4.20 The monograph referenced in footnote 2 contains a useful proposal for classifying different measurement systems according to four information quality levels. This provides a clear, step-by-step, instruction for the implementation of a usable system for recording road conditions and carrying out road inventories. Useful work by consultants has also been observed in the present study. Dissemination of the best economical practices and standardization of the
methodologies appears to be practicable and should be regarded as the basic condition for the development of reliable road statistics.

4.21 Data derived from road inventories can be aggregated using the following classifications:

(a) Functional classification: primary, secondary, local roads.

(b) Traffic carried: annual average daily traffic (AADT) and daily number of heavy vehicles, where the availability of these measures depends upon a systematic program of traffic counts.

(c) Construction standards: divided carriage highways, paved roads, gravel roads, unimproved earth roads and trails. In all of the countries visited, the term "gravel roads" applies to roads with a "selected local materials" surface; crushed rock did not appear to be used. In some countries, for example Zambia, "gravel roads" are subdivided into those constructed to proper engineering standards, similar to those applicable to "paved roads", and improved earth roads with locally available "selected materials" as surface. Thus, it may be useful to subdivide "gravel roads" into two classes.

(d) Road conditions: the most common classification is into "good", "fair" and "poor", although more detailed classifications are also used (for example, "good", "acceptable", "unsatisfactory", "bad", "very bad" or "critical").

4.22 A number of useful cross-tabulations, emerge which can also be presented in road network maps:

(a) Functional classification versus construction standards classification, for example:

<table>
<thead>
<tr>
<th></th>
<th>Dual or multiple carriage</th>
<th>Paved</th>
<th>Gravel</th>
<th>Earth or unimproved gravel</th>
</tr>
</thead>
<tbody>
<tr>
<td>International</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Other primary</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Secondary</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Local</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

(b) Construction standards versus road condition, for example:

<table>
<thead>
<tr>
<th></th>
<th>Good</th>
<th>Fair</th>
<th>Bad</th>
<th>Critical</th>
</tr>
</thead>
<tbody>
<tr>
<td>Multiple carriage</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Other paved</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gravel</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Earth</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
(c) Functional or construction standards classification \textit{versus} estimated Average:

\begin{center}
\begin{tabular}{l|c|c|c}
 & ADT 1,000 and over & ADT 300-999 & ADT under 300 \\
\hline
International & & & \\
\hline
Other primary & & & \\
\hline
Secondary & & & \\
\hline
Local & & & \\
\end{tabular}
\end{center}

B.2 Traffic

4.23 The principal method for measurement of road traffic are the road counts, which record the number of passing vehicles, by vehicle classe, and possibly hour. In all of the countries visited during this project, road traffic counts are currently performed in a systematic manner or a systematic system of traffic counts is being introduced or revived. The general use of traffic counts indicates the perceived usefulness of the data, as well as considerable experience in employing the data for planning and programming purposes.

4.24 Techniques of traffic counts vary substantially, which often reflects the origin of a particular system. Road count periods vary from seven days to two days, but seven days appears to be preferable during the period of introduction or revival of road count systems. The composition of field crews varies from four enumerators and a field supervisor (Louis Berger study of Uganda) to three and two, including the supervisor, for daytime counts (Burundi). A review of existing systems indicates that in many cases the surveys could be improved by a more careful sample design and by the adoption of the best simple techniques used by other countries in the region. In all cases, traffic counts are administered by the Road Department (RD) and the units responsible for the execution of the program are attached to the RD planning division. The need for careful supervision and control of the collection is well understood in all countries.

4.25 Traffic counts are reasonably inexpensive\textsuperscript{24} but they require support in the form of

\textsuperscript{24} The Louis Berger International, Inc. Uganda transport study provides the following estimates of resource use per station in a traffic count program:

\begin{itemize}
\item \textbf{Field Team:}
\begin{itemize}
\item Enumerator - 4
\item Field supervisor - 1
\item Driver - 0.5 (serving 2 stations)
\item District supervisors - 0.4 (2 serving 5 stations)
\item Pick-up - 0.5 (shared by 2 stations)
\item Fuel - 25 litres
\item Pena, forms, clip-board, wrist watch, stools
\end{itemize}
\end{itemize}

\begin{itemize}
\item \textbf{Headquarters Supervision:}
\begin{itemize}
\item 2 professionals, 1 driver, fuel, other vehicle costs.
\item Direct team costs per week were: personnel USD 128.55 and material USD 53.06. Headquarters supervision costs were: personnel USD 498.75 vehicle and material USD 901.25 (Uganda, Ministry of Transport and Communications, I.D.A. Third Highway Project, National Transport Data Base, Report of Road Traffic on the Classified Road Network, February 1991, p. S 17.)
\end{itemize}
\end{itemize}

Most of the counts were of one week duration; 10 classes of vehicles were identified; daily traffic ranged from 300-4,000 vehicles, including motorcycles. Supervision costs are higher at the start of
vehicles, materials and provisioning of field crews, which may be a problem under conditions of severe budgetary stringency. During the current study, the problem of the availability and capacity of data processing equipment was also noted. The efficiency of road counting programs greatly depends on the experience of the organization and of the supervisory staff. Problems can often be alleviated by improving the effectiveness and efficiency of the existing systems through experience transfer; however, while many improvements are feasible and worthwhile, one should be careful not to break the continuity of systems that are already working.

4.26 The other scheme, much more costly and complicated, for obtaining road traffic data are Origin-Destination Surveys. Roadside Origin-Destination surveys provide information on traffic origin and destination and can be used to collect additional data. In fact, a general temptation exists to overload the surveys on the assumption that once a vehicle is stopped, additional information to be obtained is "free".

4.27 Given high costs and the considerable complexity inherent in roadside Origin-Destination surveys, they are conducted infrequently and usually with the assistance of foreign consultants. However in Madagascar, the national RD has replicated the survey done some five years earlier. The consistent application of the same, well documented, methodology permits comparisons of the results over time.

4.28 In the long run, one should hope for improvements in the Origin-Destination survey methodology and inter-country experience transfer. However, these surveys are likely to remain relatively infrequent, serving as inputs into major transport studies, and are not likely to become part of a continuous transport statistics program.

B.3 Road Maintenance and Road Construction Capacity

4.29 Two aspects of road maintenance and road construction capacity should be distinguished: (a) the capacity of the RD to carry out routine maintenance and to supervise contracts; and (b) the capacity of the contractors in each national state to undertake maintenance and road construction contracts.

4.30 Capacity of RD. Simple measures of capacity should be easily available as a part of routine administrative processes and control, i.e. (i) inventory of professional and semi-professionals (number of engineers and technicians, by diplomas or equivalent professional qualifications); and (ii) inventory of equipment by type and age group. The second indicator is also useful for planning renewal cycles. A high proportion of useful, but old, equipment indicates the need for replacement, which involves considerable expenditures in foreign currency. Some RDs visited maintain an updated equipment inventory; in Madagascar for example, equipment is classified by condition (good, fair and unserviceable); in Uganda, Louis Berger introduced a simple equipment inventory form which also contains an estimate of the remaining useful life of

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26 In 1980, under contract with the Canadian International Development Agency, the Canadian Transport Commission, in cooperation with the Government of Peru and Statistics Canada, developed and tested a roadside Origin-Destination survey methodology, documented in Canadian Transport Commission, Roadside Measurement of Cargo Flows in Peru, Ottawa, 1980. The system was easily adaptable for subsequent Origin-Destination surveys in other countries (e.g. in the Dominican Republic in 1988). A well prepared manual, using proper statistical sample design techniques and detailing the necessary roadside survey practices, is likely to reduce the costs of such surveys and make it possible for the national authorities to execute them without outside specialists.
a particular piece of equipment. It has been suggested that major material stores should also
be identified, such as fuel and bitumen. However, the discussions with RDs revealed that the
existing management information systems could not easily generate this information.

4.31 Contractors' Capacity. Potentially this information could be easily available from pre-
qualification documents. A simple listing of equipment available and value of contracts executed
during the last twelve months would be a useful general indicator. In the countries visited this
information is not tabulated, although there was some interest in having this information
available. In view of the trend to use contracting out to replace some maintenance activities
carried out directly by the RD, a systematic collection of basic information on contractors' 
capacity appears to be strongly indicated. Capacity statistics could be easily obtained by
periodic surveys, say twice a year.

B.4 Cost Statistics

4.32 Theoretically, it would be useful to have comparative road maintenance costs. In
practice, this does not appear to be feasible at present. Budgetary systems differ widely and
the precision of recording funds actually spent is not always adequate. Furthermore, even if
actual expenditures were properly and consistently recorded, the standards of maintenance vary
greatly. Thus, if country X spends $3,000 per year per km. on routine maintenance, while
country Y spends $5,000, this does not necessarily indicate greater efficiency or lower costs
of country X; it may simply indicate that in country X, budgetary stringency is creating a
"deferred maintenance" problem.

4.33 Both from the point of view of road system management and from the point of view of
obtaining meaningful historical road expenditure series, it would be most useful to compile a
simple road expenditures index. The expenditure components of the index would be foreign
exchange (since most of the equipment is obtained from industrialized countries); fuel; principal
construction materials; and wages. All of this information is readily available; and construction
of proper "weights" for the index is, in most cases, a reasonably simple task. Once such an
index is constructed, its updating would require minimum effort. Over a longer time period, a
more detailed breakdown of expenditure components could be incorporated into the index.
However, although a more comprehensive system could be developed now as a final objective
to be achieved in the future, the consultants are recommending a more modest start to obtain
the necessary minimum of useful information.

C. KEY STATISTICAL INDICATORS

4.34 As previously mentioned, the types of performance indicators depend on the level of
management. The head of road maintenance operation, for example, may consider daily
equipment utilization and percentages of serviceable equipment, by categories, to be his key
performance indicator, while only broad aggregates are useful at higher management levels.
Subject to this general caveat, the following broad measurements are suggested, with these
derived from basic management information systems:

(a) The extent of the road network, showing kilometres of paved and all roads per
 km², per 1,000 heads of population and per $ million of GNP; length of roads, by
 surface type and by broad "functional classification". In larger countries, these
 broad aggregates could be subdivided by administrative districts or provinces.

(b) Road conditions by broad classification (good, fair, unsatisfactory) and by surface
 type (paved, gravel). However, it is likely that, in most countries, relatively reliable
 road condition data would exist only for paved roads.
(c) Traffic by kilometres of roads (exclusive of urban and suburban roads) in broad traffic volume classifications. The data could be usefully supplemented by simple maps of road networks with high, medium and low traffic volumes marked. The analysis could be extended to disaggregate the volume of international traffic and its distribution by road network.

(d) Total road expenditures by broad functional classifications of construction and paving, reconstruction, improvements, periodic maintenance, and current or routine maintenance. This indicator would only be useful if the expenditures are deflated by the proper price index. Properly adjusted, historical trends could be revealing.

(e) Capacity indicators of RD equipment and professional staff inventory, as well as broad indicators of road construction industry capacity.

D. RECOMMENDATIONS

4.35 The key elements of an adequate road statistics system and their interdependence have been stressed. The approach adopted was from the "bottom up", that is from the analysis of the sources of data and their use by operating management through increasing levels of aggregation required by the policy makers and senior sector management to the derivation of key indicators. All the elements of the system are reasonably simple and indeed most of them exist - in one form or another - in African countries. It appears, therefore, that construction of an integrated, reliable road statistics or road information system is quite feasible, even under the existing, difficult conditions. In a few countries, such as Ethiopia, sophisticated management information systems are in use, which provide extensive information on unit costs, equipment and crew utilization. As such systems become more widely used, one could visualize the availability of useful international comparative statistics, but this can only be expected in the rather distant future.

4.36 Nevertheless, serious problems do emerge, such as:

(a) Different information systems, both formal and informal, are not integrated. Various data are collected, but not always processed and analyzed to meet the requirements of different users.

(b) The quality of data varies, ranging from rough estimates to potentially accurate data. Unfortunately, it is not always obvious how different data have been obtained, what quality control mechanisms have been applied and how they should be interpreted. Considering that the producers and principal users of road information are a part of the same department, the necessary improvements should be administratively simple.

(c) There appears to be a widespread lack of clearly defined and documented collection methodologies, which presents a problem in view of frequent changes of personnel. In some cases, adequate documentation exists in the appendices of consultants' reports but, in the long run, these may disappear and the relevant parts are not always easy to locate. Although some excellent international monographs and manuals exist, they do not always find their way to the proper "working-level" office and the level of exposition may be too complicated for the local user.

(d) Source documents and data collection or reporting forms vary greatly, from excellent to poorly designed.

(e) Design of surveys including road traffic surveys is often inefficient and could be easily improved with a saving of costs and/or improved quality.

(f) Systematic, periodic road inventories and equipment inventories vary greatly in design and execution.
4.37 The recommendations emerging from this analysis are:

1. The national road data collection and analysis programs should be formalized to assure the availability of adequate statistics for the subsector. The key elements of a program to improve data collection and analysis capacity improvement are:

   (a) experience transfer between African countries as the means for disseminating and adoption of the best African experience, where the best method of effecting such an experience transfer is through specialized workshops; and

   (b) an appropriately designed road module of a transport statistics manual.

2. The methodology of survey design (traffic counts and origin and destination surveys) should be improved by the dissemination of comprehensive descriptions of the best methods fully developed and already tested.

3. Standardization of norms and definitions of road data should be encouraged, as an important step towards the experience, transfer and creation of a comparable database.

4. Simple but adequate road construction and maintenance cost indexes should be developed.

5. Basic information on contractors' capacity should be developed and maintained.

6. Careful attention should be paid to the full documentation of collection methods.

7. Effort should be made to improve the presentation of data in order to enhance their usefulness to various groups of users. In all cases where the data are presented, they should contain adequate explanatory notes and a clear definition of source and the type of collection methods employed.
CHAPTER 5: VEHICLES, FUEL, ROAD TRANSPORT AND ROAD ACCIDENTS

Chapter 5 commences with a discussion of user requirements for data on vehicles, fuel, road transport, road accidents, and road taxation and vehicle regulations. The examination then proceeds in five separate sections, covering each of these topic areas, with each section addressing both data availability and key statistical indicators.

A. USER REQUIREMENTS

A.1 Context

5.01 With road transport of passengers and freight becoming the principal transport mode in Africa, there exists a growing need for monitoring of this industry. Investments in vehicle fleets are substantial and require large outflows of convertible currencies. Also the provisioning of the vehicle fleets - spare parts and fuel - requires significant imports; thus the efficiency of using the existing fleets is of considerable interest both from the transport and macroeconomic management points of view.

5.02 Unfortunately in Africa, as in many other parts of the world, availability of reliable data on road transport operations is inadequate, which should make this area of transport statistics a prime candidate for improvement. The review of road transport data should distinguish four major areas:

(a) **Fleet statistics**, referring to the size and composition of the motor vehicle fleet, its rate of growth and scrapping;

(b) **Fuel statistics**, relating to the total consumption of motor fuels (gasoline and diesel fuel) and average vehicle fuel use;

(c) **Road transport operating statistics**, relating to the activities of road transport firms and fleet users, the structure of the industry, patterns of input use and services, and costs and prices; and

(d) **Accident statistics**, dealing with road accidents, their distribution and costs.

A.2 Data Uses

5.03 **Fleet statistics**. The size and distribution by vehicle classes of vehicle fleets provide an important general indicator of the demand for road transport and road infrastructure, and are thus of major interest to transport planners. As already noted, imports of vehicles, spare parts and fuel (in petroleum producing countries domestic consumption affects the exportable surplus) are of interest to the authorities concerned with trade policies. Vehicle taxation is a major source of revenues, thus the knowledge of the "taxable pool" is important. Importers, national producers and reconditioners of spare parts, car assembly plants and fuel distributors require vehicle data for commercial planning. The above-enumerated users and uses require both inventory type data on the size and composition of the fleet and flow data on rates of growth.

5.04 **Fuel statistics**. Fuel is a major imported or internationally tradable input to motor vehicle operations. The uses and users of fuel statistics are broadly speaking the same as for vehicle data. Furthermore, fuel consumption data can be utilized as one of the indicators of road vehicles use.
5.05 **Road transport operating statistics.** Monitoring of costs, performance and efficiency of the road transport industry provides an essential input to transport policy development and execution. There is a growing concern that inefficiencies in road carriage impose a serious burden on transport users. More sophisticated carriers are also interested in comparative performance; such interest is evidenced by the common practice in the industrialized countries of collecting performance and cost data either through special tabulations provided by statistical offices or through industry cooperative arrangements. Unfortunately, reliable data on the road transport industry structure and performance are most difficult to obtain in Sub-Saharan Africa.

5.06 **Accident statistics.** Accident data are essential for the analysis of accident causality in order to plan, assess and implement remedial measures. Given apparently high accident rates and high accident costs in Africa, this is a subject of considerable interest to transport infrastructure planners as well as to the authorities charged with responsibilities for vehicle inspection, licensing and traffic enforcement. It should be stressed that the primary reason for obtaining road accident data is the analysis of accident causality, which implies disciplined collection of rather detailed information. While global accident figures are interesting for the assessment of the overall extent and costs of the problem, remedial actions require a high degree of detail.

**B. VEHICLE FLEET STATISTICS**

**B.1 Data Problems**

5.07 The collection of reliable and detailed vehicle fleet data should be relatively easy as a by-product of vehicle registration, taxation and inspection activities. Yet, surprisingly, this is a major problem area observed in all of the African countries visited.

5.08 In order to understand the problem, the major events in a vehicle's life and the related documentation are tabulated as follows:

<table>
<thead>
<tr>
<th>Major event</th>
<th>Documentation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Importation of the vehicle</td>
<td>Customs document</td>
</tr>
<tr>
<td></td>
<td>Initial registration</td>
</tr>
<tr>
<td>Original sale of domestically assembled vehicle</td>
<td>Initial registration</td>
</tr>
<tr>
<td>Periodic (annual or quarterly) licence renewal</td>
<td>Licence renewal and tax receipt</td>
</tr>
<tr>
<td>and tax payment</td>
<td></td>
</tr>
<tr>
<td>Periodic roadworthiness inspection</td>
<td>Certificate</td>
</tr>
<tr>
<td>Sale or transfer of ownership</td>
<td>Amendment to vehicle licence</td>
</tr>
</tbody>
</table>

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28 See "The Challenge Facing the Road Transport Industry in the BLS Countries in the Wake of the BLS/RSA Road Transport Agreement", Transit Transport (UNDP/UNCTAD Bulletin of Issues and Prospects Facing International Transport in Southern Africa) July 1990, pp. 24-28. This gives a short description of the problems facing the road transport industry in Botswana, Lesotho and Swaziland and the remedial technical assistance program designed to overcome such problems. The basic issues are common to most African countries, and the program described can be viewed as an example of the growing realization of the need for a comprehensive, well informed approach to the improvement of efficiency of African road transport.
<table>
<thead>
<tr>
<th>Liability insurance</th>
<th>Insurance policy and certificate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Scrapping (removal of vehicle from operations)</td>
<td>Owner’s declaration as road the basis for ceasing to pay vehicle tax</td>
</tr>
</tbody>
</table>

5.09 With the exception of customs declaration and insurance, all the documentation contains the vehicle registration number. Yet, in most African countries, the problem of estimating the size and the composition of the vehicle fleet is a serious one. The reasons for this include the following:

(a) Administrative. The responsibilities for vehicle registration, safety checks and periodic tax collection are divided. There is no central register or common vehicle file. The forms used by different authorities in discharging their respective responsibilities are inconsistent.

(b) Tax evasion. In most countries the only control over payment of vehicle taxes are the occasional road checks. The reliability and credibility of the system depends on the frequency of checks and honesty of the police. The actual extent of tax evasion and thus underreporting of the vehicles in use varies. In one country visited, a senior official estimated underreporting as high as 15-20 percent; in another, the estimate was between three and five percent, confined to remote rural areas. The problem affects different classes of vehicles differently: older vehicles used in rural areas are likely to be more underreported than new vehicles, while heavy trucks and larger buses tend to be reported fully.

(c) Lack of adequately designed forms and data processing equipment. In some countries visited, vehicle registration and taxation data were kept in hand-written ledgers and statistical data were extracted through a laborious manual process. In one country, the manual system of keeping voluminous vehicle registration data coexisted with a computerized system of collecting airport statistics, where the volume of data was much smaller. In another country, the vehicle registration data were computerized, but the data processing was done on an obsolete mainframe computer to which the data producing unit had limited access.

5.10 In general, the inescapable conclusion emerges that the existence of the problem is due to a failure of administrative system design and coordination between different authorities. It should be noted that a properly designed administrative system would more than pay for itself by largely resolving the problem of avoidance of vehicle taxes. A known vehicle, with a known owner, can be automatically identified for tax collection purposes.

5.11 Since computerized, comprehensive and well managed central vehicle files are widely used in industrialized and in many less developed countries, the absence of such systems in the African countries visited is puzzling. One of the explanations is that the existing systems are a carry-over from the pre-computer past, when the fleets were small enough to manage the essential documentation by hand-kept ledgers. The other reason appears to be the absence of Organization and Methods or Administrative Systems Units in government organizations, which is reflected in poor form design and cumbersome procedures. Thinking in a disciplined manner about the information to be recorded, recording procedures and forms, paper flows, data processing, storage and retrieval is not a trivial task and requires specialized professionals. The problem falls outside the scope of the present project but it is important enough to be mentionned here.
B.2 Data Availability

5.12 In all the countries visited, new registration statistics are adequate, but there is no reliable documentation of the number of vehicles on the road and their distribution by vehicle classes and ages. This gap is partially filled by estimations of the fleet size, based on past new registrations and assumed "useful life of the vehicle". Since the estimates of "useful life" are of doubtful accuracy, total fleet estimates are also of limited validity. One of the ways in which the age distribution of the fleet is estimated by using roadside traffic surveys, but this method has a number of limitations. Surveys are infrequently conducted and the survey points tend to be located on major arteries outside the conurbations. Since the vehicles used in long distance movements tend to be normally newer than those used in rural areas and within the major conurbations, the survey results are biased towards underestimating the number of older and smaller vehicles.

5.13 From a statistical point of view, a side effect of the absence of a reliable centralized vehicle file is that it removes the possibility of using such a file as a survey frame for inquiries into the characteristics and performance of road carriers. In the absence of this centralized vehicle file, some surveys have been based on business registration files. Such files, however, tend to be incomplete and do not permit identification of vehicle owners, who operate such vehicles as a sideline of their main business.

5.14 Most Sub-Saharan African countries present a statistical series of new registrations by major vehicle type. These distinguish motorcycles and small vehicle chassis mounted on motorcycles, a growing trend in many less developed countries; private automobiles; four-wheel drive vehicles, such as Land Rovers and Jeeps; pick-up trucks and light goods carrying vehicles; minibuses, minibuses and buses\(^{27}\); trucks; and road tractors and trailers. These broad vehicle types, usually in nine or ten categories, are generally shown in new vehicle reporting. However, there is considerable discrepancy among countries in the definitions used and grouping of vehicles.

5.15 Vehicle fleet statistics, by type of vehicle and age, are not available on a reliable basis. In many cases, however, data to compile fleet statistics of larger trucks, tractors, trailers and buses do exist. In these areas, tax avoidance is less common and, in many countries, regulations regarding transport permits exist, thus providing a further source of data. The vehicle inspection of larger vehicles operated commercially is more strict than on passenger cars and light trucks and this gives yet more additional information. This would permit the following tabulation:

<table>
<thead>
<tr>
<th>Age (years)</th>
<th>minibus</th>
<th>buses</th>
<th>trucks*</th>
<th>tractors</th>
<th>trailers</th>
</tr>
</thead>
<tbody>
<tr>
<td>less than 3</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3 to 5</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6 to 10</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>11 to 15</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>over 15</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* Over a specified Gross Vehicle Weight or carrying capacity.

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\(^{27}\) The definitions of microbus, minibus and bus vary. Informal (that is, uncodified) practice in Latin America is: microbus, less than 12 seats or 6 to 12 seats, which would include a number of different types of vehicles from microbuses manufactured as such to converted light trucks; minibus, 13 to 26 seats; bus, over 26 seats. A standardization of definitions is needed both for international comparisons and for classified road counts.
5.16 The problems and indicated solutions in the production of vehicle fleet statistics can be summarized as follows:

(a) The systems of recording and handling of data on vehicle registration, vehicle taxes and vehicle inspections are inadequate. The indicated solution is a thorough review of administrative systems, including paper and information flow, form design, data processing, data storage and access to data.

(b) There is a lack of consistent definitions of vehicle types. The adoption of regionally standard definitions and norms is needed.

(c) In many cases, significant improvements are needed in data processing, especially elimination of hand-written ledgers and, in some cases, replacing obsolete equipment.

The suggested improvements are conceptually simple, but they require sustained major effort, mostly related to administrative systems design.

B.3 Key Indicators

5.17 The size and distribution of the motor vehicle fleet are the most important of transport statistics. Once the reliable basic data are available, a number of useful derived statistics can be compiled, namely:

(a) number of automobiles per 1,000 inhabitants and per $1,000,000 (or 1,000,000 Ecus) of GNP;
(b) number of vehicles per km. of road;
(c) number of buses per 1,000 inhabitants and estimated "seating capacity" (number of seats available) per 1,000 inhabitants; and
(d) ratio of road tractors to total number of trucks (excluding light trucks and pick-ups), which is a useful indicator of maturing of the road haulage industry.

Data derived from import statistics of spare parts and tires are also useful inputs into the analysis of the implications of road transport developments.

C. Fuel Statistics

C.1 Data Availability

5.18 Data on fuel sales are easily available from oil distribution companies. Reliability of data is high because of oil company control at the point of sale and fuel tax requirements. The only major problem which may arise is when the tax on diesel fuel for small-scale electricity generation and agricultural use is the same as the tax on diesel fuel used by vehicles. If diesel fuel used in road transport cannot be readily separated from other sales, this should be clearly indicated and properly footnoted. Subject to this qualification, it can be said that reliable historical information of fuel consumption in road transport are generally available both for gasoline and diesel fuel.

5.19 Another important type of information concerns the evolution of fuel prices and fuel taxes. The rates of fuel taxes per litre are easily available. Average fuel prices, usually available by district, can be obtained from oil companies.
C.2 Key Indicators

5.20 The evolution of fuel consumption is an important indicator of road transport activities. In the case of oil importing countries, oil and refined fuel imports and costs of such imports are also important for the estimation of the trade effects of fuel consumption. Price and taxation statistics are key inputs into the analysis of costs of road transport operations and, in the case of fuel, international comparative data help to place fuel taxation and subsidy policies in a proper context. Fuel consumption figures, combined with price and income data are, of course, essential in forecasting the effects of changes in fuel taxation or fuel subsidies.

5.21 Based on these considerations, the following key indicators are proposed: (a) fuel consumption or fuel sales series, segregated into gasoline and diesel; (b) price statistics for gasoline and diesel at pump; and (c) fuel tax per litre for gasoline and diesel.

D. ROAD TRANSPORT OPERATING STATISTICS

D.1 Data Problems

5.22 In all countries, including African countries, collection of data from transport operators is quite difficult. The reason for the inherent difficulty of data collection from the operators is that small- and medium-size operators, as well as some of the large ones, have only rudimentary management information and accounting systems. Compounding the difficulty is the lack of confidence that the data given to a government agency will not be used “against them”, which was mentioned during conversations with statistical offices and ministries in the countries visited. Of course, in all countries information provided to statistical offices is confidential at the level of individual operators, and such confidentiality is guaranteed by law. However, legal guarantees, even if scrupulously observed - as they are - may not be sufficient to create the necessary confidence. Canadian experience indicates that only slowly, and with significant effort, do road carriers become sensitized to the value of reliable information on the industry. The key role in this “education campaign” was played by the carriers’ associations. This point is worth stressing, because the prerequisite for the improvement of motor carrier statistics is mutual confidence and cooperation between the carriers, their associations and government departments.

5.23 The exceptions to poor information systems and thus poor reporting are some larger parastatal organizations. Probably the existing systems and the use of information could be improved in some cases, but the subject of internal management information systems and the use of such systems is outside the scope of the present study. The major point which needs stressing is that national road transport statistics can only be constructed on the basis of reasonable internal information systems. Since the majority of the carriers tend to be small and not sophisticated, such internal management information systems have to be simple and of obvious value to the operators.28

28 It is interesting to note that currently the Canadian federal transport department, Transport Canada, is pursuing a project to design a simple management accounting information system for owner-operators in the motor carrier industry. A similar initiative was undertaken some years ago in France which resulted in a useful and concise “management manual” for small road transport operators. The American Trucking Association has produced an exhaustive manual for “contract operators”, who are small independent entrepreneurs working for large road transport enterprises, and this has proved so useful that during the last ten years the manual has been through several editions. Although the development of a simple, practical and meaningful management information system, as part of upgrading of managerial capacity of road carriers, is outside the scope of the present study, the need for a program to upgrade managerial capacity of African road operators should be
5.24 In order to systematize the discussion, the following classification of carriers will be adopted:

(a) Passengers carriers
- urban
- rural and interurban
- urban and interurban

(b) Freight carriers
- own account
  - "carrier-traders"
- professional
  - "for hire" and "contract carriers"
- local
- long distance
  - general
  - specialized

This classification is consistent with general statistical practice. Under African conditions, small, independent bus operators, normally using mini and microbuses are common, while they are an exception in the industrialized countries. Obviously, the ability of small owner-operators to provide statistical information is extremely limited.

The above classification differs in one respect from the generally applied one. The category of "carrier-traders" is usually absent in industrialized countries, but it is needed in Africa, where small traders operating their own trucks for carrying goods from farm to market, play an important role in the national economies and have distinct operating characteristics. Specialized carriers include fuel, automobile, heavy equipment and container carriers. They are becoming increasingly common as the industry develops, and their operating and cost characteristics are different from general carriers.

5.25 There is a natural relationship between the size of operation and distance covered. Local carriers, able to make one or more return trips per day, tend to be smaller with a predominance of owner-operators. In general, small owner-operators or "microenterprises" dominate the industry. Their capacity to provide statistical information is extremely limited.

D.2 Data Availability

5.26 As could be expected, the data on the road transport industry are extremely scarce and, with few exceptions, of poor quality. The exceptions are large companies and para-statals. The problem is further complicated by the existence of "mini-conglomerates"; for example, a combination of truck and bus operation, with the same owner-manager, same repair and maintenance shop, also doing repairs and even bus rebuilding for others, and managed with the most rudimentary accounting system serving all interrelated operations.

5.27 If a proper, centralized vehicle register existed - and, as it was noted, it usually does not

emphasized. The design of such a program would require, as one of the first, fundamental steps, information on the structure and activities of the sector, including a "profile survey" of the industry, as discussed briefly in paragraphs 5.28 to 5.33 of this chapter.
- a relatively simple computer program could provide data on the frequency distribution of multiple vehicle ownership, which is the first step towards the analysis of the industry’s structure. However, the basic data for this elementary analysis do not exist.  

5.28 In Kenya and Nigeria, the statistical offices have attempted to conduct surveys of road transport operators. Since such surveys are likely to become more common over time, as the need for knowledge of the industry becomes more obvious, these experiences are briefly reviewed.

5.29 The Kenya surveys appear to have been initiated as a part of the program of improving national accounts statistics. The original one-page form was recently replaced by more comprehensive forms for road freight and bus industries. The survey asks for data over a two-year period. The question areas are summarized below:

(i) Are vehicles used in carrying your own goods and materials?
(ii) Do you earn revenue from the transport of goods?
(iii) For bus carriers, what are your areas of operation and routes?
(iv) Number of persons employed, by category.
(v) Operating expenses - 28 categories for freight, 23 for bus operators.
(vi) Operating revenues - 15 categories for freight, 5 for bus operators.

The forms are quite complicated and suffer from some design deficiencies (e.g., revenue categories for freight carriers are not mutually exclusive). From the transport analysis point of view, the lack of information on vehicles operated is troublesome.

5.30 Given that operating licenses have to be gazetted in Kenya, the potential for obtaining statistics from the licensed road transport operators appears to be good. The licenses provide information on the type of carriage, area or routes and, in the case of passenger carriers, vehicle capacity. However, given the complexity of the forms, it is by no means obvious that reliable data, meaningful for transport analysis, can be collected.

5.31 In Nigeria, the surveys of road transport operators are restricted to larger carriers only. The form produced for a 1984 survey was reviewed and it is reproduced in Appendix 3. The questions asked are geared to the needs of transport analysis. However, the form is too long (five pages) and appears more complicated than it really is; thus, it is hardly surprising that the response rate was very low. The Federal Office of Statistics is currently planning to repeat the survey. The consultants had no opportunity to review the questionnaire to be used in the coming survey.

5.32 The surveys reviewed tended to be overambitious in terms of scope and complexity of information required. This does not imply that the initiatives should be abandoned. However, a strong case appears to exist for a thorough re-thinking of the programs, and for the design of a survey to be restricted to a few key questions and possibly conducted on a sample basis. By restricting coverage to a sample of the carriers, more assistance could be given in filling out questionnaires and on follow-up procedures. In other words, it is essential to establish a viable, practical base for collection of information from the carriers before any further refinements of data are attempted.

29 Admittedly, the use of registration data is not perfectly reliable for the determination of the frequency distribution of road carriers by number of vehicles, because it tends to underestimate the number of multi-vehicle fleets. Nonetheless, it provides very basic information inexpensively and simply.
5.33 In the opinion of the consultants, the priority to be assigned to a survey of road transport operators will depend on the basic policy of the governments relating to this important subsector. Should it be decided to consider seriously a major program aimed at the improvement of the efficiency of road transport operators, a carefully designed "profiling survey" becomes a necessary preliminary step. In this context the need for very careful survey design and disciplined execution should be emphasized. It should also be expected that, as part of the upgrading of the managerial capacity of operators, simple and useful internal management systems will develop, requiring preparation of uncomplicated manuals, recording systems and explanation of their usefulness to the operators. The subsequent upgrading of the management information systems for the carriers will make it possible to obtain more meaningful data for the monitoring of road transport. However, a full discussion of this important subject is outside the scope of the present study.

D.3 Future Developments

5.34 The following conclusions emerge from the review of road transport operating statistics:

(a) In view of the importance of road transport activities, it is highly desirable to strengthen existing efforts and/or to introduce appropriate, practical programs to obtain basic data on the industry's structure and performance.

(b) Given the structure of the industry, the design of suitable statistical programs would require considerable sustained efforts and, most likely, some outside assistance. Such assistance should be organized on a regional or subregional basis and include the design and testing of appropriate methodologies.

(c) The programs undertaken should involve national statistical offices, transport ministries and carriers. Logically, the statistical program should be combined with a program of designing and introducing to the carriers simple, minimum internal accounting and information systems, as a means of improving carriers' management and performance.

(d) Where the larger companies maintain their own information systems, an effort should be made to encourage and facilitate exchange of experience. The value of intra-regional experience transfer cannot be overstressed. Again, a program of this nature would require some international assistance.

(e) Given the existing situation and current limitations on industry survey capacities, no recommendations can usefully be made regarding the presentation of key data and the identification of key indicators for road transport operations.

E. Accident Statistics

E.1 Data Availability

5.35 The main sources of road accident statistics are police reports, with subsidiary sources from insurance company data. The quality and usefulness of data crucially depends on the design of proper reporting forms and their careful use by the police, which, in turn, requires proper training in accident reporting. For the administration of road safety programs, the data reported should be transmitted, with full details on individual accidents, for central processing and analysis. These basic conditions are seldom met.
5.36 Accident reporting systems were carefully reviewed by the Norwegian Institute of Transport Economics for the Southern Africa Transport and Communication Commission (SATCC). Although the reports deal specifically with the situation in SATCC countries, the problems observed have general application:

- Not all accidents are reported: most fatal accidents are reported, however, underreporting of accidents resulting in injuries and property damage is believed to be significant.
- Internationally agreed definitions are not always rigorously employed.
- Accident investigation report forms do not always meet the requirements of subsequent analysis.
- Proper training of police in accident investigation and reporting is not always provided. The Road Safety Corps in Nigeria (a federal organization operating outside the police force) is unique as far as proper training and professionalism is concerned.
- Full information on the conditions of the accident is not usually reported.
- Processing of accident reporting forms is not always adequate; in some cases, the reporting forms are kept at the police station without a copy being sent to a central data processing and data analysis office.

5.37 The Executive Summary of the Norwegian Institute of Transport Economics includes the following recommendations (pages not numbered):

- The recording and reporting of accidents should be based on reporting of each individual accident.
- A special accident recording form has to be developed. This form can be a part of the ordinary accident investigation form or a specially developed accident recording form designed for statistical recording only. A model accident recording form is presented.
- It is recommended to establish a Central Accident Analyzing Unit, whose main tasks are to compile and prepare statistics at the central level and carry out accident analyses.

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31 See Economic Commission for Europe, Road Traffic Accidents in Europe, Geneva, 1991, Annex I, Definitions and General Notes, pp. 79-80 (English) and 81-83 (French). The definitions "conform with the substance of the Convention of Road Traffic (Vienna, 1968) and the European Agreement supplementing the Convention". A perusal of tables indicates that the full consistency of national definitions was achieved only in the late 1970's. However, as long as the definitions used are clear and consistent, adjustments are possible. For example, deaths were defined in three categories - "died on the scene of the accident or on the way to the hospital", "died within three days", "died within thirty days" (the definition now adopted). It is estimated that "figures in respect of deaths resulting from accidents can be broken down according to the time in which they occur roughly as follows: Died at the scene of accident or on the way to the hospital: 65%; died within three days: 88%, died within thirty days: 97%".
It is necessary to develop a system for identification of accident locations.

It is recommended that only accidents with injury to persons be included in the national road accident statistics ...

To obtain the full benefit of accident statistics, it is recommended that the data about the road network, about the vehicles in use and about the road users, be easily available. It is therefore recommended that over time a road register, a vehicle register and a driving permit holder be developed.

Use of computers is necessary for compilation of the national accident statistics. This use of computers has to be seen in connection with computerization of a vehicle register and a driving licence register.

These recommendations are sound and it would be worthwhile to disseminate the report to countries outside SATCC. Also, it would be useful to add specific recommendations regarding basic training of police in accident reporting.

E.2 Key Indicators

5.38 For purposes of establishing the general extent of the road accident problem and making international comparisons, the basic traffic accident statistics are:

* number of accidents resulting in death or injury;
* number of persons killed and injured; and
* numbers of accidents in urban areas.

The following derived statistics are useful as key indicators:

* deaths and injuries per 10,000 vehicles;
* deaths and injuries per 10,000 inhabitants; and
* deaths from traffic accidents as a percentage of total deaths.

Deaths and injuries per estimated vehicle kilometres are also used in road accident analysis. However, at this stage of transport statistics development in Africa, it is most doubtful whether reasonable estimates of vehicle kilometres could be obtained.

5.39 In the longer run, these basic figures should be supplemented by more detailed statistics, for example:

* accidents involving major property damage;
* accidents disaggregated by type of vehicle;
* deaths and injuries by gender and age; and
* deaths and injuries distinguishing drivers, passengers and other persons.

Such data could be related to the number of driver licences issued, vehicle age distribution, road conditions and population age distribution.

F. ROAD TAXATION AND VEHICLE REGULATIONS

5.40 Both national transport studies and international comparisons frequently require information on vehicle taxation and vehicle and carrier regulations. Although this information
could be obtained without establishing a complex and expensive system, it is rarely kept in a user-friendly, easily accessible and comparative format. Furthermore, the historical information is often lost, or cannot be readily retrieved, yet the documentation of historical changes is essential for the analysis of the impacts of government policies in this area.

5.41 It should be a simple matter to design a standardized form for a full documentation of all the changes imposed on the importation of vehicles and spare parts, as well as taxes and other fees related to vehicle operation and ownership. A similar tabulation would be required for listing vehicle operating restrictions and regulations. The form should be prepared once a year, with changes which occurred during the year noted, together with the dates of these changes.

G. RECOMMENDATIONS

5.42 With the exception of fuel statistics, there is a great need for improvement of data reviewed in this chapter. Such improvements would require considerable sustained efforts and, in some cases, technical assistance. In this field, development of statistical standards should be accompanied by the transfer of experience among African countries and development of proper manuals.

5.43 The recommendations for improvement made in most of the sections of this chapter are summarized below:

1. **Vehicle Fleet.** It is recommended that the currently existing procedures regarding vehicle registrations and annual licences be reviewed and central computerized registration files of vehicle ownership be created; such a central file would both serve administrative purposes and generate the database for comprehensive motor vehicle statistics. The introduction of an adequate modern system would require considerable effort; its maintenance, however, should be relatively simple. Since the system would enhance inspection checks, there can be little doubt that the costs and efforts in this area would be easily offset by administrative benefits. Benefits to the users of data are self-evident.

2. **Road Transport Operating Statistics.** Progress in this area is likely to be difficult, thus a gradual improvement program is recommended. The first step in this program would be the design of a "profiling survey" to capture basic data on vehicle operators. The design of such a survey would require collaboration between transport specialists, survey statisticians and the industry. The questionnaire should be simple and the questions asked formulated in such a way as to correspond with the way of thinking of the operator about his business; questions must be capable of being answered without referring to records which may not exist. Subsequently, more comprehensive surveys of certain parts of road transport industry should be organized, as resources allow.

3. **Road Accident Statistics.** Most of the existing accident recording systems should be upgraded by a careful introduction of good internationally tested standards. The report by the Norwegian Institute of Transport Economics, prepared for SATCC countries, may be the best starting point in this effort. Experience transfer between African countries should also prove extremely useful.

4. **Road Taxation and Vehicle Regulation.** Systematic preparation of key information, described in Section F, is recommended.
5. **Methods of Upgrading Road Transport Statistics.** As it was repeatedly noted, the upgrading of road transport statistics would require well organized experience transfer and technical assistance. In order to effect such improvements in an efficient manner and avoid duplication of effort, well designed, coordinated programs are needed at the regional and subregional levels. Such programs would involve: (a) dissemination of practical methods; (b) preparation of appropriate manuals; and (c) organization of workshops and training courses.
CHAPTER 6: URBAN TRANSPORT

This chapter first discusses user requirements for urban transport data followed by a discussion of statistical data and key indicators for urban roads, traffic management, public transport, non-motorized transport and accidents.

A. USER REQUIREMENTS

6.01 The UNTACDA II requirements for urban transport are best stated in the general overview for this transport mode:\(^{32}\)

Although there are many issues and problems that need to be tackled to improve urban transport in African cities, six main issues stand out from the rest. They are: (a) increasing the supply, productivity and efficiency of urban public transport services to keep pace with the fast growth in demand; (b) facilitating the development of cheaper and more appropriate modes of transport; (c) improving the efficiency of urban road networks through road rehabilitation, maintenance and comprehensive traffic management measures; (d) reducing the number and severity of road accidents, particularly in urban areas; (e) the overarching need to develop sound and accountable institutions and human resources; and (f) establishment of new financing policies.

6.02 Urban research generally fell out of favor during the 1980s\(^ {33}\), and this malaise also affected urban transport research. For example, a World Bank report dated May, 1990, stated that the last comprehensive urban transport plan was developed for Nairobi in 1974\(^ {34}\), although there has, of course, been some further research since that date. In Nigeria, the Federal Urban Mass Transit Programme (FUMTP) was only established in 1988.\(^ {35}\) In view of this comparatively recent reawakening in urban transport, it is not surprising that UNTACDA II adopted a cautious attitude in respect of articulating goals and targets.

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\(^ {32}\) United Nations Economic Commission for Africa, Programme of the Second United Nations Transport and Communications Decade in Africa 1991-2000, Project RAF/89/016, Addis Ababa, March 1991, p.11. In other chapters of the present study, quotations have been made from the Goals and Targets Chapter of the UNTACDA II document; this section is not appropriate for urban transport, as it states that monitoring targets have not yet been developed "since the parameters defining the existing conditions of urban transport have not been assessed" (p. 83).

\(^ {33}\) See World Bank, Urban Policy and Economic Development: An Agenda for the 1990's, Washington, D.C., April 1991, p. 12, which is quoted as follows:

After extensive investments in urban research during the 1970's, the quantity of urban research fell sharply in developed and developing countries in the 1980's. The scarcity of public resources for universities and independent research institutes, coupled with increasing interest in such other subjects as debt and adjustment, has led to a decline in urban research capacity just when many urban policy questions are becoming increasingly important. The need is thus great for increasing research on urban issues.


6.03 Yet urban transport is extremely important to the economic development of Sub-Saharan Africa. The Urban Transport Sub-Sector Working Group of UNTACDA II has described this role as follows:38

The important role of urban transport in the economies of African nations is evidenced by the fact that the economic activities in the principal cities of the region generate between fifty and seventy percent of GNP. Within these cities are located the majority of industry and manufacturing centers. Many of them are also the main ports and commercial centers. The businesses operating in these centers are dependent upon manpower that must be transported to and from work as quickly and as cheaply as possible. Urban transport facilitates this movement, provides the means by which products are distributed to industry and consumers, and creates opportunities for education and social contact. . . . . Keeping transport costs low improves urban efficiency, strengthens the economy and increases competitiveness. Excessive traffic congestion and poor road surface conditions increase transport costs through greater fuel consumption, time losses, and wear and tear on vehicles.

6.04 During the course of the present study, the operators of large urban transport companies were clear as to the information they required as management tools and were generally able to provide this from their own records, although interest was expressed in having the opportunity to compare their results with those of similar enterprises in other countries. However, there was relatively little reaction from government departments in the countries visited on their needs for urban transport data and key statistical indicators required for the identification of problems and monitoring attempted solutions. The relative paucity of urban transport studies may be both the cause and the effect of this situation.

6.05 The approach in the present chapter draws heavily on recent literature, particularly the three documents already referenced in footnotes 3, 4 and 5, which show excellent insights into the problems of urban transport. The chapter focuses on: urban roads; traffic management; public transport; non-motorized transport; and accidents. For reasons explained, the approach in this chapter is tentative, and basic statistical data and key statistical indicators are addressed together for each of the five subject areas listed, rather than use the approach adopted in later chapters of the report of dealing first with data and then with indicators.

6.06 In some publications, the approach to urban transport statistics is to focus on all urban areas of a given country, while elsewhere the focus is on individual cities. The present chapter deals with individual cities on the grounds that this allows concentration of attention on large cities where the problems are most acute, that it facilitates regional comparisons of cities of similar size in different countries, and that it avoids the serious problems of interpretation of figures lumped together for a variety of different sized urban communities within a country.

6.07 Estimates for 1990 indicate that there were 17 cities in Sub-Saharan Africa with populations over one million, and a further 34 cities with population over 500,000 but under one million. Populations for the 17 largest cities are given in Table 6.1, together with the geographical distribution of the other 34 cities with population in the intermediate range specified.

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### Table 6.1: City Populations in Sub-Saharan Africa, 1990

<table>
<thead>
<tr>
<th></th>
<th>Western Africa</th>
<th>Central Africa</th>
<th>Eastern &amp; Southern Africa</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lagos</td>
<td>5,580,000</td>
<td>Kinshasa</td>
<td>Dar Es Salaam</td>
</tr>
<tr>
<td>Ibadan</td>
<td>2,809,000</td>
<td>Douala</td>
<td>Addis Ababa</td>
</tr>
<tr>
<td>Abidjan</td>
<td>2,734,000</td>
<td>Kananga</td>
<td>Luanda</td>
</tr>
<tr>
<td>Conakry</td>
<td>1,680,000</td>
<td></td>
<td>Maputo</td>
</tr>
<tr>
<td>Kano</td>
<td>1,626,000</td>
<td></td>
<td>Nairobi</td>
</tr>
<tr>
<td>Accra</td>
<td>1,470,000</td>
<td></td>
<td>Lusaka</td>
</tr>
<tr>
<td>Dakar</td>
<td>1,470,000</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ogbomosho</td>
<td>1,097,000</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Number of other cities with population over 500,000 but under 1 million

<table>
<thead>
<tr>
<th></th>
<th>Western Africa</th>
<th>Central Africa</th>
<th>Eastern &amp; Southern Africa</th>
</tr>
</thead>
<tbody>
<tr>
<td>Benin</td>
<td>1</td>
<td>Cameroon</td>
<td>Ethiopia</td>
</tr>
<tr>
<td>Liberia</td>
<td>1</td>
<td>C.A.R.</td>
<td>Madagascar</td>
</tr>
<tr>
<td>Mali</td>
<td>1</td>
<td>Chad</td>
<td>Somalia</td>
</tr>
<tr>
<td>Nigeria</td>
<td>11</td>
<td>Congo</td>
<td>Tanzania</td>
</tr>
<tr>
<td>Sierra Leone</td>
<td>1</td>
<td>Zaire</td>
<td>Uganda</td>
</tr>
<tr>
<td>Togo</td>
<td>1</td>
<td></td>
<td>Zimbabwe</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td><strong>16</strong></td>
<td><strong>8</strong></td>
<td><strong>10</strong></td>
</tr>
</tbody>
</table>


6.08 At this stage, it is suggested that the database exercise be restricted to the 51 cities of population of over 500,000. Of the 17 very large cities, the consultants visited four: Lagos, Abidjan, Nairobi and Lusaka. Although Addis Ababa was also visited, this was only for a meeting with ECA and no examination was made of transport statistics. In the intermediate range, only two cities were visited: Antananarivo (estimated population 770,000) and Kampala (705,000). Three other cities were visited: Mombasa (497,000), Ouagadougou (410,000) and Bujumbura (400,000), although they did not meet the requirements for inclusion in Table 6.1. It is, of course, common knowledge and documented in all the sources footnoted in this chapter that urban growth is proceeding very rapidly in Sub-Saharan Africa. The number of cities with population over 500,000 will therefore be considerably increased by the end of the century.
B. URBAN ROADS

6.09 The main sources of information on urban roads and traffic management were the City Engineers in the anglophone Sub-Saharan African countries visited, and meetings were held with these departments in Lusaka, Mombasa and Nairobi. The consultants did not find a corresponding organization in francophone countries, and all the information was therefore obtained from ministries of works and ministries of transport. These government departments were also visited in the anglophone countries.37

6.10 The main statistical data and key indicators needed to monitor the urban road infrastructure are:

(a) kilometrage of urban roads;
(b) road kilometres per 1,000 heads of population;
(c) percent of urban roads that are paved;
(d) percent condition of urban roads by categories of good, fair, and poor;
(e) urban road expenditures in real terms over time, and expressed as ratios in relation to urban road kilometres and to urban population.

6.11 Before making brief comments on these measures, it is useful to show the data available for (a) to (d) in four anglophone cities.

Table 6.2: Urban Roads

<table>
<thead>
<tr>
<th>Countries</th>
<th>Length Kms</th>
<th>Kms per 1,000 pop.</th>
<th>% paved</th>
<th>Condition - %</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Good</td>
</tr>
<tr>
<td>Lagos</td>
<td>2,630</td>
<td>0.47</td>
<td>55</td>
<td>20</td>
</tr>
<tr>
<td>Nairobi</td>
<td>1,900</td>
<td>1.34</td>
<td>*</td>
<td>26</td>
</tr>
<tr>
<td>Mombasa</td>
<td>310</td>
<td>0.62</td>
<td>*</td>
<td>19</td>
</tr>
<tr>
<td>Lusaka</td>
<td>1,200</td>
<td>1.18</td>
<td>54</td>
<td>*</td>
</tr>
</tbody>
</table>

* data not available.

Note: Lagos, Nairobi and Mombasa: from studies referenced in footnotes 3 and 4 of this chapter; Lusaka: verbally from City Engineer.

6.12 The length of urban roads is reasonably available and seemingly straightforward, but there is a problem in some cities that these figures may not include informal or unadopted roads. This can create problems in the future planning of urban infrastructure, since many of the informal roads of today will have to be regularized or adopted in the future, having serious implications on required infrastructure investments.

6.13 The problems of road condition - good, fair and poor - have already been discussed in Chapter 4, where the key importance of keeping up-to-date road inventories has been

37 The offices of City Engineers tended to be small and, regardless of formal institutional arrangements, central governments tend to play a major role in the provision of urban infrastructure and the determination of urban transport policies. For example, while the consultants were in Kenya, following newspaper criticism about the state of Nairobi roads, the President ordered the Department of Public Works to undertake remedial action, i.e., to carry out urban road reconstruction using national resources.
highlighted. Initially, the consultants thought that the ratio of feeder roads to main roads would be a useful indicator of the extent to which a city is providing access for its inhabitants to the main roads of the city; this ratio could be calculated fairly easily by City Engineers, provided that there was an adequate definition of feeder roads. However, after discussion with urban transport experts, it was decided to omit this indicator because it is very difficult to calculate meaningfully over time since, as a city grows, feeder roads can often become main roads.

6.14 Nevertheless, there still exists a need for standardization of functional classification of urban roads; the existing classifications vary and, often, urban roads are also classified by responsibility levels, namely, national or international roads which cross the urban area and urban roads, which are the responsibility of municipal governments. Such classification by level of responsibility is obviously useful for budgeting purposes, when national roads are paid for by the central governments: however, the absence of functional classification, based on clear definitions, is regrettable both on planning and statistical grounds. The classification of roads by paved and unpaved also overlooks an important element in describing the urban road network by omitting the classes of urban expressways (quite important in Lagos, for example) and divided arterial roads.

6.15 Expenditure on urban road infrastructure is clearly important in view of widespread complaints of inadequate maintenance, posing serious problems both now and in the future. This information is needed for planning and budgeting of urban roads, and requires a clear definition of budgetary responsibilities and a comprehensive budgeting system. The compilation of construction and maintenance expenditures can be quite difficult, especially when price deflators are needed for year-to-year comparisons and exchange rate conversions for comparisons between cities of similar size in different countries.

C. TRAFFIC MANAGEMENT

6.16 Traffic management relates to the efficiency with which urban roads are managed. The basic data and indicators required are:

(a) number of vehicles by type;
(b) total number of vehicles per kilometre of urban roads and per 1,000 heads of population;
(c) number of signalized traffic intersections in working order;
(d) number of traffic roundabouts;
(e) rates of signalized traffic intersections and roundabouts per kilometre of urban roads and per 1,000 heads of population, with the possibility of combining signalized traffic intersections and roundabouts in one index;
(f) kilometres of segregated busways as a percentage of the total urban road network; and
(g) number of traffic professionals, probably defined as civil engineers, traffic engineers and planners, with this also expressed as a rate per 1,000 heads of population.

6.17 The number of vehicles in cities obviously cannot be calculated with any degree of confidence, when it has been explained in Chapter 5 that none of the countries visited in the present study had reliable figures on the national fleet of road vehicles. In some countries, it is theoretically possible to distinguish the place of registration of a vehicle from the licence configuration, but this is by no means universal. The improvements suggested in Chapter 5 in collecting data on national fleets of motor vehicles should therefore incorporate more accurate recording of geographical districts, particularly urban areas. Given a proper, centralized and up-
to-date register of motor vehicles, the number of vehicles owned by residence of a particular city and, presumably, used largely within the urban area can be estimated, with the exception of large buses and lorries used mainly in inter-city transport.

6.18 The number of signalized traffic intersections and roundabouts (or traffic circles) produces a general indication of the extent of the effort to manage urban traffic, while the kilometres of segregated busways provide an indication of attempts to improve the efficiency of public transport and effect a modal shift. Such data should be readily available in each city, but it is necessary to ensure that all signal systems are in fact operative, as the incidence of nonfunctioning traffic lights can be very high.

6.19 In order to indicate the strength of the urban transport planning and traffic management organizations, it is useful to obtain information on the number of professionals employed, preferably by area of specialization, such as civil engineers, traffic engineers and planners. Such data are easily available and could be reported as of the beginning of a fiscal year, with, possibly, authorized positions in brackets. However, problems can arise in some cities, where civil engineers are employed on road maintenance, traffic engineering and non-transport tasks.

6.20 While the parameters listed are useful measures of traffic management, they are obviously not all-inclusive. In principle, it would be helpful to measure:

(a) parking provisions;
(b) traffic enforcement and fines;
(c) one-way streets;
(d) traffic flows in relation to road capacity; and
(e) traffic speeds.

Unfortunately, the consultants are not yet able to recommend any effective method of monitoring (a) and (b). Determination of the kilometrage of one-way streets in a city is relatively easy, but it is uncertain as to what this would prove. A high percentage of one-way streets could mean effective traffic management to speed the flow of traffic or merely a heavy incidence of very narrow streets in "old town" areas, such as was noted in the centre of Mombasa. Intensity of traffic flows and average traffic speeds would be useful indicators of street utilization and traffic congestion. Such data are usually only collected for urban transport planning studies and cannot easily be produced on a routine city-wide basis.

D. PUBLIC TRANSPORT

6.21 Before proceeding to public transport, it is useful to comment on the modal split of urban travel journeys in the cities of Sub-Saharan Africa. Modal split studies are normally conducted as a part of a major project; they are inherently difficult and their results tend to be highly sensitive to the methodologies selected. It is unrealistic at this stage to suggest either the adoption of a common methodology or the conduct of such surveys on an ongoing basis. A summary of recent studies is included in the report of the Urban Transport Sub-Sector Working Group already cited.38 Examination of this material suggests a considerable variation in methodology between cities. However, the importance of bus transport in the urban travel patterns in the large cities is very clear, with the bus accounting for 60% of person-trips in Lagos, 51% in Abidjan and 50% in Nairobi.

38 op.cit, footnote 5 of this chapter, Annex 11.
6.22 The problems of definition of microbus, minibus and bus have already been discussed in Chapter 5. The availability of bus transport in cities has often been calculated in terms of population per available bus (i.e., considering only buses that are operational and excluding those that are out of service) and in terms of population per route kilometre served by the bus network. In many African countries, population per available bus should be calculated not just in relation to buses, but to a combination of bus/minibus/microbus, with the smaller vehicles weighted in the same proportion as their capacity bears to a full-size bus. This has in fact been done in some studies and, from the countries visited in Africa for the present report, reliable data are available to allow this calculation in some cities, for example Antananarivo and Mombasa. The compilation on these lines of an index of the provision of public transport is useful. The index related to route kilometres is of more dubious value, as microbuses and minibuses do not usually run along fixed routes.

6.23 In the case of larger, parastatal bus companies, considerable information is generated internally, although the design of management information systems varies considerably. The consultants visited parastatal bus companies in Bujumbura, Kampala, Lusaka and Ouagadougou and also received very considerable information on the operations of these companies from government departments in other countries visited. The bus companies use an extensive range of physical and financial performance indicators, as well as information on traffic carried. The best systems build up their operating statistics from strong internal control systems, geared to the day-to-day needs of management. The dissemination of the best practices would, of course, be of considerable utility to public transport operators, and would also provide a firm basis for the organization of reliable statistics for this sector.

6.24 It is suggested that the following data on physical inputs and outputs are needed for analysis beyond the level of operational management:

(a) fleet size and seating capacity;
(b) employment;
(c) average daily number of passengers transported;
(d) route kilometres;
(e) vehicle kilometres; and
(f) fuel consumed.

6.25 The main operational indicators are:

(a) percentage of fleet available for service;
(b) number of staff employed by the enterprise divided by the number of available buses, to give a ratio of staff per available bus.
(c) daily vehicle kilometres per available bus;
(d) daily passengers per available bus; and
(e) average fuel usage in litres per 100 km travelled.

6.26 These operational indicators are widely used and are useful for a comparison of performance within the same bus company over time. However, comparisons between cities are often affected by geographical differences. There is also a tendency, noted for example in Lusaka and Kampala, for bus services whose original mandate was urban transport to engage

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38 The proportion of urban transport carried out by the private sector is, of course, substantial in many African cities, the primary vehicles used being mini and microbuses. This proportion is increasing significantly and is over 50% in Lagos and Nairobi, as well as in many other African cities. See “Urban Transport in Crisis”, Africa Transport, a Quarterly Newsletter of the Sub-Saharan Africa Transport Program, Number 5, August 1991, p. 1.
extensively in intercity and even international bus transport. The reasons are mainly commercial, sometimes encouraged by market distortions; the consultants were frequently informed that urban transport could never be profitable, a comment which has also been made frequently in the industrialized countries. The use of urban buses for long-distance trips can play havoc with the indicators suggested above, vastly increasing efficiency measured in vehicle kilometres per bus and fuel usage, but reducing performance in terms of passengers per bus. Although the indicators listed are usually readily available, there can be problems in interpretation.

6.27 The financial monitoring of public transport enterprises normally uses the following indicators: (a) operating revenue as a ratio of operating cost; (b) operating revenue as a ratio of total cost; (c) operating cost per available bus; and (d) operating cost per passenger/kilometre.

6.28 These financial indicators are obviously useful in assessing the financial viability of the enterprise and the cost of producing output units. The latter two indicators require deflation by a suitable price index to make comparisons over time as well as exchange rate conversions when making international comparisons. The problems of distortion to these indicators, when urban transport operators undertake considerable long-distance transport, have already been signalled.

6.29 The problem of capturing information from microenterprises in the informal transport sector was noted in Chapter 5, and the same line of reasoning applies to microenterprises in urban transport. The only feasible way of obtaining information for this important sector is through a simple sample survey, asking the operators such basic information as the bus characteristics, which route or part of town the vehicle is serving, number of trips during the last week and estimated number of passengers carried. The importance of a proper design and pre-testing of the questionnaire, as well as the need to obtain owner cooperation cannot be overemphasized. Successful survey designs and results should be disseminated.

6.30 The analysis of urban public transport in Africa would not be complete without noting the problem of pricing. On one hand, governments tend to prevent the parastatal operators from raising tariffs, thus exacerbating their deficits; on the other hand, it is claimed, not without justification, that the costs of urban transport prevent the poor from travelling to places of employment. Information on urban transport fares is required, but this is very difficult to obtain. Often the nominal fares per trip can remain stable over time, but the trip length is decreased through changes in route definitions. In the absence of transfer tickets (which are very rare in Africa), such route changes effectively increase the fare. The logical way of solving the problem is to collect fare data, both from transit companies and microenterprises, on a sample of typical long and short haul trips. In order to shed some light on the problem of accessibility and the relative burden of urban transport fares, the fares should be compared to average industrial earnings, for which statistics exist. Such earnings would likely be higher than the earnings in the informal sector, but they would at least provide a factual basis for further investigations.

E. NON-MOTORIZED TRANSPORT

6.31 Information on non-motorized transit is particularly sparse. Data summarized by the Urban Transport Sub-Sector Working Group already cited in footnote 6, showed bicycles and walking accounting for only 2.5% and 2.8% respectively of person-trips in Lagos; for 0.8% and 30.2% in Abidjan; and walking for 15% in Nairobi, with a bicycle figure not separately shown. To some extent, these differences between cities must reflect variations in survey methodology as well as real differences in travel patterns.

6.32 While recognizing the importance of non-motorized transport in urban areas, the consultants do not feel confident at this stage in listing data to be collected and indicators to be
calculated. The Urban Transport Sub-Sector Working Group has made a useful start on enumerating the problems.\textsuperscript{40} Pedestrians often have to compete for space in which to walk with motorized traffic streams and with market stalls, while frequently they are forced to walk on the roadway because of a lack of sidewalks. Overpass and protected road crossings are in short supply. There is only modest use of bicycles in African cities for passenger and freight transport. This reflects the high cost of bicycles and of imported spare parts, poor topography and lack of infrastructure. Improvement in these areas are needed and data and indicators must be assembled to monitor the progress made; however, these parameters cannot be specified in any meaningful way without further study.

F.\hspace{1em} ACCIDENTS

6.33 Road accident data required for cities are as follows, with these data distinguished by type of vehicle for more detailed analysis:

(a) number of accidents reported to the police;
(b) number of persons killed in road accidents; and
(c) number of persons seriously injured in road accidents.

Statistical problems related to road accidents have already been discussed in Chapter 5 and the comments there apply to accidents in urban areas. In respect of the data needs, outlined above, there is an obvious need to standardize definitions of accidents and serious injuries and some problems of underreporting. From discussions during the present study, the reporting of urban road traffic deaths is more complete, although there may be a need to standardize the time period in which deaths are reported between different jurisdictions. The number of deaths should probably be the main data source used for road safety analysis, but this can fluctuate randomly from one year to another. It may therefore be safer to interpret this figure as a three-year moving annual average.

6.34 The statistical indicators of road safety are obtained by expressing accidents, deaths and serious injuries as: (a) rates per 1,000 heads of population; and (b) rates per 1,000 vehicles.

The main reliance should be placed on rates calculated with respect to deaths. In addition, it may be useful to have an indicator of road traffic deaths as a percentage of total deaths or as a percentage of some subset of total deaths, e.g., road traffic deaths plus deaths from major communicable diseases.\textsuperscript{41}

6.35 The compilation of road traffic accident data appears to be reasonable in many African cities, at least in respect of fatalities. The calculations of indicators related to population and motor vehicles can then be made, although recognizing the difficulties in compiling reliable up-to-date figures both for population and motor vehicles. The consultants were able to assess the collection of road accident data in some detail in Kampala during a meeting with the Uganda Police Force. The form for reporting traffic accidents statistical data was designed many years ago, but it provides most of the data required on accident particulars, casualties, vehicles involved, cause of accident and other factors, such as weather and road conditions. A statistical code is provided for each of these sections, together with space for explanatory detail. Forms are transmitted by the Police to the National Transport Database in the Ministry of Works,

\textsuperscript{40} ibid., pp. 13-14.

\textsuperscript{41} This subset of deaths was used in *Nigeria Urban Transport in Crisis, op.cit.*, Annex 1, p. 15.
Transport and Communication and duly processed. Data are provided for Kampala and the various geographical districts of Uganda on accidents, deaths and injuries, together with rates per thousand population, and further breakdowns are available in respect of the other parameters recorded in the forms. In short, this is an impressive and well-coordinated system of data collection and data processing of road traffic accidents.

G. RECOMMENDATIONS

6.36 The following recommendations are derived from the analysis of urban transport statistics:

1. While there are good reasons for the UNTACDA II caution in determining goals and targets for this sector in the Second Decade, nevertheless the importance of urban transport requires that data needs and key statistical indicators be specified as soon as possible.

2. The analysis of urban transport should relate to individual cities, rather than to the conglomeration of urban areas within a specific country, and attention should be confined to cities of population in excess of 500,000.

3. In respect of urban roads, parameters have been specified to measure condition and functional use. The necessary steps to assure the consistency of such data are the adoption of consistent definitions and the establishment of an urban roads inventory system. Statistics of urban road expenditures are valuable, but their estimation in real terms would present substantial difficulties.

4. For traffic management, a number of straightforward statistical measures of performance have been recommended. The major problems relate to determination of the number of vehicles in each city and the development of measurement methods for more difficult parameters, such as parking provisions and traffic enforcement and fines. Collection of statistics of motor vehicles registered in urban areas will only be possible after national vehicle statistics are upgraded.

5. In respect of public transport, information on large parastatal bus companies is generally extensive, but there is still need to standardize definitions and methods of collection; the required data and key indicators are enumerated. A good case can be made to promote experienced transfer among African public transit organizations to disseminate the best existing practices.

6. It is recommended that data be collected for the informal sector of public transport, where operations are mainly by microbus or minibus, through a well-designed, simple survey.

7. A simple methodology should be developed for the collection of key urban transport fares, with these related to average industrial earnings.

8. Non-motorized urban transport is important, but it is a sector for which data are particularly scarce. It is recommended that this be rectified.

9. Road accident data for cities should be focused primarily on numbers of fatalities, which should be expressed in relation to city population and in relation to the number of vehicles, if the latter can be properly obtained.
CHAPTER 7: RAILWAY TRANSPORT

Chapter 7 discusses user requirements for railway transport data. The availability of statistical data is addressed in respect of the physical inputs used in railway operations, the physical outputs produced, the financial condition of railways and railway safety. The discussion then proceeds to the key statistical indicators needed for railway transport. Because of the extent of material relating to railways, it is possible in this chapter to give arithmetical examples of data and indicators to a degree not possible in earlier chapters and thus allow a greater understanding of the nature and limitations of the statistics to be produced.

A. USER REQUIREMENTS

7.01 The following goals and targets from the UNTACDA II document relate to railways: 42

(a) Through improvement of railway services it is expected that rail traffic will increase by 3 percent for freight and 2 percent for passengers;

(b) Availability of locomotives should be at least 70 percent of the projected total fleet at the end of the Decade, the number of breakdowns per 100,000 km should be reduced by 50 percent and average run per locomotive should be increased by 30 percent;

(c) Wagon and passenger car productivity should be increased by 30 percent;

(d) Average cost per unit/km should be reduced by 30 percent;

(e) Human resources productivity expressed in unit/km per staff should be raised by at least 40 percent;

(f) During the Decade, at least 25 percent of the existing track should be either partially or totally renovated (about 8,000 km);

(g) By the end of the Decade, every railway corporation should seek to establish formal relationships with governments through contract plan or memorandum of understanding clearly spelling out the role of the railway and the obligation of the railway and the State. Each railway plan of action should be spelt out in the corporate plan;

(h) Training courses for railway managers should be established in the four African subregions;

(i) Greater attention should be given to the environmental impact of railways;

(j) Railway safety should be increased by at least 10 percent;

(k) Development of African manufacturing capability should be accelerated.

Objectives (a) to (f) and (i) are addressed in this chapter. The four other objectives, (g), (h), (l) and (k) are important, but not relevant within the context of the present study.

7.02 This chapter examines data availability and key statistical indicators for railway transport with the objective of providing monitoring tools to measure attainment of the goals and targets specified in the UNTACDA II document. Railway managers in the various countries visited were very conscious of the need for data and indicators to manage their enterprises effectively, and the statistics required are outlined in the course of this chapter. Moreover, these managers were also making very determined efforts to obtain the information needed. Turning to data users other than railway management, there was almost a negligible response to the question of where improved or expanded data were needed in this transport mode. Unlike the situation in road transport, there is often a surfeit of statistics in railway transport, perhaps indicative of the lack of user concern in respect of railway statistics. The approach in this chapter is to identify the main statistical data and the key statistical indicators needed to monitor railway developments and to allow international comparisons.

B. STATISTICAL DATA

7.03 Of the eight African countries visited in the course of the present study, all except Burundi had railway systems. Visits were made to railway management in five countries: Kenya, Madagascar, Côte d’Ivoire, Burkina Faso and Uganda. Annual reports or the equivalent were provided in Kenya, Madagascar and Uganda. Until 1989, the railway systems of Côte d’Ivoire and Burkina Faso were completely integrated into one company. With the division of this company into the Société Ivoirienne des Chemins de Fer and the Société des Chemins de Fer du Burkina, there has been some temporary interruption in the production of statistics. Consequently, only limited data for these railways are given in this chapter, but the railways will shortly be producing data as comprehensive as the others visited. Due to time constraints, it was not possible to visit Zambia Railways, but considerable information on this system had been provided in advance. The Nigerian Railway Corporation was unable to meet with the consultants because of labor disturbances in early July 1991, caused by delays in the payment of salaries.

7.04 During the course of the discussion below on railway data and railway key statistical indicators, numerical examples are given as illustrations. As far as possible, these are taken from annual reports or similar documents produced by the railways, as it is far more efficient and accurate wherever possible to use data already produced and published by the carrier rather than seek the production of special data which may be of more interest to the statistical analyst than to the carriers themselves. The World Bank has recently collected considerable information up to 1989 for the Ethiopia Djibouti Railway, and some of this information is also used in the present chapter. It should be noted that the consultants did not visit the Union of African Railways in Kinshasa, Zaire. This is an obvious omission, but there were limits to the comprehensives of this Stage 1 study.

7.05 Railway transport data are discussed under four headings: physical inputs, physical outputs, financial performance, and accident records. (Blanks are left in statistical tables for data that are not available and dashes represent zero.) There is always a problem in determining the extent of data collection in any transport mode, as excessive detail can obscure rather than illuminate. However, it has been suggested that the data listed below on physical inputs should be expanded to include fuel consumption and other materials purchased.
B.1 **Railway Inputs**

B.1.1 **Railway Track**

7.06  Key data on railway track are given in Table 7.1.

<table>
<thead>
<tr>
<th>Countries</th>
<th>Route Kms</th>
<th>Track mts*</th>
<th>Gauge 1,000 mts*</th>
<th>Gauge 1,067 mts*</th>
<th>Gauge 1,435 mts*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ethiopia</td>
<td>781</td>
<td>781</td>
<td>781</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Kenya</td>
<td>2,065</td>
<td>2,065</td>
<td>2,065</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Madagascar</td>
<td>883</td>
<td>888</td>
<td>888</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Nigeria</td>
<td>3,512</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Uganda</td>
<td>1,240</td>
<td>1,240</td>
<td>1,240</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Zambia</td>
<td>1,266</td>
<td>1,266</td>
<td>-</td>
<td>1,266</td>
<td>-</td>
</tr>
</tbody>
</table>

* Blanks are left for data that are not available and dashes represent zero.


7.07  The key statistic in Table 7.1 is track kilometres, defined as the kilometrage of track over which the railway runs trains. Such track is generally owned by the railway, but the figures include privately owned lines, as distinct from private sidings, where the railway runs trains but does not own the line. This distinction can be illustrated from the 1988-89 Annual Report of Kenya Railways, p. 52. In addition to the main and branch lines owned and operated by Kenya Railways, Table 7.1 includes Kibini Hill Siding (19 kms) and the Magadi Branch (146 kms), which Kenya Railways operates but does not own. However, Table 7.1 does not include 670 kms of private sidings, where Kenya Railways delivers wagons but does not operate the sidings as an integral part of its system kilometrage.

7.08  Route kms are supposed to count multiple track kilometrage (e.g., double track) only once and to exclude loops and sidings; double trackage is unimportant in these countries, but the exclusion of loops and sidings has not been very effective in Table 7.1. It was the intention to identify electrified track, but none was reported in any of the countries visited. UNTACDA II gives a breakdown of the track gauges of African railways with 19 percent as 1,000 metres, 61 percent as 1,067 metres, and 15 percent as 1,435 metres.43 The countries selected for the present study were predominantly using the 1,000 metre gauge, but this bias does not cause any real difficulty in the present exercise.

7.09  Mention should be made of two problems affecting the measure of track kilometrage. Firstly, railways do not operate trackage purely for commercial reasons and are often required by governments to operate some uneconomic track for socioeconomic reasons. For example, in Madagascar the parastatal railway company RNCFM operates two independent networks, of which the second the Fianarantsoa-Manakara line carried only 14 percent of the passengers and 6 percent of the freight in 1990. Key indicators developed for RNCFM later in this chapter would be more favorable if this lower volume line were omitted. The problem of operation of

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43  *Ibid.*, p. 8. Figures were not presented for individual countries.
non-economic lines is characteristic of all railways to a greater or lesser extent and is evident in North America as well as in Africa. It is not possible to make any real adjustment for this problem in the calculations of statistical indicators for transport.

7.10 The second problem relating to railway kilometrage is best illustrated by current conditions in Uganda. Table 7.1 shows 1,240 kms of track in Uganda, but at present the Uganda Railways Corporation is operating only 508 kms, because internal disturbances in the north of the country are temporarily preventing railway operations there. It may be worthwhile to show operative kilometres separately, when there are inoperative sections on the system. The Uganda Railways Corporation also operates three ferries carrying rail cars across Lake Victoria over the equivalent of 582 kms of water and this causes a further statistical problem.

B.1.2 Railway Rolling Stock

7.11 Key data on railway rolling stock are given in Table 7.2.

<table>
<thead>
<tr>
<th>Locomotives</th>
<th>Passenger Equipment</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Total</strong></td>
<td><strong>Mainline</strong></td>
</tr>
<tr>
<td>Burkina Faso</td>
<td>35</td>
</tr>
<tr>
<td>Ethiopia</td>
<td>25</td>
</tr>
<tr>
<td>Kenya</td>
<td>219</td>
</tr>
<tr>
<td>Madagascar</td>
<td>31</td>
</tr>
<tr>
<td>Nigeria</td>
<td>209</td>
</tr>
<tr>
<td>Uganda</td>
<td>67</td>
</tr>
<tr>
<td>Zambia</td>
<td>71</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Freight Wagons</th>
<th></th>
<th></th>
<th>Carrying Capacity - tons</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Total</strong></td>
<td><strong>Railway Owned</strong></td>
<td><strong>Privately Owned</strong></td>
<td><strong>Carrying Capacity - tons</strong></td>
</tr>
<tr>
<td>Burkina Faso</td>
<td>325</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ethiopia</td>
<td>588</td>
<td>467</td>
<td>121</td>
</tr>
<tr>
<td>Kenya</td>
<td>6,490</td>
<td>668</td>
<td>92</td>
</tr>
<tr>
<td>Madagascar</td>
<td>760</td>
<td>668</td>
<td>92</td>
</tr>
<tr>
<td>Nigeria</td>
<td>7,046</td>
<td>1,638</td>
<td></td>
</tr>
<tr>
<td>Uganda</td>
<td>6,810</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Zambia</td>
<td>6,810</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Note:** Figures of passenger seat numbers and freight wagon carrying capacity have been rounded. The consultants collected figures for: Kenya - 1989; Madagascar - October/December 1990; and Uganda - 1989. World Bank data were used for: Ethiopia - 1989; Nigeria - 1987; and Zambia - 1989. Figures were also available for Burkina Faso for January 1991.
7.12 Railway rolling stock consists of locomotives, freight wagons and passenger coaches, as it was not thought necessary to extend the basic statistics to include equipment used by the railways themselves in work trains. The statistics distinguish mainline and shunting locomotives. It had been the original intention to distinguish mainline locomotives by their power sources; however, as all mainline locomotives were diesel for the six countries for which information was available, the breakdown by source of power did not seem relevant.

7.13 The total number of freight wagons should include both those owned by the railway and those that are privately owned but operating on the railway system. This gives the most appropriate measure of the carrying capacity available to carry the freight offered. However, it will be seen from the table that figures of privately owned cars are not immediately available for many railway systems.

7.14 Passenger coach numbers include simple passenger coaches, sleeping cars, restaurant and buffet cars and self-propelled railcars. It was the intention to exclude from the passenger coach fleet inspection coaches and cabooses coaches used by the railways as part of their operations and also luggage vans. It is possible that this exclusion has not been made in all the figures given in Table 7.2.

B 1.3 Railway Employment

7.15 Table 7.3 shows data on railway employment.

Table 7.3: Railway Employment

<table>
<thead>
<tr>
<th></th>
<th>Total</th>
<th>Permanent</th>
<th>Temporary</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ethiopia</td>
<td>3,690</td>
<td>2,600</td>
<td>1,090</td>
</tr>
<tr>
<td>Kenya</td>
<td>22,050</td>
<td>4,700</td>
<td>450</td>
</tr>
<tr>
<td>Madagascar</td>
<td>32,670</td>
<td>5,640</td>
<td></td>
</tr>
<tr>
<td>Nigeria</td>
<td></td>
<td>8,000</td>
<td></td>
</tr>
</tbody>
</table>

Note: Employment figures have been rounded. Data sources as in Table 7.2.

7.16 The division of employees into permanent and temporary is not given routinely by most of the railways interviewed, but this distinction is useful because temporary staff are often employed on work of a capital nature, rather than on ongoing operations. Some railways give the number of staff employed at the end of the fiscal year, for example Kenya Railways where the figures relate to 30 June, 1989. Other railways, for example Madagascar, make figures available each month. There does not seem to be a problem of seasonal fluctuation in employment, and the difference in reporting practices is probably not significant.

7.17 There are, however, greater problems in measuring relative employment between different railways caused by variations in the amount of work carried out internally within a railway organization. African railways provided substantial amounts of housing to their employees, and some staff members included in figures of railway employment are really employed in residential building and repair or as gardeners and house servants. In the case of at least two railways - Kenya and Uganda - some of the railway employees are sailors, and we return to this problem later in the chapter. If a railway contracts repair work to other railways, it can manage with smaller employment, while conversely a railway carrying out contract work for others will need an increased labor force. Finally, there is the problem that railway
employment may not reflect the staff required to run the system economically, but may be inflated by government or union pressure to maintain jobs.

B 2 Railway Output Data

B 2.1 Freight Traffic

7.18 Table 7.4 shows output data for freight traffic.

<table>
<thead>
<tr>
<th></th>
<th>Tonnes - thousands*</th>
<th></th>
<th>International</th>
<th>International %</th>
<th>Container</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Total</td>
<td>Domestic</td>
<td>International</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Burkina Faso</td>
<td>369</td>
<td></td>
<td></td>
<td>(75.7)</td>
<td>(46)</td>
</tr>
<tr>
<td>Ethiopia</td>
<td>299</td>
<td>64</td>
<td>235</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Kenya</td>
<td>3,161</td>
<td></td>
<td></td>
<td></td>
<td>270</td>
</tr>
<tr>
<td>Madagascar</td>
<td>604</td>
<td>604</td>
<td></td>
<td></td>
<td>41</td>
</tr>
<tr>
<td>Nigeria</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Uganda</td>
<td>415</td>
<td></td>
<td>414</td>
<td></td>
<td>99.6</td>
</tr>
<tr>
<td>Zambia</td>
<td>3,767</td>
<td>2,263</td>
<td>1,504</td>
<td></td>
<td>39.9</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>Tonne-kilometres - millions*</th>
<th></th>
<th>Average</th>
<th>Average</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>Haul kms*</td>
<td>kms*</td>
</tr>
<tr>
<td>Burkina Faso</td>
<td>114.2</td>
<td>(83.1)</td>
<td>309</td>
<td></td>
</tr>
<tr>
<td>Ethiopia</td>
<td>128.6</td>
<td>21.0</td>
<td>430</td>
<td>340</td>
</tr>
<tr>
<td>Kenya</td>
<td>1,826.3</td>
<td></td>
<td>578</td>
<td></td>
</tr>
<tr>
<td>Madagascar</td>
<td>210.3</td>
<td>210.3</td>
<td></td>
<td>348</td>
</tr>
<tr>
<td>Nigeria</td>
<td>305.6</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Uganda</td>
<td>90.4</td>
<td></td>
<td>218</td>
<td></td>
</tr>
<tr>
<td>Zambia</td>
<td>1,285</td>
<td>471.0</td>
<td>341</td>
<td></td>
</tr>
</tbody>
</table>

* Blanks are left for data that are not available and dashes represent zero.

Note: The consultants collected figures for Burkina Faso - 1990, with bracketed figures annual averages based on data for October 1990/May 1991; Kenya - July 1988/June 1989; Madagascar - 1990; and Uganda - 1989. World Bank data were used for Ethiopia - 1989; Nigeria - 1987; and Zambia - 1989. It was the intention also to include average carloadings in this table, but figures were only available for Kenya and Uganda.

7.19 Freight traffic handled by the railways in the countries visited is shown and the importance of international traffic is very clear. In particular, Uganda has virtually no domestic traffic; imports and exports are received predominantly by water via Jinja Pier with a much smaller international exchange by rail. Surprisingly, in view of the high quality of statistics provided by Kenya Railways, it was not possible to quantify international traffic there, but this
is obviously substantial. Container tonnages shown in Table 7.4 also form part of the total tonnage moved and are therefore not to be added to the total figures. Relative to total railway tonnage, the container element is highest in Burkina Faso. Figures of container movements are generally available by number as well as by weight, but these are not shown in Table 7.4.

7.20 Ton-kilometres of freight carried are generally used as a measure of work performed in freight transport, but it has long been recognized that this is a very imperfect measure. It is much easier for a railway to achieve an impressive performance, relating ton-kilometres to inputs used, when traffic carried is homogeneous, when average car loadings are high and when the average haul is long. Conversely, performance tends to deteriorate when these conditions do not hold. Table 7.4 recognizes this problem only to the extent that a column is shown for average length of haul.

7.21 Table 7.4 shows only ton-kilometres performed by railways in the railway mode. In the case of Kenya Railways, the ton-kilometres performed outside the railway mode are quantitatively insignificant and there is no great problem with their mission. However, the Uganda Railways Corporation performs a very substantial part of its ton-kilometres in transporting freight across Lake Victoria in the three ferries owned by the company. The omission of work performed in the marine mode therefore has a depressing effect on the performance of the Uganda Railways Corporation. We return to this problem again in section C.

B 2.2 Passenger Traffic

7.22 Table 7.5 shows data on passenger traffic.

<table>
<thead>
<tr>
<th></th>
<th>Passengers</th>
<th>Passenger-Kilometres</th>
<th>Average Distance</th>
<th>travelled - kms</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>thousands</td>
<td>millions</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Burkina Faso</td>
<td>753</td>
<td>179.3</td>
<td>238</td>
<td></td>
</tr>
<tr>
<td>Ethiopia</td>
<td>1,095</td>
<td>297.6</td>
<td>272</td>
<td></td>
</tr>
<tr>
<td>Kenya</td>
<td>3,957</td>
<td>822.5</td>
<td>208</td>
<td></td>
</tr>
<tr>
<td>Madagascar</td>
<td>2,295</td>
<td>195.9</td>
<td>85</td>
<td></td>
</tr>
<tr>
<td>Nigeria</td>
<td></td>
<td>1,491.0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Uganda</td>
<td>581</td>
<td>70.8</td>
<td>122</td>
<td></td>
</tr>
<tr>
<td>Zambia</td>
<td>1,189</td>
<td>269</td>
<td>226</td>
<td></td>
</tr>
</tbody>
</table>

Note: Sources as in Table 7.4.

7.23 Data on passenger traffic cover intercity, local and suburban traffic. In detailed analysis of railway passenger traffic, these data are separated. Because of tariff policies and government subsidies to urban transport, it is important that suburban rail traffic be separately identified. However, because of definitional problems, it is not recommended that a distinction be made between intercity and local traffic for purposes of the present study. In the case of suburban commuter traffic, figures are published for Kenya, Madagascar and Uganda, but were not readily available for other countries. The exclusion of suburban traffic would, of course, increase the average distance travelled - to 269 kms in Kenya, 92 kms in Madagascar and 160 kms in Uganda, as compared with the figures including suburban traffic in Table 7.5. The
average distance travelled by railway passengers is, of course, considerably less than the average distance travelled by freight, as shown in Table 7.4. This statement still holds, excluding suburban traffic from the passenger statistics.

B 2.3 Combined Freight and Passenger Traffic

7.24 Freight traffic and passenger traffic are jointly produced by the railways in the sense that they both use the same track and share parts of the overall administrative structure. It is therefore necessary to have a combined measure of railway output, covering both freight and passenger traffic. It has often been customary in railway operations to obtain this overall measure of traffic units simply by adding ton-kilometres and passenger-kilometres. This practice is followed in several of the railways surveyed in the present study.

7.25 However, the consultants consider that this procedure leads to an overweighting of passenger transport as against freight. Table 7.6 shows railway revenue on a unit basis from freight and passenger transport. Revenue per passenger-kilometre is far below revenue per ton-kilometre.

<table>
<thead>
<tr>
<th>Currency</th>
<th>Revenue per Ton-Km (a)</th>
<th>Revenue per Passenger-Km (b)</th>
<th>(b) as % of (a)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Burkina Faso</td>
<td>23.6</td>
<td>9.8</td>
<td>42</td>
</tr>
<tr>
<td>Ethiopia</td>
<td>12.2</td>
<td>3.8</td>
<td>31</td>
</tr>
<tr>
<td>Kenya</td>
<td>61.8</td>
<td>17.7</td>
<td>29</td>
</tr>
<tr>
<td>Madagascar</td>
<td>69.2</td>
<td>16.5</td>
<td>24</td>
</tr>
<tr>
<td>Nigeria</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Uganda</td>
<td>37.9</td>
<td>3.8</td>
<td>10</td>
</tr>
<tr>
<td>Zambia</td>
<td>79.3</td>
<td>19.7</td>
<td>25</td>
</tr>
</tbody>
</table>

Note: Data sources as in Table 7.4.

7.26 In comparing freight and passenger traffic, it can be argued that conversion to a common unit should be based on the relative costs of the two types of transport rather than on revenue received, on the grounds that costs reflect work performed. Conceptually, the argument for converting freight and passenger transport on the basis of costs is not necessarily accepted, as it can be argued equally cogently that marketing considerations as reflected in revenues are more appropriate. However, in the present context, this argument is academic as only the revenue figures are available. It has therefore been decided to combine ton-kilometres and passenger-kilometres on the basis that one ton-kilometre is equivalent to one output unit-km while one passenger-kilometre is equivalent to only half an output unit-km. This approach is already followed by some railways, but there will no doubt be future debate on the appropriateness of this combined measure.

7.27 Table 7.7 takes output units from Table 7.4 and Table 7.5 and combines them on the basis specified, where passenger-kilometres count as equivalent to half the weight of ton-kilometres.
Table 7.7: Freight and Passenger Traffic

<table>
<thead>
<tr>
<th></th>
<th>Ton-kms millions</th>
<th>Passenger-kms millions</th>
<th>Unit-kms millions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Burkina Faso</td>
<td>114.2</td>
<td>179.3</td>
<td>203.9</td>
</tr>
<tr>
<td>Ethiopia</td>
<td>128.6</td>
<td>297.6</td>
<td>277.4</td>
</tr>
<tr>
<td>Kenya</td>
<td>1,826.3</td>
<td>822.5</td>
<td>2,237.6</td>
</tr>
<tr>
<td>Madagascar</td>
<td>210.3</td>
<td>195.9</td>
<td>308.3</td>
</tr>
<tr>
<td>Nigeria</td>
<td>305.6</td>
<td>1,491.0</td>
<td>1,051.1</td>
</tr>
<tr>
<td>Uganda</td>
<td>90.4</td>
<td>70.8</td>
<td>125.8</td>
</tr>
<tr>
<td>Zambia</td>
<td>1,285</td>
<td>269</td>
<td>1,420.0</td>
</tr>
</tbody>
</table>

B.3 Financial Performance

7.28 Data on the financial performance of railways in the eight countries visited are less comprehensive than the operating statistics relating to physical inputs and outputs. As a result of the separation of the two railways in 1989, no financial data are presented for Côte d’Ivoire and Burkina Faso; for reasons already explained, financial data were not collected in Nigeria.

Table 7.8: Financial Performance

<table>
<thead>
<tr>
<th>Currency</th>
<th>Ethiopia birr million</th>
<th>Kenya shs million</th>
<th>Madagascar FMG million</th>
<th>Uganda shs million</th>
<th>Zambia kw million</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operating Income</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Freight</td>
<td>15.7</td>
<td>1,145</td>
<td>14,570</td>
<td>3,414</td>
<td>1,278</td>
</tr>
<tr>
<td>Passenger</td>
<td>11.4</td>
<td>163</td>
<td>3,279</td>
<td>314</td>
<td>54</td>
</tr>
<tr>
<td>Other commercial</td>
<td>0.9</td>
<td>103</td>
<td>4,101</td>
<td>29</td>
<td>61</td>
</tr>
<tr>
<td>Government compensation</td>
<td>—</td>
<td>100</td>
<td>323</td>
<td>—</td>
<td>(34)</td>
</tr>
<tr>
<td>Total</td>
<td>28.0</td>
<td>1,511</td>
<td>22,273</td>
<td>3,757</td>
<td>1,358</td>
</tr>
<tr>
<td>Operating Expenses</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Personnel</td>
<td>16.3</td>
<td></td>
<td>7,469</td>
<td></td>
<td>235</td>
</tr>
<tr>
<td>Fuel</td>
<td>3.9</td>
<td></td>
<td>8,945)</td>
<td></td>
<td>333</td>
</tr>
<tr>
<td>Materials</td>
<td>4.4</td>
<td></td>
<td></td>
<td></td>
<td>299</td>
</tr>
<tr>
<td>Depreciation</td>
<td>4.7*</td>
<td>297</td>
<td>3,283</td>
<td>739*</td>
<td>213*</td>
</tr>
<tr>
<td>Other</td>
<td>1.6</td>
<td></td>
<td>1,807</td>
<td></td>
<td>19</td>
</tr>
<tr>
<td>Total</td>
<td>30.9*</td>
<td>1,521</td>
<td>21,504</td>
<td>3,381*</td>
<td>1,099*</td>
</tr>
<tr>
<td>Net Operating Income</td>
<td>(2.9)*</td>
<td>(10)</td>
<td>769</td>
<td>376*</td>
<td>260*</td>
</tr>
<tr>
<td>Interest</td>
<td>152</td>
<td></td>
<td>2,051</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Exceptional items</td>
<td>—</td>
<td>221</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Surplus (deficit) *(161) (1.503)*

*Treat all asterisked figures with caution, for reasons explained in this Note.

Note: Some columns do not total precisely because of rounding. Kenya Railways data are from the Annual Report 1988-89, p. 46. Operating expenses have been adjusted to include "interim depreciation" in addition to "depreciation-wasting assets". Kenya Railways does not summarize operating expenses in accordance with the breakdown shown in Table 7.8 and the consultants were not confident that they could produce this from detailed figures given on pp. 49-52. RNCFM of Madagascar does not separately distinguish operating expenses for fuel and materials in its 1990 accounts. Income for 1990 included a large extraordinary item of 1,989 million FMG produced from a financial restructuring. Uganda Railways Corporation gives operating expenses excluding depreciation at 2,642 million shs and, on the basis of the relationship of depreciation to operating income for Kenya Railways, the consultants have estimated a depreciation figure for Uganda. Data for Ethiopia and Zambia are taken from World Bank files. Figures from this source, which are labelled both depreciation and interest, have been assigned entirely to depreciation, as this seems reasonable from the consultants' examination of more detailed figures for Kenya.

7.29 Accounting procedures for compiling financial data vary from country to country to a greater extent than the methodologies for measuring railway physical inputs and outputs. There is also the additional problem of the timing of receipts and payments in countries where inflation rates are high. The revenue heads in Table 7.8 are self-explanatory. Government compensation covers payments made to railways for performing non-economic services deemed to be in the public interest and is not supposed to include subsidy payments made to cover more general railway deficits. The negative item under this heading for Zambia should probably appear as a tax under operating expenses rather than as negative revenue. The categories of operating expenses shown in Table 7.8 were not readily available for Kenya and Uganda, but this breakdown could probably be obtained without placing major data processing demands on the railways. Depreciation requirements have to be much more clearly defined than in Table 7.8, as there must be considerable variation in depreciation practices between different railways. "Surplus (deficit)" is net operating income after the deduction of interest and exceptional items.

7.30 Financial ratios estimated from the previous table are shown in Table 7.9. In principle, these ratios should allow comparisons over time and between railways without raising problems relating to the measurement of inflation and exchange rates.

<table>
<thead>
<tr>
<th></th>
<th>Working Ratio</th>
<th>Operating Ratio</th>
<th>Surplus (Deficit)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ethiopia</td>
<td>6.4</td>
<td>(10.4)*</td>
<td></td>
</tr>
<tr>
<td>Kenya</td>
<td>19.0</td>
<td>(0.7)</td>
<td>(10.7)</td>
</tr>
<tr>
<td>Madagascar</td>
<td>18.2</td>
<td>3.5</td>
<td>(6.7)</td>
</tr>
<tr>
<td>Uganda</td>
<td>29.7</td>
<td>10.0*</td>
<td></td>
</tr>
</tbody>
</table>
Zambia 34.8 19.1*

Note: The working ratio expresses net income before depreciation as a percentage of operating income. The operating ratio expresses net income after depreciation as a percentage of operating income. Surplus (deficit) is also expressed as a percentage of operating income. See Table 7.8 for caution on asterisked figures.

7.31 The working ratio before depreciation, which measures cash flow, is the least argumentative arithmetically, as this is not affected by differences in provisions for depreciation. The operating ratio after depreciation is more meaningful in economic terms, as depreciation is a cost of doing business, but this is obviously affected by different treatments of depreciation. The final column of Table 7.9 relates the surplus (deficit) to total operating income. This measure is not too useful for comparing different railways, or even the same railway over time, because of differences in debt to equity ratios. The calculation could only be made for two railways, neither of which covered their interest payments. However, the failure to cover cost of capital for these railways is much greater than indicated in Table 7.9, because they are also paying no return on the equity component of the railway’s financing.

8.4 Railway Accidents

7.32 Railway accident data are shown in Table 7.10 for Kenya and Uganda. Similar data were also provided for Burkina Faso, but for an incomplete year. Data were not collected from other railway companies, but these would generally be available.

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Major derailments</td>
<td>16</td>
<td>7</td>
</tr>
<tr>
<td>Major collisions</td>
<td>4</td>
<td>—</td>
</tr>
<tr>
<td>Crossing accidents</td>
<td>20</td>
<td>—</td>
</tr>
<tr>
<td>Total</td>
<td>40</td>
<td>—</td>
</tr>
<tr>
<td>Deaths</td>
<td>66</td>
<td>9</td>
</tr>
<tr>
<td>Serious injuries</td>
<td>334</td>
<td>8</td>
</tr>
</tbody>
</table>

7.33 There is a need to standardize definitions before meaningful comparisons of railway accident data can be made and the Union of African Railways is currently addressing this problem. The consultants agree with the Kenyan practice of reporting only major derailments and major collisions, but the figure of crossing accidents also includes cases of property damage without any fatality or personal injury. Uganda reports both major and minor derailments, but only major derailments are included in the table. Ugandan statistics showed no collisions in 1989 and crossing accidents were not included in the Annual Statistical Digest. Neither railway indicated its definitions of major and minor.

7.34 Deaths from railway accidents are the least argumentative measure, but mortality figures are subject to considerable variation from year to year depending mainly on the incidence of
passenger train accidents. Table 7.10 includes the figure of 31 deaths due to trespassing in Kenya, but the Uganda figure probably excludes trespassing deaths. (In North America, it has been argued that trespassing deaths should be excluded from railway mortality figures on the grounds that many of these are suicides rather than the result of railway operations.) Serious injuries are often a very imperfect measure of railway safety because of variations in the definition of "serious". Looking at the ratio of serious injuries to deaths in Table 7.10, it would appear that Kenya defines serious injuries more broadly than Uganda. However, none of these measurement problems is insuperable.

C. **KEY STATISTICAL INDICATORS**

7.35 Railway managers in the various countries visited were asked which key statistical indicators they used in managing and monitoring the performance of the railways; similar questions were also asked of government departments. Many of the measures examined later in this section were used, particularly output per employee, and locomotive and wagon availability. However, the most important measure used by railway management and often by government was comparing forecasts or targets of traffic, revenues and expenses with what was actually achieved. This approach was used fairly generally, and extensive documentation was provided to the consultants in Burkina Faso, Kenya and Madagascar. While recognizing the usefulness of forecast/actual comparisons, they cannot be used as key statistical indicators, mainly because of the intractable difficulties that would be caused by variations in forecasting methodologies between different railways.

7.36 Key statistical indicators for railway transport are addressed in this section under eight headings. For #2 to #8, the letter reference refers to the relevant UNTACDA II goals and targets quoted in section A of this chapter. Key indicators under #1 do not relate to a specific UNTACDA II objective, but give an indication of the importance of railway transport in each economy. The eight headings are as follows:

1. Extent of railway activity;
2. Changes in rail traffic (a);
3. Output per person (e);
4. Average cost per unit-km (d);
5. Locomotive productivity (b);
6. Wagon and passenger car productivity (c);
7. Track condition (f); and
8. Railway safety (j).

C.1 **Extent of Railway Activity**

7.37 Data on the extent of railway activity are shown in Table 7.11.

<table>
<thead>
<tr>
<th></th>
<th>Population millions</th>
<th>Area 100,000 Sg.kms</th>
<th>Railway Track kms ratio to Population</th>
<th>Railway Track kms ratio to Area</th>
<th>Railway Output unit-kms ratio to Population</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ethiopia</td>
<td>44.8</td>
<td>12.22</td>
<td>17.4</td>
<td>63.9</td>
<td>6.2</td>
</tr>
<tr>
<td>Kenya</td>
<td>22.1</td>
<td>5.83</td>
<td>93.4</td>
<td>354.2</td>
<td>101.2</td>
</tr>
</tbody>
</table>
Madagascar  10.9  5.87  81.5  151.3  28.3
Nigeria     106.6  9.24  32.9  380.1  9.9
Uganda     15.7  2.36  79.0  525.4  8.0
Zambia     7.2  7.53  175.8  168.1  197.2

Note: Population at mid-1987 and area from World Bank, African Economic and Financial Data, Washington, 1989, p.3. Ratios relating to railway track used track km from Table 7.1 in this chapter and ratio relating to railway output used output units in millions from Table 7.7.

7.38 Table 7.11 shows the availability of railway infrastructure, measured as track, in relation to the population and the area to be served. Railway output is then related to population, where output is millions of unit-kms measured as ton-kms of freight traffic plus half the passenger-kms of passenger traffic. Although the present study does not call for the interpretation of the results of these calculations, it will be seen that railway transport is relatively most important in Zambia and Kenya. The availability of infrastructure in Uganda is somewhat exaggerated in the table, as it was explained earlier that the Uganda Railway Corporation is currently operating less than half its trackage. It may not be necessary to monitor the data shown in Table 7.11 on a yearly basis, but only update this periodically. Ideally, it would be useful to include statistics on the railway shares of freight, passenger and total traffic. However, primarily because of data problems in road transport, this must remain a long-term objective.

C.2 Changes in Rail Traffic

7.39 Data on rates of change in railway output can be presented in the format shown in Table 7.12 for each country, with initial figures averaged for 1989-91 to smooth out some of the random year-to-year variations.

<table>
<thead>
<tr>
<th>Freights Ton-Kms</th>
<th>Passenger-Kms</th>
<th>Unit-Kms</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>annual change (%)</td>
<td>annual change (%)</td>
</tr>
</tbody>
</table>

Ethiopia
1989-91 average
1992

Rates of change: 1989-91 to (latest available year)
Cumulative percent
Compounded annual percent
7.40 The annual percentage rate of change shown in the body of Table 7.12 relates to each year compared with the previous year, e.g., 1996 will be compared with 1995 and not with the initial 1989/91 average. At the foot of the table, the cumulative percent rate of change would show the current year compared with 1989/91, e.g., 1996 would be expressed as a percentage of the base period 1989-91. The compounded annual rate of change would then be estimated, e.g. in the case of 1996 allowing for the lapse of six years since 1990 (the mid-point of 1989-91). UNTACDA II calls for rail traffic increases of 3 percent per annum for freight and 2 percent per annum for passenger traffic. Although this could be monitored on a year-to-year basis from Table 7.12, main reliance should be placed on the calculation of the compounded annual percent rate of growth to avoid random year-to-year variations, often attributable mainly to macro-economic conditions.

C.3 Output Per Person

7.41 Railway output per employee is shown in Table 7.13. The denominator for this calculation is total railway employment taken from Table 7.3. Ideally, this denominator should exclude staff charged to capital projects to give a better measure of operational productivity; however, the figures to be excluded may be difficult to calculate.

<table>
<thead>
<tr>
<th>Country</th>
<th>Thousand unit-kms per employee</th>
<th>% change from 1989-91 to latest year</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ethiopia</td>
<td>75.2</td>
<td>latest year</td>
</tr>
<tr>
<td>Kenya</td>
<td>101.5</td>
<td>actual</td>
</tr>
<tr>
<td>Madagascar</td>
<td>65.6</td>
<td>target</td>
</tr>
<tr>
<td>Nigeria</td>
<td>32.2</td>
<td></td>
</tr>
<tr>
<td>Uganda</td>
<td>22.3</td>
<td></td>
</tr>
<tr>
<td>Zambia</td>
<td>177.5</td>
<td></td>
</tr>
</tbody>
</table>

Note: *The figures in this column are not 1989-91 averages, but are derived for various years as indicated from data in Tables 7.3 and 7.7. Averages for 1989-91 should be substituted when available.

7.42 Table 7.13 calculates railway output per employee. A base period of 1989-91 is chosen for the reasons indicated earlier in this section and the latest available year is then shown. Taking as an example the year 1996, the output per employee for that year would be shown in the column headed "latest year" and the actual percent change would be calculated for 1996 as against the 1989-91 average. UNTACDA II specifies an increase in "human resources productivity" of at least 40 percent. For the year 1996, the target column of Table 7.13 would therefore show 24 percent, calculated as 4 percent per annum for the six years from the mid-point of 1989-91 to 1996.

7.43 Table 7.13 give a measure of change in labor productivity within a national railway company, although government or union pressure can sometimes prevent railway management from reducing employment levels and this obviously reacts adversely on output per employee. In addition, if macroeconomic conditions cause a reduction in traffic, this is almost inevitably
accompanied by declining labor productivity, as it is not possible to adjust employment immediately to follow fluctuations in demand. The figures in Table 7.13 are much more difficult to use in making comparisons between countries. Output measured in unit-kms does not allow for differences in traffic mix, car loadings and length of haul between different railway systems. Nevertheless, the extent of variation shown in the table is disturbing from a statistical standpoint.

C.4 Average Cost per Unit-Km

7.44 Average cost per unit-km should include not only current expenses but also the cost of capital employed in the railway industry. In order to calculate cost of capital, there would have to be a policy recommendation on the revaluation of railway assets, since policies on the various railways differ widely. At present, it is not feasible to estimate the cost of capital, and Table 7.14 is therefore limited to operating expenses, with these defined to include depreciation. However, the consultants have some reservations as to whether a high priority should be attached to attempting to standardize the valuation of railway assets; the task is enormous and not necessarily justified by the usefulness of the results.

<table>
<thead>
<tr>
<th>Currency</th>
<th>1989-91*</th>
<th>1989-91 prices</th>
<th>% change from 1989/91 in real terms</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ethiopia</td>
<td>11.1</td>
<td>11.1</td>
<td></td>
</tr>
<tr>
<td>Kenya</td>
<td>68.0</td>
<td>68.0</td>
<td></td>
</tr>
<tr>
<td>Madagascar</td>
<td>69.8</td>
<td>69.8</td>
<td></td>
</tr>
<tr>
<td>Uganda</td>
<td>26.9</td>
<td>26.9</td>
<td></td>
</tr>
<tr>
<td>Zambia</td>
<td>77.4</td>
<td>77.4</td>
<td></td>
</tr>
</tbody>
</table>

Note: *The figures in this column are not 1989-91 averages, but are derived for various years as indicated from data in Tables 7.3 and 7.7. Averages for 1989-91 should be substituted when available.

7.45 The 1989/91 average is again suggested as the base for this table, and it is necessary to take future figures of expense per unit-km and convert these back to 1989-91 prices. The choice of the most appropriate price deflator is not discussed at length in the present study; while a price index relating to railway inputs may be conceptually the most suitable, in practice it may be necessary to use either a Consumer Price Index or an Implicit Price Deflator for GDP. The table shows the reduction in average expense in real terms between 1989-91 and the latest available year. The target calls for a reduction in average expense per unit-km of 30 percent over the decade, which is interpreted roughly as 3 percent per annum. Thus, by 1996, six years after the mid-point of 1989-91, the target decrease in average expense per unit-km is 18 percent.

7.46 It was pointed out in the discussion of railway output per employee that any deterioration in macroeconomic conditions would normally produce a deterioration in output per employee, as the railway cannot adjust immediately to declining demand. This same caveat applies to average expense per unit-km. Table 7.14 does not allow comparisons of average expense
between railways and exchange rate conversions would be necessary for this. Exchange rate conversions are often possibly misleading, when exchange rates do not necessarily reflect purchasing power parities and cost differences between different economies. Further problems are created when there is a substantial difference between a country's official exchange rate and rates available on an informal basis. At this stage, exchange rate conversions have not been included in Table 7.14, but this may be necessary in due course.

7.47 Although UNTACDA II does not specifically require any other financial measures, financial ratios would also be helpful. Table 7.9 showed working and operating ratios and these two figures should be used as key indicators. The working ratio before depreciation indicates the extent to which the railway's revenues are adequate to cover ongoing expenses, while the operating ratio after depreciation includes the replacement of assets. After meeting current expenses and depreciation, the railway still has to provide a return on capital in the form of interest on debt and a return to equity. Measurement of the required return to capital for each individual railway would be a lengthy task, and it is not recommended that this be attempted. A more feasible solution would be to prescribe overall targets for working and operating ratios, but the present study does not attempt to determine these targets.

C.5 Locomotive Productivity

7.48 Key data for locomotives are presented in Table 7.15, with all data relating to mainline locomotives and excluding locomotives used in shunting. The key indicators are those required by UNTACDA II. The availability ratio expresses the number of locomotives available for service as a percentage of the total number of locomotives in the fleet. A locomotive breakdown is defined as a lack of motive power for at least an hour and a calculation is made of the number of breakdowns per 100,000 km of locomotive miles performed. The average run per locomotive is the number of kilometres per available locomotive per annum. Ethiopia, Nigeria and Zambia are omitted from the last two parts of the table; the relevant material was not collected, but it is available. (In due course, it may be necessary to add indicators on fuel consumption and maintenance costs to the measures of locomotive productivity.)

<table>
<thead>
<tr>
<th>Table 7.15: Mainline Locomotives</th>
</tr>
</thead>
<tbody>
<tr>
<td>1989-91*</td>
</tr>
<tr>
<td>average</td>
</tr>
<tr>
<td><strong>Mainline Locomotive Availability - % (Target 70%)</strong></td>
</tr>
<tr>
<td>Ethiopia</td>
</tr>
<tr>
<td>Kenya</td>
</tr>
<tr>
<td>Madagascar</td>
</tr>
<tr>
<td>Nigeria</td>
</tr>
<tr>
<td>Uganda</td>
</tr>
<tr>
<td>Zambia</td>
</tr>
<tr>
<td><strong>Mainline Locomotive Breakdowns per 100,000 kms-number (Target 50% reduction)</strong></td>
</tr>
<tr>
<td>Kenya</td>
</tr>
<tr>
<td>Madagascar</td>
</tr>
<tr>
<td>Uganda</td>
</tr>
</tbody>
</table>
Available Mainline Locomotive Average Annual Distance Traveled-thousand kms. (Target 30% improvement)

<table>
<thead>
<tr>
<th>Country</th>
<th>Distance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kenya</td>
<td>94.3</td>
</tr>
<tr>
<td>Madagascar</td>
<td>112.8</td>
</tr>
<tr>
<td>Uganda</td>
<td>34.5</td>
</tr>
</tbody>
</table>

Note: *The figures in this column are not 1989-91 averages, but 1989 figures for all countries except Nigeria, which is 1987. Averages for 1989-91 should be substituted when available.

7.49 There is no guarantee that the data presented in Table 7.15 have all been collected on the same basis and according to the same definitions. There is need for a "glossary of standard terms". For example, the percentage of mainline locomotives available for service should be calculated only with respect to the stock of locomotives that are potentially available for service. This stock figure should not include locomotives that are defective or outdated to the point that they will never run again. This procedure is not followed by all railway companies. Madagascar appears to have written off defective locomotives from its stock and this is the desired approach. However, some 25% of the locomotive fleet of Kenya Railways are non-operational and should be excluded from the locomotive stock. If this were done, the availability percentage in Kenya would increase to 64% (calculated as 48% of 75%). A similar problem exists in Uganda and probably in Nigeria, but data are not available to allow quantification.

7.50 In measuring the incidence of locomotive breakdowns, the figures of kilometres travelled appear to be reasonably accurate, but there is always a risk that minor breakdowns will not be reported. The consultants are not convinced that any great improvement can be achieved in this reporting and the indicator must be treated with caution.

7.51 The average annual distance travelled by mainline locomotives is, quite correctly, calculated by railways only in respect of those locomotives that are available for service. This indicator would appear to be the most accurate of those shown in Table 7.15. However, the performance of the Uganda Railways Corporation is adversely affected by the low average length of haul and by the use, in 1989, of many mainline locomotives for shunting where kilometrage generated is inevitably lower.

C.6 Wagon and Passenger Car Productivity

7.52 Freight wagon availability and average freight ton-kilometres per wagon are shown in Table 7.16.

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Ethiopia</td>
<td>85</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Kenya</td>
<td>85</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Madagascar</td>
<td>82</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Nigeria
Uganda
Zambia 90

**Average Freight Ton-Kilometres per Wagon-thousands per annum (Target 30% improvement)**

<table>
<thead>
<tr>
<th>Country</th>
<th>1989-91</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ethiopia</td>
<td>218.7</td>
</tr>
<tr>
<td>Kenya</td>
<td>281.4</td>
</tr>
<tr>
<td>Madagascar</td>
<td>276.7</td>
</tr>
<tr>
<td>Nigeria</td>
<td>43.4</td>
</tr>
<tr>
<td>Uganda</td>
<td>55.2</td>
</tr>
<tr>
<td>Zambia</td>
<td>188.7</td>
</tr>
</tbody>
</table>

*Note:* *The figures in this column are not 1989-91 averages and should be replaced with 1989-91 averages when available. Wagon availability figures are 1989 for Ethiopia, Kenya and Zambia and 1990 for Madagascar. Average freight tonne-kilometres per wagon is calculated from Tables 7.2 and 7.4.*

7.53 Wagon availability is much higher than locomotive availability shown in Table 7.15, and has therefore not been specified as a key indicator.

7.54 Average freight ton-kilometres per wagon is calculated as total railway ton-kilometres divided by the number of wagons, including all wagons both available and unavailable. UNTACDA II calls for a 30 percent improvement in wagon productivity, a most realistic measure for monitoring this target. Nevertheless, the differences in present performance will be noted, differences which are great when comparing the two extremes of Kenya and Nigeria. Average freight-ton kilometres per wagon can be improved by railway management as a result of greater wagon availability, improved wagon cycles, increased distance travelled per day and higher carloadings. However, the total volume of freight carried by the railway obviously affects this measure, and this can vary from year to year due to macroeconomic conditions which cannot be influenced by railway management.

7.55 Data on passenger coach availability and average passenger-kms per coach are shown in Table 7.17.

**Table 7.17: Passenger Coaches**

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>average</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Coach Availability - %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ethiopia</td>
</tr>
<tr>
<td>Kenya</td>
</tr>
<tr>
<td>Madagascar</td>
</tr>
<tr>
<td>Nigeria</td>
</tr>
<tr>
<td>Uganda</td>
</tr>
</tbody>
</table>
Zambia 50

Average Passenger-Kilometres per Coach-thousands (Target 30% improvement)

Ethiopia 6,470
Kenya 3,213
Madagascar 3,211
Nigeria 2,249
Uganda 796
Zambia 3,202

Note: *The figures in this column are not 1989-91 averages and should be replaced with 1989-91 averages when available. Coach availability was only available for two countries, both for 1989. Average passenger-kilometres per coach is calculated from Tables 7.2 and 7.5.

7.56 Coach availability figures are not widely available, and it thus may be necessary to abandon this indicator. Average passenger-kilometres per coach can be used to monitor the UNTACDA II target of a 30 percent increase in passenger car productivity. However, the measure is imperfect, as productivity would apparently improve with increased coach size and with increased overcrowding of passengers on existing coaches.

7.57 The variability in average passenger-kilometres per coach will be noted. Ethiopia is extremely high, but the consultants were not able to check on the reasons for this. Uganda has very poor performance, but civil disturbances in the north prevent operation of more than half the railway’s network. Uganda could show a massive increase in productivity from a resumption of operations throughout the country, but this is a factor beyond the control of railway management, illustrating the limitations of key statistical indicators.

C.7 Track Condition

7.58 With respect to track, UNTACDA II requires that at least 25 percent of the existing track be either partially or totally renovated over the decade. Renovation needs definition before this concept can become operational, but this should not present any overwhelming difficulty. A table could then be set up showing existing track length, as already given in Table 7.1, and documenting the kilometres renovated each year. Track maintenance costs could also be monitored but the resulting indicators are often ambivalent: low costs per km could mean low traffic volume, efficient maintenance practices, or unjustified deferred maintenance.

7.59 It would be possible to set up a table of intensity of track usage simply by dividing the unit-kilometres of output given in Table 7.7 by the track kilometres of each railway given in Table 7.1. The results are in terms of thousand unit-kilometres per kilometre of track as follows: as expected, by far the most intensely used railway systems are Zambia (1,122) and Kenya (1,084). Far behind these leading railways come three systems with very similar intensity of track use - Ethiopia (355), Madagascar (347) and Nigeria (299). The Uganda ratio is very low (101), for reasons already given earlier. A key indicator table could easily be developed for unit-kilometres per kilometre of track. However, this may not be very useful, as changes in railway output are already captured by the key indicators outlined in Table 7.12 and length of track does not normally change significantly from year to year.
C.8 Railway Safety

7.60 Railway accident data were given in Table 7.10, but the material collected was very sparse. Since accidents must be related to the level of railway activity, it is proposed that unit-kilometres of output, as shown in Table 7.7, be used as the denominator for establishing accident rates. Although it can be argued that train-kilometres are a more suitable denominator for collisions and railway crossing accidents, the advantages from departing from unit-kilometres do not justify the additional calculations. The UNTACDA II requirement of a 10 percent improvement in railway safety should therefore be measured in terms of railway accidents and railway fatalities expressed as a ratio to unit-kilometres of work performed.

D. RECOMMENDATIONS

7.61 Because of the ready availability of railway transport statistics, there is always a danger that too much material can swamp the most relevant comparisons. The present chapter has specified railway data and key statistical indicators required at national and international levels for monitoring and planning the evolution of the mode. Given the quantity of statistics easily available, the chapter has presented a considerable number of arithmetical examples in the hope of providing a more hands-on illustration of some of the pitfalls that must be faced. Examples have been given of lack of comparability of data between different railways, together with some suggestions for improvement, but the study has not attempted an in-depth examination of the quality of railway data. The consultants are well aware that these quality limitations exist; nevertheless, the statistical documentation of railway activity is much more extensive than in most other modes, and the consultants warn against any undue allocation of resources to improving railway data, if this should be at the expense of failing to fill the more glaring data gaps identified for road vehicles and urban transport in Chapters 5 and 6.

7.62 The recommendations from this examination of railway transport are:

1. Data should continue to be collected on the physical inputs used by railways - track, rolling stock and employment - and the physical outputs of freight and passenger traffic, with international traffic clearly distinguished. Extensive data on railway transport are already available, but care must be taken to ensure that definitions are standardized and that data are collected on a comparable basis.

2. Data should continue to be collected on railway financial performance and on railway accidents. The information available is generally less satisfactory than that for physical inputs and outputs, and efforts are needed to standardize and improve measurement.

3. The statistical indicators relevant to the goals and targets of UNTACDA II should be developed, with particular care taken in respect of the difficulties involved in comparing the indicators between countries.

4. The development of railway data and indicators should, of course, proceed in full cooperation with other work currently underway in this area. This includes the work of the Railway Transport Sub-Sector Working Group set up for UNTACDA II; the efforts to harmonize railway statistics carried out by the Union of African Railways; and the UNCTAD project, Advance Cargo Information System (ACIS), which includes generation of railway operations and management data for selected African countries.
CHAPTER 8: AIR TRANSPORT

This chapter commences with a discussion of ICAO and the need for air transport statistics, followed by a discussion of data availability and data problems. The performance of African airlines is reviewed with a considerable number of arithmetical examples and key statistical indicators are suggested. In view of the extensive collection of air transport data by ICAO, it is recommended that future improvements in aviation statistics be based on the ICAO system.

A. USER REQUIREMENTS

8.01 The goals and targets specified in the UNTACDA II Programme for air transport are as follows:

(a) Implementation of phases I, II and III of the Yamoussoukro Declaration from now to the end of the Decade in line with the schedule established, that is: phase I: two years, phase II: three years, phase III: three years, taking account of the fact that, in certain cases, it may not be necessary to pass through each phase;

(b) Maintaining the operating costs of African airlines as much as possible in the neighborhood of the world average and not exceeding 10 percent of that average;

(c) Managing airlines to increase the number of viable airlines established following regrouping and implantation of the measures recommended in the Yamoussoukro Declaration;

(d) Management of airports and air space to increase the number of autonomous airport and joint air space management authorities;

(e) Improving the African traffic network by increasing frequencies between pairs of towns, reducing flight time, coordinating and rationalizing flight schedules;

(f) Replacement of fleet of aircraft through the existing or future financing mechanisms;

(g) Improvement of air traffic services so as to enhance crew efficiency and passenger safety;

(h) Increasing the level of implementation of the ICAO Air Navigation Plan for Africa and Indian Ocean Region (AIF);

(i) Improvement of airport infrastructure by reducing the number of accidents and incidents associated with deficiencies of airport infrastructure, installations, facilities and services;

(j) Improvement and strengthening of African civil aviation training centres;

(k) Improvement of facilitation and preparation of regulations that take the needs of users into account;

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Improvement of air transport safety and security by reducing the number of acts of unlawful interference against civil aviation.

A.1 Context

8.02 Although air transport accounts for a rather small part of total transport work, it is of considerable importance to transport planning and economic management.

(a) Air transport provides the principal passenger transport interregional and intercontinental links and is of crucial importance for the development of tourism.

(b) In many cases, air cargo provides an important means for resupplying spare parts and makes possible exports of certain high value, perishable products, especially when backhaul capacity exists.

(c) In Moslem countries, air transport plays an important part in facilitating religious pilgrimages; in countries where labor migration is important, it provides the needed link between the emigrants and their home countries.

(d) Air transport is useful as the means of maintaining links between the metropolitan facilities and outlying areas.

(e) Air transport is a major consumer of foreign currency: the equipment and parts for aircraft, aids to navigation and ground facilities are virtually totally imported; fuel is either imported or exportable; much of the advanced training and equipment overhaul are carried out outside the countries (although some significant progress has been made in establishing African training and overhaul bases).

(f) Given the international dimension of air transport and relatively low route densities, management of bilateral and multilateral arrangements in Africa is both important and difficult.

8.03 The above listing helps to identify the users of aviation statistics. These are:

(a) Airlines and air transport infrastructure management: control of operations, market development and corporate planning.

(b) Governments: resource allocation, performance monitoring and estimation of future resources needs.

(c) Financing and aid institutions: identification and assessment of needs, project evaluation, policy and performance monitoring.

(d) Tourist industry: monitoring development trends in air transport capacity and tariffs, as well as planning of tourist marketing and market development.

(e) Air transport policy administrators: bilateral and multilateral agreements.

8.04 Most of the users of aviation statistics are fairly sophisticated, aware of data needs, and capable of using detailed data. Of course, considerable differences exist between different countries and different airlines, but if the objective of improved management and productivity of airlines is achieved, one can expect increased demand for information and improvement in the quality of data supplied.
A.2 International Civil Aviation Organization

8.05 For a great number of years, the International Civil Aviation Organization (ICAO) has pursued programs of standardization of aviation information and collection of internationally comparable air transport statistics. An impressive system of centralized data collection and dissemination has been developed. Obviously, the existing system is not without shortcomings. The major criticisms have been:

(a) Airline financial reporting framework does not reflect the advances in airline accounting. However, the system has the advantage of simplicity and different existing accounting systems can be easily translated into the ICAO framework.

(b) ICAO publications tend to be considerably retarded. This is the result of slow and often irregular reporting by individual countries and airlines, while correction of misreported data is extremely time consuming.

(c) ICAO statistical publications, as a result of universal coverage, tend to be voluminous and thus not easy to use. Clearly, regional digests would be shorter and easier to use and, in fact, the publication of an African aviation compendium in now being considered.

8.06 However, the ICAO system has a number of advantages:

(a) It has existed for many years, thus it enjoys the benefits of experience and continuity.

(b) Over the years, a very competent and experienced statistical section has been developed; the work of the ICAO Secretariat is further improved by the expert inputs from member countries.

(c) ICAO has developed a useful network of relationships with national aviation authorities, which helps in following up inquiries and reducing reporting errors. Within the resources of the organization, ICAO has been implementing technical assistance programs, including statistical workshops, which have been appreciated by the national specialists.46

8.07 For the above reasons, the improvements of aviation statistics should be built up on the basis of the existing ICAO system and should preserve the achieved advances in standardization of norms and information systems.

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46 As part of the present study, two workshop reports were reviewed, conducted in Dakar in May 1981 and April 1991, respectively. The 1981 workshop was attended by 20 participants from eight countries; the 1991 workshop by 18 participants from nine countries. Both workshops were of less than a week in duration. The major thrust of the workshops was the resolution of reporting difficulties. The 1981 workshop dealt largely with airline reporting forms; also, some basic concepts of airline statistics were presented with examples. The 1991 workshop reviewed airline reporting forms, as well as airports and route facilities forms. The following remarks at the conclusion of the 1991 workshop are worth quoting:

The workshop raised the question of training for states in the field of statistics. It was pointed out that an analysis of States’ training requirements had been examined by the Tenth Meeting of the Statistics Panel in 1980 and that the results were being reviewed by ICAO in the wider context of technical co-operation. The meeting insisted that ICAO needed to do more in this very important area if the statistical expertise of the region was to evolve. (Report on the Regional Meeting on Aviation Statistics, Dakar, 15-19 April, 1991, STAW/32 p. S.)
8.08 In view of ICAO experience in international statistical collection, staff composition of the statistics division is interesting. Currently, the division has an authorized strength of seven professionals (including the Division Chief), eleven clerical and semi-professional officers and two secretaries. The division is responsible for data collection and publications as well as for the technical assistance program of statistical workshops. The functions of the division are not confined to information "flow-through", that is receiving, storing and publishing the data. In fact, a large part of the effort is spent on liaison with the producers of statistics, resolving their difficulties, correcting the data and attempting to improve timeliness of the reports. A proper performance of such functions requires considerable professional skills and experience, which are reflected in position classifications. The size of the ICAO statistics division is roughly comparable to the size of aviation statistics unit within Statistics Canada, and it is larger than any transport statistics unit in the countries visited during the present review.

8.09 In addition to ICAO — which is an intergovernmental organization — other international bodies are active in this field, particularly the International Air Transport Association (IATA) and African Airlines Association (AFRAA). IATA statistical activities are confined to association members, that is the scheduled airlines involved in international air transport, and IATA publishes valuable statistical bulletins. However, it should be noted that IATA and ICAO activities in the statistical field are coordinated and that IATA participates, as an active observer, in the meetings of the ICAO statistical division. Thus IATA and ICAO systems should be considered as complementary rather than competitive. A number of multilateral and bilateral projects and programs provide financial and technical assistance on infrastructure, e.g., airports, navigational aids, etc.

8.10 The explanation for the development of international statistical systems in the airline industry and the existence of direct relations between airlines and aviation authorities with ICAO is based on the inherent internationalization of most aviation activities. By definition, international airlines serve more than one country. A common framework of approval and/or exchange of traffic rights is obviously desirable; aircraft, airports and navigation aids are subject to consistent rules regarding safety, operating limitations and certification of common operating standards; and interline arrangements, such as joint ticketing, require the existence of a common document (ticket, airbill) and a system of multi-airline clearings. Standardization of the basic documents and records leads to international standardization of statistical definitions. By its very nature, the system is global, rather than regional in scope. It may still be necessary to have national, bilateral, subregional and regional arrangements to deal with specific sets of problems, but such arrangements should be fitted into the international framework, which is already functioning.

B. STATISTICAL DATA

B.1 Data Problems

8.11 The airlines follow the ICAO statistical and financial reporting system. However, many airlines, normally the smaller ones and those in the state of reorganization, do not properly report the data. The reasons are managerial and administrative rather than the complexity of the reporting system. The extent of the problem is illustrated below, with data from the ICAO Statistics Program's Progress Report for the second quarter of 1991:

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48 The level of statistical and financial reporting of small Canadian air carriers has always been somewhat more detailed than that prescribed by ICAO yet no reporting difficulties have been encountered, even before the advent of electronic data processing.
Table 8.1: Delinquent and Not Reported Status, 1991

<table>
<thead>
<tr>
<th></th>
<th>Western and Central Africa</th>
<th>Eastern and Southern Africa</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Sched. Airlines</td>
<td>Airports</td>
</tr>
<tr>
<td>Reports due</td>
<td>24</td>
<td>33</td>
</tr>
<tr>
<td>Delinquent &amp; not reported</td>
<td>21</td>
<td>24</td>
</tr>
<tr>
<td>% delinquency</td>
<td>87.5</td>
<td>72.7</td>
</tr>
</tbody>
</table>

The difference between Western and Central and Eastern and Southern Africa is largely explained by the differences in airline and country sizes; in francophone Africa, the dominant airline is Air Afrique, usually coexisting with small local airlines, whose reporting records tend to be poor.47

8.12 In the case of inter-airline employment and labor productivity comparisons, the problem arises in establishing the scope of airline operations. For example, consider two airlines: airline A does extensive overhaul and aircraft servicing work for others; airline B relies to a great extent on aircraft overhaul and services performed outside. Consequently, airline A would have higher employment in the maintenance and ground servicing departments than airline B. Only with rather sophisticated systems of time keeping can the functions of maintenance done on its own aircraft and performed for others on a contract basis be disaggregated. With a proper accounting system, the problem can be overcome if "services purchased from outside" and "non-flying revenues" are properly recorded, which is not always the case. In other words, in comparing different enterprises care must be taken to properly define the scope of their respective operations.

8.13 Obviously, only statistics of the airlines domiciled in a country can be reported through the national aviation authorities. For example, the activities of Air Afrique, a consortium of francophone African airlines, can be reported only through the airline’s head office for the group of countries and not by the individual national authorities.

8.14 Small domestic airlines may experience some reporting difficulties. However, the main problem is not related to the complexity of the reporting forms, which are quite simple, if the ICAO scheme is followed, but to the problems of internal accounting and record keeping, as well as to the reluctance of smaller private carriers to report their commercial results. The reporting capacity of small aircraft operators is quite limited; however, their transport role is also limited. In order to obtain basic information on the activities of small carriers, minimal reporting requirements should be imposed, such as number and types of aircraft licensed and operated and hours flown.

8.15 A similar problem relates to the private charter operators. The lack of information on these carriers may have serious consequences: a carrier’s solvency should be of interest to national aviation authorities given the potential problems arising if passengers are stranded at a foreign airport due to the airline’s financial failure. Some charter carriers are incapable of reporting passenger-km carried, for example, if the whole aircraft capacity is chartered by another organization and the carrier does not issue individual tickets. However, aircraft hours,

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47 This statement does not imply that the statistical reporting of all small airlines is inadequate. Nevertheless, there is a tendency for the quality of reporting to decline for smaller airlines because of less sophisticated administrative arrangements.
by aircraft type, and the total number of passengers should be reported, as well as the airline's financial results. It appears that the principal reason for the poor reporting record of African non-scheduled carriers is due to the lack of sensitivity of governments to the importance of knowledge about this sector of civil aviation.

8.2 Traffic Flows

8.16 Airline traffic flow statistics are useful for the following applications: (a) Monitoring of market developments; (b) Bilateral and multilateral negotiations; and (c) development of tourism.

8.17 There are serious limitations affecting the collection of Origin-Destination information from carriers not domiciled within a country. The basic document from which Origin-Destination data are compiled is the ticket, or a sample of tickets. This document is processed within the airline's head office; if the head office is outside the country's frontiers, this information cannot be obtained through the application of national laws.

8.18 ICAO collects information on traffic flow by sectors, that is traffic carried between points on an airline's route ("On-Flight Origin and Destination" and "Traffic by Flight Stage"; these statistics do not provide "true" Origin and Destination, as they do not provide information on the initial destination of a passenger whose trip involves changing flights.) However, this information is of considerable value for the analysis of route densities of the existing networks and for planning competitive network extensions.

8.19 Related statistics are collected through the airports: in the countries surveyed, the airlines are required to report arriving, departing and in-transit traffic by flights. This information is available to the airlines' station managers and thus can be requested and controlled by the national authorities. Examples of internal statistical systems necessary to support international reporting systems are reproduced in Appendix 3.

8.20 A potentially rich source of data is available through the immigration or tourist office authorities on entry to the country. Indeed, in all African countries visited, form completion and form control are quite extensive. However, as illustrated in Appendix 3, the design of the forms often leaves much to be desired, although some standardization of forms exists in francophone countries. To prevent the loss of this potentially valuable information, current attempts to promote a well designed, standardized form should be pursued, together with an efficient system of coding and processing. The airlines favor the simplest common system, which would relieve them of the obligation of carrying a number of different forms. Less pressure exists on the immigration and customs authorities to standardize the forms, while many tourist authorities fear that some important data would disappear through standardization. The resolution of the problem requires not only international cooperation, but also the cooperation of different users of forms within each country. The value of an upgraded system both for air transport monitoring and for tourist planning is evident.

8.3 Airports

8.21 The basic airport reporting form has been developed by ICAO. The form is satisfactory and the reporting difficulties are restricted to capital investment items; unfortunately, as shown in Table 8.1, this does not imply that the extent of reporting is satisfactory.

8.22 Normally, airport authorities require simple reporting from airline stations of incoming, departing and in-transit traffic, by flights and often by hours. This information is useful both for traffic monitoring and terminal planning. Traffic control towers keep a current record of aircraft movements. This should be considered as authoritative since it is integrated into the controller's
activities and has potential legal status as evidence of the controller’s handling of a particular flight. Processing of the information is straightforward. Another set of useful data would be a simple inventory of basic airport characteristics such as length, width and type of pavement of runways; approach and traffic control systems; runway lighting; and capacity to handle aircraft up to a certain size. These data, presented according to standard international specifications, are easily obtainable; nonetheless, there is some virtue in having them presented in a single, consistent tabulation.

B.4 Price Statistics

8.23 Collection of airline price statistics can be quite complex. The standard, aggregate measures of "revenue per passenger km" and "revenue per ton-km" obscure the differences between price levels prevailing on different routes. Such differences are related, to some extent, to costs and traffic density: for example, a short-haul route is likely to have higher per traffic unit costs than a long-haul one; a route with low traffic density is more expensive per passenger-km than a high density route; the directional traffic imbalance may result in very low rates for backhaul traffic, thus depressing the average yield. Secondly, a different mix of premium (First, Business) and economy classes, as well as between standard and promotional fare traffic, also affects average traffic revenues.

8.24 A more satisfactory method of obtaining price information is through periodic surveys of tariffs usually based on published airline tariffs. Although tariff publications provide a well arranged basis for such surveys, the survey design requires expert knowledge of tariff making and traffic composition. International comparisons of fares and rates on selected city pairs are published in the ICAO Survey of International Air Transport Fares and Rates (1990 publication containing 1989 data: Circular No. CIR 224). The number of city pairs analyzed could usefully be expanded.

C. REVIEW OF THE RESULTS

8.25 In the following paragraphs the structure and performance of civil aviation in Sub-Saharan Africa will be reviewed as a general indication of the findings which can be derived.

C.1 Airline Sizes

8.26 In view of the existing reporting problems, the data for a large proportion of smaller African airlines are not available; thus, the following table is biased towards larger carriers.

<table>
<thead>
<tr>
<th>Airline</th>
<th>Revenue Ton-km</th>
<th>Operating Revenues</th>
<th>Value of Fleet (after depreciation)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(millions)</td>
<td>(USD 1,000,000)</td>
<td>(USD 1,000,000)</td>
</tr>
<tr>
<td>Air Burundi</td>
<td>NR</td>
<td>6.9</td>
<td>NR</td>
</tr>
<tr>
<td>Air Ivoire</td>
<td>6.7</td>
<td>7.6</td>
<td>NR</td>
</tr>
<tr>
<td>Ethiopian</td>
<td>278.6</td>
<td>NR</td>
<td>199.0</td>
</tr>
<tr>
<td>Ghanair</td>
<td>52.5</td>
<td>NR</td>
<td>0.3</td>
</tr>
<tr>
<td>Airline</td>
<td>Total Revenue (US$)</td>
<td>Operating Expenses (US$)</td>
<td>Net Profit (US$)</td>
</tr>
<tr>
<td>-------------------------</td>
<td>---------------------</td>
<td>--------------------------</td>
<td>-----------------</td>
</tr>
<tr>
<td>Kenya Airways</td>
<td>206.3</td>
<td>250.8</td>
<td>167.8</td>
</tr>
<tr>
<td>Lesotho Airways</td>
<td>3.2</td>
<td>1.2</td>
<td>5.0</td>
</tr>
<tr>
<td>Air Madagascar</td>
<td>69.0</td>
<td>78.7</td>
<td>75.4</td>
</tr>
<tr>
<td>Air Malawi</td>
<td>10.1</td>
<td>8.7</td>
<td>20.1</td>
</tr>
<tr>
<td>Air Mauritius</td>
<td>229.8</td>
<td>182.3</td>
<td>NR</td>
</tr>
<tr>
<td>LAM (Mozambique)</td>
<td>38.7</td>
<td>70.7</td>
<td>NR</td>
</tr>
<tr>
<td>Nigeria Airways</td>
<td>112.1</td>
<td>30.6</td>
<td>118.0</td>
</tr>
<tr>
<td>Air Rwanda</td>
<td>0.0</td>
<td>NR</td>
<td>NR</td>
</tr>
<tr>
<td>Somali Airlines</td>
<td>31.2</td>
<td>NR</td>
<td>NR</td>
</tr>
<tr>
<td>Air Tanzania</td>
<td>18.8</td>
<td>22.0</td>
<td>22.1</td>
</tr>
<tr>
<td>Air Afrique</td>
<td>341.5</td>
<td>NR</td>
<td>401.3</td>
</tr>
<tr>
<td>Air Zaire</td>
<td>112.5</td>
<td>86.3</td>
<td>96.4</td>
</tr>
<tr>
<td>Zambia Airways</td>
<td>115.5</td>
<td>31.1</td>
<td>NR</td>
</tr>
<tr>
<td>Affretair (Zimbabwe)</td>
<td>56.6</td>
<td>50.8</td>
<td>17.4</td>
</tr>
<tr>
<td>Air Zimbabwe</td>
<td>80.8</td>
<td>NR</td>
<td>NR</td>
</tr>
</tbody>
</table>

**Notes:** NR = not reported; NA = not available in required detail; a first 9 months only; b fiscal year ending March 31; c eight months only; d three months only; e January and February only; f January-October; g three months only.


**Observation:** Incomplete and absent reports may be filled later as the result of Statistics Division inquiries. Such addenda and corrections will appear in subsequent volumes or in separate addenda sheets.

8.27 Of the three size indicators, only total revenue ton-km is consistently usable. The value of the fleet after depreciation tends to be inconsistently reported and, in some cases, maybe misleading in view of the widespread practice of aircraft leasing and the wide variation of terms of such leases. Using revenue ton-km as a size indicator, it is clear that only the four largest African airlines, with annual revenue ton-km production of over 200 million, would fall into the category of medium- or even small-medium size by international standards. Airlines with revenue ton-km in the range of 50-200 million could be considered small, the rest as very small. This size distribution explains, to some extent, the poor reporting capacity of the majority of airlines. Nevertheless, knowledge of small carriers and the environment in which they operate is quite important. In addition to small size, the minor carriers tend to be based in places far from major centers of aviation activity, which affects their regular access to spare parts and access to well-developed maintenance facilities. In advanced countries, there is easy access to overhaul facilities, spare parts distributors, training centers, etc. — this is not the case for small African carriers. A combination of remoteness and small size affects productivity and also has important implications on the need for outside technical assistance, the planning of which requires adequate data on their operations.

C.2 **International Traffic**

8.28 The relative importance of international traffic is indicated in Table 8.3.
Table 8.3: Relative Importance of International Traffic

<table>
<thead>
<tr>
<th>Airline</th>
<th>International traffic as % of total revenue ton-km</th>
</tr>
</thead>
<tbody>
<tr>
<td>Air Ivoire</td>
<td>58.5</td>
</tr>
<tr>
<td>Ethiopian</td>
<td>89.0*</td>
</tr>
<tr>
<td>Ghanair</td>
<td>99.2</td>
</tr>
<tr>
<td>Kenya Airways</td>
<td>92.9</td>
</tr>
<tr>
<td>Lesotho Airways</td>
<td>85.4</td>
</tr>
<tr>
<td>Air Madagascar</td>
<td>83.3</td>
</tr>
<tr>
<td>Air Malawi</td>
<td>78.0</td>
</tr>
<tr>
<td>Air Mauritius</td>
<td>99.6</td>
</tr>
<tr>
<td>LAM (Mozambique)</td>
<td>68.0</td>
</tr>
<tr>
<td>Nigeria Airways</td>
<td>68.2</td>
</tr>
<tr>
<td>Air Rwanda</td>
<td>50.0*</td>
</tr>
<tr>
<td>Somali Airlines</td>
<td>97.4*</td>
</tr>
<tr>
<td>Air Tanzania</td>
<td>52.9</td>
</tr>
<tr>
<td>Air Afrique</td>
<td>100.0*</td>
</tr>
<tr>
<td>Air Zaire</td>
<td>66.2</td>
</tr>
<tr>
<td>Zambia Airways</td>
<td>95.9</td>
</tr>
<tr>
<td>Affretair (Zimbabwe)</td>
<td>100.0</td>
</tr>
<tr>
<td>Air Zimbabwe</td>
<td>85.8*</td>
</tr>
</tbody>
</table>

* 1989 only

Source: calculated from ICAO, op.cit.

8.29 The importance of international traffic is evident. Unfortunately, the data available do not permit the segregation of international traffic into intercontinental and intraregional. From the point of view of statistical system design, the importance of international traffic implies the need for more detailed traffic flow data and obtaining maximum utility from immigration or tourist reporting.

C.3 Traffic Density

8.30 Traffic density is one of the most important factors in assessing airline performance. The measures usually used are:

- Traffic per station;
- Passenger-km and ton-km produced per kilometre flown;
- Passenger-km and ton-km per kilometre of scheduled airline routes; and
- For the analysis of specific routes or route segments, traffic flow by flight stages is, by far the most appropriate; consolidated airline data provide not only traffic
density information for a particular airline, but also for other airlines flying over this route segment.

8.31 The present ICAO statistical system does not permit calculation of traffic per station. The second best method is to estimate the number of scheduled departures per station using airline timetables (or listed in the ABC Guide). This method has a number of obvious disadvantages: it cannot easily make adjustments for type and capacity of equipment used, nor does it account for extra sections and flight cancellation, unfortunately not uncommon on some African routes.

8.32 Unduplicated route kilometrage can also be estimated from airline flight schedules, but such estimates require many assumptions. For the analysis of particular routes, the ICAO publication "Traffic by Flight Stages" is the best source, subject, of course, to the problems imposed by imperfect reporting.

8.33 However, the user of airline statistics, desirous of a quickly and easily calculated measure, is forced to use the least satisfactory indicator, namely passenger-km and ton-km per kilometre flown. The results of such calculations are presented in Table 8.4.

<table>
<thead>
<tr>
<th>Airline</th>
<th>Passenger-km per km flown</th>
<th>Ton-km per km flown</th>
</tr>
</thead>
<tbody>
<tr>
<td>Air Ivoire</td>
<td>41.7</td>
<td>0.7</td>
</tr>
<tr>
<td>Ethiopian*</td>
<td>71.2</td>
<td>11.1</td>
</tr>
<tr>
<td>Ghanair</td>
<td>94.9</td>
<td>12.3</td>
</tr>
<tr>
<td>Kenya Airways</td>
<td>102.6</td>
<td>13.1</td>
</tr>
<tr>
<td>Lesotho Airways</td>
<td>21.9</td>
<td>2.4</td>
</tr>
<tr>
<td>Air Madagascar</td>
<td>84.4</td>
<td>12.9</td>
</tr>
<tr>
<td>Air Malawi</td>
<td>41.2</td>
<td>4.3</td>
</tr>
<tr>
<td>Air Mauritius</td>
<td>152.4</td>
<td>19.1</td>
</tr>
<tr>
<td>LAM (Mozambique)</td>
<td>105.4</td>
<td>11.8</td>
</tr>
<tr>
<td>Nigeria Airways</td>
<td>62.6</td>
<td>7.2</td>
</tr>
<tr>
<td>Air Rwanda*</td>
<td>8.5</td>
<td>1.0</td>
</tr>
<tr>
<td>Somali Airlines*</td>
<td>88.5</td>
<td>11.7</td>
</tr>
<tr>
<td>Air Afrique</td>
<td>112.7</td>
<td>20.4</td>
</tr>
<tr>
<td>Air Zaire</td>
<td>70.4</td>
<td>7.8</td>
</tr>
<tr>
<td>Zambia Airways</td>
<td>97.4</td>
<td>11.3</td>
</tr>
<tr>
<td>Affretrai (Zimbabwe)</td>
<td>n/a</td>
<td>24.5</td>
</tr>
<tr>
<td>Air Zimbabwe*</td>
<td>82.7</td>
<td>8.7</td>
</tr>
</tbody>
</table>

* 1989 only

Source: ICAO, op.cit.
8.34 It can readily be seen that African airlines fall into two distinct groups: small carriers, using low capacity planes and producing less than 50 passenger-km per kilometre flown; and those operating intercontinental and major intracontinental routes with traffic passenger-km per kilometre flown of 70 and more. Nigeria Airways, operating an extensive domestic network, lies inbetween. The second group's results are not different from those of medium size South American or European airlines. However, it should be kept in mind that passenger-km or ton-km per kilometre flown are imperfect measures of traffic density, as they do not take into account flight frequency and station utilization.

8.35 As already noted, for analytical purposes, these average data should be supplemented by information obtained from the ICAO publication "Traffic by Flight Stages" which includes number of flights, aircraft capacity and traffic (passengers, freight and mail). Unfortunately, in many cases, the statistics are incomplete due to inadequate reporting of what should be a relatively simple compilation of data easily available from key documents. One can hope that, with growing sophistication of African airline management, this gap will be closed.

C.4 Average Length of Haul and Average Load

8.36 Other key airline data are average haul and average load factors. These are reproduced for passenger traffic in Table 8.5.

<table>
<thead>
<tr>
<th>Airline</th>
<th>Average length of haul (km)</th>
<th>Average load factor (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>System</td>
<td>International</td>
</tr>
<tr>
<td>Air Ivoire</td>
<td>670</td>
<td>950</td>
</tr>
<tr>
<td>Ethiopian*</td>
<td>2,468</td>
<td>3,467</td>
</tr>
<tr>
<td>Ghanair</td>
<td>1,648</td>
<td>1,879</td>
</tr>
<tr>
<td>Kenya Airways</td>
<td>1,959</td>
<td>3,242</td>
</tr>
<tr>
<td>Lesotho Airways</td>
<td>267</td>
<td>699</td>
</tr>
<tr>
<td>Air Madagascar</td>
<td>1,250</td>
<td>4,438</td>
</tr>
<tr>
<td>Air Malawi</td>
<td>670</td>
<td>1,102</td>
</tr>
<tr>
<td>Air Mauritius</td>
<td>4,337</td>
<td>4,488</td>
</tr>
<tr>
<td>LAM (Mozambique)</td>
<td>1,926</td>
<td>3,352</td>
</tr>
<tr>
<td>Nigerian Airways</td>
<td>1,234</td>
<td>2,574</td>
</tr>
<tr>
<td>Air Rwanda*</td>
<td>168</td>
<td>242</td>
</tr>
<tr>
<td>Somali Airlines*</td>
<td>2,777</td>
<td>2,950</td>
</tr>
<tr>
<td>Air Tanzania</td>
<td>714</td>
<td>1,789</td>
</tr>
<tr>
<td>Air Zaire</td>
<td>2,018</td>
<td>4,435</td>
</tr>
<tr>
<td>Zambia Airways</td>
<td>2,667</td>
<td>4,465</td>
</tr>
<tr>
<td>Air Zimbabwe</td>
<td>1,303</td>
<td>2,674</td>
</tr>
</tbody>
</table>

* 1989 only
8.37 Again, two distinct groups of carriers are noted: the small carriers with low traffic density per kilometre flown are also the airlines with short average length of haul. Their characteristics are not dissimilar to those of domestic carriers in larger countries. Since these airlines, although modest in size, perform useful transport functions, imperfections of the statistical coverage of this group should be a matter of concern. The solution to this problem is in the hands of national governments.

C.5 Airport Statistics

8.38 Airport statistics show considerable differences between airports.

<table>
<thead>
<tr>
<th>Country/Airport</th>
<th>Passengers Handled (000)</th>
<th>Freight (000 tons)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Burundi</td>
<td>nr 65 nr 64</td>
<td>nr 6.1 nr 6.1</td>
</tr>
<tr>
<td>Bujumbura</td>
<td></td>
<td>Cameroon</td>
</tr>
<tr>
<td>Cameroon</td>
<td></td>
<td>Doula 436 nr 256 nr 14.3 nr 13.7 nr</td>
</tr>
<tr>
<td>Doula</td>
<td></td>
<td>Côte d’Ivoire Abidjan 849 nr 766 nr 29.7 nr 14.2 nr</td>
</tr>
<tr>
<td>Abidjan</td>
<td></td>
<td>Ghana Accra 325 762 299 751 16.9 16.9 15.4 16.9</td>
</tr>
<tr>
<td>Ghana</td>
<td></td>
<td>Kenya Mombasa 680 nr 377 nr 4.9 nr 3.8 nr</td>
</tr>
<tr>
<td>Mombasa</td>
<td></td>
<td>Nairobi 1,519 nr 1,151 nr 44.2 nr 43.1 nr</td>
</tr>
<tr>
<td>Nairobi</td>
<td></td>
<td>Lesotho Maseru 67 58 45 36 ... ... ... ...</td>
</tr>
<tr>
<td>Lesotho</td>
<td></td>
<td>Madagascar Antananarivo 328 nr 141 nr 8.7 nr 8.6 nr</td>
</tr>
<tr>
<td>Maseru</td>
<td></td>
<td>Malawi Lilongwe 239 233 165 157 6.1 6.7 6.3 4.6</td>
</tr>
<tr>
<td>Madagascar Antananarivo</td>
<td></td>
<td>Mozambique Beira 98 108 7 7 6.5 4.9 0.0 0.1</td>
</tr>
<tr>
<td>Lilongwe</td>
<td></td>
<td>Maputo 339 373 161 183 3.7 3.4 1.4 1.4</td>
</tr>
<tr>
<td>Beira</td>
<td></td>
<td>Nigeria Karo 339 nr 122 nr 6.7 nr ... nr</td>
</tr>
<tr>
<td>Maputo</td>
<td></td>
<td>Lagos 1,910 nr ... nr 19.7 nr ... nr</td>
</tr>
<tr>
<td>Location</td>
<td>Operations</td>
<td>Passengers</td>
</tr>
<tr>
<td>---------------</td>
<td>------------</td>
<td>------------</td>
</tr>
<tr>
<td>Port Harcourt</td>
<td>368 nr</td>
<td>25 nr</td>
</tr>
<tr>
<td>Uganda</td>
<td>160 nr</td>
<td>130 nr</td>
</tr>
<tr>
<td>Entebbe</td>
<td>108 nr</td>
<td>33 nr</td>
</tr>
<tr>
<td>Tanzania</td>
<td>423 nr</td>
<td>211 nr</td>
</tr>
<tr>
<td>Lusaka</td>
<td>676 590 nr</td>
<td>399 nr</td>
</tr>
<tr>
<td>Zimbabwe</td>
<td>925 1,016 nr</td>
<td>623 nr</td>
</tr>
</tbody>
</table>

nr = not yet reported; ... = not available

Source: ICAO, op. cit.

8.39 Of the airports listed, only four can be regarded as major airports - Lagos, Nairobi, Harare and Abidjan. Addis Ababa and Dakar, for which data were not available, would also qualify as major airports, raising the number to six.

8.40 Further analysis of data, using the ratio of in-transit traffic to total international incoming and outgoing traffic, would be helpful to identify the existing "hubs" of the African air transport system. The relative importance of air cargo is also of some interest - in general African airports, especially in landlocked countries tend to have more developed air cargo traffic than airports of similar size in other parts of the world. This observation indicates the need for in-depth studies of the role of air cargo in the African provisioning system.

D. **KEY INDICATORS**

D.1 **National Airline Performance**

8.41 Meaningful assessment of airline performance requires employment of a number of interrelated measures. The most widely employed ones are noted below:

(a) Total traffic carried and its distribution among main traffic categories (scheduled, international and domestic; non-scheduled; passengers and cargo). Traffic characteristics: average length of haul and measurements of traffic density, such as passengers and cargo per aircraft km.

(b) Useful derived statistics, already compiled by ICAO, are: load factors, utilization (hours per aircraft), and revenues per passenger-km and per ton-km.

(c) Aircraft operating costs per hour by aircraft type.

(d) Partial productivity indicators, such as passenger-km and ton-km per employee, must be handled with considerable care in order to take account of the different
scope of operations of various airlines, especially in respect of contracting practices for services. 

(e) Total factor productivity estimates are more difficult to obtain and are normally very sensitive to the assumptions used. A review of total factor productivity studies indicates an extremely wide diversion and inconsistency of results obtained by different highly competent investigators. It is therefore not suggested that this be pursued for Sub-Saharan Africa at this time.

D.2 Airport Performance

8.42 An assessment of airport traffic and financial statistics is needed:

(a) Comparative data on airport traffic are useful for the assessment of future investment needs and monitoring the relative importance of various hubs. The ratios of in-transit to total traffic, intercontinental to subregional, and international to domestic traffic are also interesting from the point of view of interairport comparison.

(b) Because of the importance of airports as consumers of foreign currency inputs and the large investments required, monitoring of the financial statistics of different airports is needed.

(c) It would also be useful to produce comparative data on user charges applicable at different airports. This information should be easily available.

E. RECOMMENDATIONS

8.43 A basic, functioning civil aviation statistics system already exists in ICAO. No case exists for the development of a parallel African system. Also the idea of "double reporting" — that is standard forms to be forwarded simultaneously to ICAO and ECA — should be rejected. At best, "double reporting" would amount to the duplication of data processing effort and would probably be counterproductive: two organizations dealing independently with delays and errors of reporting would produce confusion, while the independent data correction and editing systems would undoubtedly create inconsistencies, bringing both systems into question.

8.44 However, the production of a digest of African civil aviation statistics based on ICAO's statistical system has some merit and should be explored. Indeed, ICAO and AFCAC (African Civil Aviation Conference) are currently studying the production of a "Compendium of African Aviation Statistics". Also the African Airlines Association (AFRAA) has embarked on the establishment of an African airlines data bank which will rely on ICAO and IATA provided information. Possibly, ECA could become a user of the AFRAA data bank.

8.45 In general, one should be careful in distinguishing between a data bank, based on information collected by other organizations, and a data bank based on an original data collection system. The first type of the data bank is a matter of convenience or facilitation of in-house

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An illustration of the effects of different contracting practices in the airline maintenance field and of the importance of maintenance work performed for others is provided by ICAO figures of mechanics and maintenance workers as a percentage of the airline labour force. This shows considerable differences between African airlines; in 1989, this figure was 42.3 percent for Ethiopian Airlines, 38.0 percent for Air Madagascar, 26.8 percent for Nigerian Airways, 14.7% for Air Tanzania, and 10.6 percent for Zaire.
analytical activities. With the widespread use of electronic data processing, powerful microcomputers and intercomputer communication, data banks of this type are becoming more common and are an obviously sensible extension of the "information library" concept. On the other hand, data banks established from independent data collection activities are justified only if such independent data gathering activities are absolutely necessary. In that case, the dangers of duplication should be carefully considered.

8.46 The following recommendations are derived from the analysis of aviation statistics:

1. The ICAO system already exists and does not need to be duplicated.

2. The currently considered "Compendium of African Aviation Statistics" would enhance the use of ICAO statistics in African countries, and this initiative should be encouraged.

3. The present system should be supplemented by a system of passenger origin statistics derived from immigration/tourist forms collected at airports. The first important step in this direction would be standardization and improvement of existing forms. It is recommended that this work, including the establishment of a system of transferring the results into a common center, begin on a subregional basis.

4. Standardized information on airport charges should be developed and published.

5. ICAO should be encouraged to increase the number of city-pairs for which tariff data are analyzed.
CHAPTER 9: PORTS, SHIPPING AND INLAND WATERWAYS

This chapter, which deals primarily with ports, first discusses user requirements for port data, followed by physical inputs used in port operations, physical outputs produced, financial condition of ports, and port safety and damage claims. Key statistical indicators needed for ports are then specified. The two final sections of this chapter address shipping and inland waterways, however only in a very preliminary fashion.

A. USER REQUIREMENTS

9.01 UNTACDA II was critical of the "severe shortage of basic information on all aspects of the activities" of port transport and "the lack of current information on the main performance indicators (such as port productivity, cargo transit time in ports, costs per ton of cargo handled, losses due to damage, pilfering and other factors)." In the opinion of the consultants, this evaluation of port data is somewhat harsh although information gaps are identified later in this chapter. UNTACDA II concluded with "largely qualitative targets" for ports:48

(a) To increase the productivity of African seaports;
(b) To reduce the time both ships and cargo spend in ports;
(c) To reduce cargo losses due to damage and pilfering;
(d) To reduce port costs per ton of cargo handled; and
(e) To improve the maintenance of port equipment so that the down time of equipment is reduced.

9.02 Statistical data and indicators are, of course, compiled by port management and used for performance analysis and planning. The relevant statistics are discussed below. However, port statistics appear to be used less by the commercial sector and by government than those relating to the rail and highway modes. This is not surprising, given that all port users have an interest in land surface transport modes, while all users of land transport are not necessarily involved in ports. Moreover, shipping companies and port agents often do not make much use of official statistics, partly because they already have an in-depth knowledge of the industry, and partly because the official statistics are often published too late to be of use in day-to-day decisionmaking. Nevertheless, two commercial operators in marine transport did say that more timely publication of statistics with more detailed breakdowns would be useful in establishing market sizes for different activities. In Burkina Faso, extensive information is collected by the Conseil Burkinabè des Chargeurs on transit traffic through Abidjan and Lome, apparently meeting major data requirements.

9.03 The approach adopted by the consultants was to examine individual ports rather than the entire ports systems of the various countries. The criterion adopted for including a port in the examination was an annual handling of imports and exports of at least one million tons. In the eight countries visited, the following ports qualified. (It should be noted that Calabar is far below the cargo threshold and is included only to facilitate statistical reconciliation when the Nigerian Ports Authority gives statistics for the whole system rather than for individual ports.)


60 Ibid., p. 81.
Table 9.1: Ports in Countries Visited

(traffic in thousand tons)

<table>
<thead>
<tr>
<th>Country</th>
<th>Port</th>
<th>Imports</th>
<th>Exports</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Côte d'Ivoire</td>
<td>Abidjan</td>
<td>5,775</td>
<td>4,063</td>
<td>9,838</td>
</tr>
<tr>
<td>Kenya</td>
<td>Mombasa</td>
<td>5,200</td>
<td>1,996</td>
<td>7,239</td>
</tr>
<tr>
<td>Madagascar</td>
<td>Toamasina</td>
<td>876</td>
<td>346</td>
<td>1,222</td>
</tr>
<tr>
<td>Nigeria</td>
<td>Lagos</td>
<td>6,463</td>
<td>411</td>
<td>6,874</td>
</tr>
<tr>
<td></td>
<td>Rivers</td>
<td>1,445</td>
<td>3,075</td>
<td>4,520</td>
</tr>
<tr>
<td></td>
<td>Delta</td>
<td>796</td>
<td>1,086</td>
<td>1,882</td>
</tr>
<tr>
<td></td>
<td>Calabar</td>
<td>56</td>
<td>44</td>
<td>100</td>
</tr>
<tr>
<td></td>
<td>Oil Terminals</td>
<td>—</td>
<td>73,505</td>
<td>73,505</td>
</tr>
</tbody>
</table>

Note: Data are for 1990 for Abidjan and Toamasina, and 1989 for all other ports. Abidjan from Port Autonome d'Abidjan, Rapport d'Exploitation 1990; all figures exclude the Fishing Port, which handled 411,000 tons in 1990. Mombasa from Kenya Ports Authority, Annual Bulletin of Port Statistics 1989; figures include 43,000 tons of transhipment traffic, which should not be confused with transit traffic. Toamasina from Société d'Exploitation du Port de Toamasina. Nigerian figures provided by Nigerian Ports Authority. Lagos comprises Apapa and Tin Can Island; Rivers comprises Port Harcourt, Federal Lighter Terminal, Okrika and Merryland; Delta comprises Warri, Koko and Sapele; Calabar is only Calabar; Oil Terminals comprise Bonny on-shore (8 percent of crude oil lifted) and seven off-shore terminals (92 percent of crude oil lifted).

9.04 Of the eight African countries visited in the course of the present study, only four had deep sea ports. The study included four landlocked countries - Burkina Faso, Burundi, Uganda and Zambia. Two of these countries, Burundi and Uganda, have lake transport facilities and the consultants visited the Port of Bujumbura on Lake Tanganyka in Burundi. The total handling of import and export traffic at this port is modest, amounting to 202,000 tons in 1990 (but some further comments are offered below in section F).

9.05 Abidjan dominates the overseas trade from Côte d'Ivoire, although San Pedro may also be included in this table in the future, as import and export shipments amounted to 991,000 tons in 1989. Mombasa is dominant in Kenya, and the handlings of smaller ports are almost negligible. Toamasina handled the bulk of Madagascar's overseas trade. Sixteen smaller ports together handled a total of only 648,000 tons in 1989. All of the major ports of Nigeria are included in Table 9.1.

9.06 The consultants visited the ports of Abidjan, Mombasa and Lagos. Annual reports were provided for all ports, together with much useful verbal information. Although only the headquarters of the Nigerian Ports Authority in Lagos was visited, the data provided related to all Nigerian ports. Although the consultants did not visit the Port of Toamasina, considerable statistical information was made available on the operation of the port.
B. **STATISTICAL DATA**

9.07 Port data are discussed under four headings: physical inputs, consisting of infrastructure and staff; physical outputs of traffic and ships handled; financial performance; and damage and missing cargo claims and accident records.

B.1 **Port Inputs**

9.09 Table 9.2 shows port berths. Figures for deep-water berths include container berths, which are also shown separately in the table. Tanker berths are shown only by number as they are locations where oil is pumped in or out of a tanker, and the concept of berth length is not too meaningful. The table does not include the Nigerian crude oil terminals which move massive amounts of crude oil, but most off-shore terminals can load only one vessel at a time. A more complete breakdown of berths than shown in Table 9.2 would include a separate category for dry bulk berths.

<table>
<thead>
<tr>
<th></th>
<th>Deep-Water Berths</th>
<th>Container Berths</th>
<th>Tanker Berths-No.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>No.</td>
<td>Length (m)</td>
<td>No.</td>
</tr>
<tr>
<td>Abidjan</td>
<td>28</td>
<td>4,500</td>
<td>4</td>
</tr>
<tr>
<td>Mombasa</td>
<td>16</td>
<td>3,044</td>
<td>3</td>
</tr>
<tr>
<td>Toamasina</td>
<td>4</td>
<td>706</td>
<td></td>
</tr>
<tr>
<td>Lagos</td>
<td>36</td>
<td>6,560</td>
<td>6</td>
</tr>
<tr>
<td>Rivers</td>
<td>8*</td>
<td>1,390*</td>
<td>*</td>
</tr>
<tr>
<td>Delta</td>
<td>15</td>
<td>2,740</td>
<td></td>
</tr>
<tr>
<td>Calabar</td>
<td>6</td>
<td>1,310</td>
<td></td>
</tr>
</tbody>
</table>

* Incomplete

**Note:** Container berths are also included in deep-water berths. Abidjan, Mombasa and Toamasina sources as in Table 9.1. Toamasina data exclude three cabotage berths and there is no specialized container berth. Nigerian data are from Nigerian Ports Authority Handbook 1989 and relate to March 31, 1989. However, Rivers is incomplete and shows only Port Harcourt for deep-water berths, as inadequate information was available for the Federal Lighter Terminal.

9.09 For deep-water berths, the average quay length varied between the 161 metres of Abidjan and the 218 metres of Calabar, where the new port, constructed in 1979, contains three unusually long berths. For the three ports where container facilities are shown, there is hardly any variation in berth length.

9.10 Table 9.3 gives data relating to cargo handling equipment and employment in the various ports. Data have not been published for Abidjan, but would be fairly easily available. The equipment categories are admittedly too broad and a more detailed breakdown will ultimately be required, especially to show equipment used for container handling.
### Table 9.3: Cargo Handling Equipment and Employment

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Mombasa</td>
<td>146</td>
<td>102</td>
<td>237</td>
<td>11,025</td>
</tr>
<tr>
<td>Toamasina</td>
<td>3</td>
<td>10</td>
<td>79</td>
<td>2,581</td>
</tr>
<tr>
<td>Lagos</td>
<td>162</td>
<td>426</td>
<td>162</td>
<td>11,682</td>
</tr>
<tr>
<td>Rivers</td>
<td>16*</td>
<td>70*</td>
<td>121*</td>
<td>3,543</td>
</tr>
<tr>
<td>Delta</td>
<td>15</td>
<td>154</td>
<td>37</td>
<td>1,990</td>
</tr>
<tr>
<td>Calabar</td>
<td>21</td>
<td>60</td>
<td>35</td>
<td>1,170</td>
</tr>
</tbody>
</table>

* Incomplete

**Note:** Sources as in Table 9.1, but Toamasina data are for 1989. Employment data for Nigerian ports are as of December 31, 1987, from Nigerian Ports Authority 1987 Annual Report. Nigerian employment excludes 1,619 persons employed at headquarters and at the London and Kano offices. (The inclusion of equipment and employment in a single table is for ease of presentation and does not imply any causal relationship.)

9.11 As indicated in section C below, the condition of port equipment is of considerable concern in Sub-Saharan Africa. This is highlighted in the 1987 Annual Report of the Nigerian Ports Authority (p. 27). As of December 31, 1987, availability of plant in Nigerian ports was only 20 percent for portal cranes, 10 percent for mobile cranes, 20 percent for forklift trucks, and 18 percent for tractors (p. 30, with figures also shown on an individual port basis). No other port provided figures on availability of cargo equipment.

9.12 Employment figures can obviously vary depending on how much work is carried out by port employees and how much is contracted to outside companies. Mombasa has been an operating authority port, responsible for cargo handling since December 19, 1985, and the employment count in Table 9.3 is a complete measure of the staff used to operate the port. At the opposite extreme, Abidjan is a landlord authority report, with all its cargo handling carried out by private companies; even if figures had been collected on employment by the Port Autonome d’Abidjan, this would not have given a full count of the labor resources used. The other ports appear to be closer to the Mombasa model than to that of Abidjan, but the consultants are not prepared to guarantee the complete accuracy of this statement.

### B.2 Port Outputs

9.13 Port outputs are measured in terms of tons of cargo and number of ships handled. Deep-sea ports are no longer important for passenger traffic and are not reported in the study.

9.14 Table 9.4 presents cargo throughput at the various ports; data for Abidjan and Toamasina are for 1990 and for all other ports, 1989.
### Table 9.4: Cargo Throughput

<table>
<thead>
<tr>
<th></th>
<th>General Cargo</th>
<th>Containers</th>
<th>Dry Bulk</th>
<th>Liquid Bulk</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Imports</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Abidjan</td>
<td>675</td>
<td>490</td>
<td>1,214</td>
<td>3,396</td>
<td>5,775</td>
</tr>
<tr>
<td>Mombasa</td>
<td>1,261</td>
<td>584</td>
<td>251</td>
<td>3,104</td>
<td>5,200</td>
</tr>
<tr>
<td>Toamasina</td>
<td>389</td>
<td>n/a</td>
<td>54</td>
<td>433</td>
<td>876</td>
</tr>
<tr>
<td>Lagos</td>
<td>1,828</td>
<td>940</td>
<td>496</td>
<td>3,199</td>
<td>6,463</td>
</tr>
<tr>
<td>Rivers</td>
<td>187</td>
<td>94</td>
<td>345</td>
<td>819</td>
<td>1,445</td>
</tr>
<tr>
<td>Delta</td>
<td>201</td>
<td>24</td>
<td>425</td>
<td>145</td>
<td>795</td>
</tr>
<tr>
<td>Calabar</td>
<td>11</td>
<td>7</td>
<td>-</td>
<td>37</td>
<td>55</td>
</tr>
<tr>
<td><strong>Exports</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Abidjan</td>
<td>707</td>
<td>831</td>
<td>760</td>
<td>1,765</td>
<td>4,063</td>
</tr>
<tr>
<td>Mombasa</td>
<td>288</td>
<td>681</td>
<td>498</td>
<td>529</td>
<td>1,996</td>
</tr>
<tr>
<td>Toamasina</td>
<td>129</td>
<td>n/a</td>
<td>127</td>
<td>90</td>
<td>346</td>
</tr>
<tr>
<td>Lagos</td>
<td>123</td>
<td>271</td>
<td>-</td>
<td>17</td>
<td>411</td>
</tr>
<tr>
<td>Rivers</td>
<td>46</td>
<td>21</td>
<td>305</td>
<td>2,704</td>
<td>3,076</td>
</tr>
<tr>
<td>Delta</td>
<td>30</td>
<td>40</td>
<td>8</td>
<td>1,009</td>
<td>1,087</td>
</tr>
<tr>
<td>Calabar</td>
<td>10</td>
<td>-</td>
<td>34</td>
<td>-</td>
<td>44</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>General Cargo</th>
<th>Containers</th>
<th>Dry Bulk</th>
<th>Liquid Bulk</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Total</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Abidjan</td>
<td>1,382</td>
<td>1,321</td>
<td>1,974</td>
<td>5,161</td>
<td>9,838</td>
</tr>
<tr>
<td>Mombasa</td>
<td>1,549</td>
<td>1,308</td>
<td>749</td>
<td>3,633</td>
<td>7,239</td>
</tr>
<tr>
<td>Toamasina</td>
<td>518</td>
<td>n/a</td>
<td>181</td>
<td>523</td>
<td>1,222</td>
</tr>
<tr>
<td>Lagos</td>
<td>1,951</td>
<td>1,211</td>
<td>496</td>
<td>3,216</td>
<td>6,874</td>
</tr>
<tr>
<td>Rivers</td>
<td>233</td>
<td>115</td>
<td>650</td>
<td>3,523</td>
<td>4,521</td>
</tr>
<tr>
<td>Delta</td>
<td>231</td>
<td>64</td>
<td>433</td>
<td>1,154</td>
<td>1,882</td>
</tr>
<tr>
<td>Calabar</td>
<td>21</td>
<td>7</td>
<td>34</td>
<td>37</td>
<td>99</td>
</tr>
</tbody>
</table>

**Note:** Sources as in Table 9.1. General cargo excludes containers, except for Toamasina. Abidjan statistics did not specify dry bulk; figures in Table 9.4 are estimated on approximate basis as imports of clinker, rice and wheat and exports of coffee beans and cocoa nibs. Mombasa gave numbers of containers in T.E.U.s, but not weights; using detailed Nigerian data, conversion rates per T.E.U. were taken at 12.2 tons for imports and 13.5 tons for exports with the small transhipment traffic noted in Table 9.1 also assigned to containers. (However, these Nigerian figures may not be...
appropriate for Mombasa and actual figures should be obtained for this port.) Nigerian data exclude crude oil terminals shown in Table 9.1.

9.15 The different types of cargo obviously differ in their demands on resources. In order to develop key transport indicators, there is a need, at least in the long term, to develop a composite measure of work performed. In 1978, the Bremen Institute of Shipping Economics published a Port Management Textbook which suggested that "In general the ratio for value added per ton of crude oil, dry bulk, and general cargo is 1:4:12" (p. 305). To simplify the arithmetic, the ratios are expressed as 0.25:1:3 and used to compile output-units from Table 9.4. The Bremen Institute did not give a conversion rate for containers and these are converted very arbitrarily on the basis of one ton equals two output-units. Inward and outward cargo are treated as equivalent and Table 9.5 therefore makes the conversion to output-units only in respect of the total cargo throughput. As the data from the Bremen Institute are several years out of date, it is recommended that more recent conversion rates be established in the near future.

<table>
<thead>
<tr>
<th>Table 9.5: Cargo Output-Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>Abidjan</td>
</tr>
<tr>
<td>Mombasa</td>
</tr>
<tr>
<td>Toamasina</td>
</tr>
<tr>
<td>Calabar</td>
</tr>
</tbody>
</table>

* Estimate

9.16 Information on container traffic is given extensively for most ports, generally on the basis of both actual containers moved and TEUs (Twentyfoot Equivalent Units). Data are incomplete for Abidjan, because this port gives the total movement of empty containers, but does not separate import and export figures on the empty movement. Figures are available for other Nigerian ports, but only Lagos is shown in the table.

<table>
<thead>
<tr>
<th>Table 9.6: Container Traffic</th>
</tr>
</thead>
<tbody>
<tr>
<td>Abidjan</td>
</tr>
<tr>
<td>Mombasa</td>
</tr>
<tr>
<td>Toamasina</td>
</tr>
<tr>
<td>Lagos</td>
</tr>
<tr>
<td>Total</td>
</tr>
</tbody>
</table>

Containers as % of all General Cargo

48.9
Mombasa 103.0 129.7 79 45.8
Toamasina 17.1 22.0 78 41.0
Lagos 96.7 158.7 61 38.3

Note: Container percent of all General Cargo calculated from Table 9.4, where the denominator of the calculation is general cargo plus containers. Other sources as in Table 9.1. Toamasina figures are numbers of actual containers, not TEUs, and the container share of all general cargo is our estimate. Abidjan, Mombasa and Toamasina all include transhipment traffic in totals, which are not included in imports or exports. For Lagos, it is assumed that the full/total ratio for actual containers moved also held for T.E.U.s.

9.17 Table 9.7 deals with transit traffic to other countries through the ports of Abidjan and Mombasa, the only ports visited which service landlocked countries. As throughout this chapter, Abidjan data are for 1990, and for Mombasa 1989, with sources documented in Table 9.1.

<table>
<thead>
<tr>
<th>Transit traffic-thous. tons</th>
<th>Abidjan</th>
<th>Mombasa</th>
</tr>
</thead>
<tbody>
<tr>
<td>Imports</td>
<td>267.4</td>
<td>319.5</td>
</tr>
<tr>
<td>Exports</td>
<td>170.1</td>
<td>230.1</td>
</tr>
<tr>
<td>Total</td>
<td>437.4</td>
<td>549.6</td>
</tr>
</tbody>
</table>

| Of which,                   |         |         |
| Containers - thous. tons    | 148.4   |         |
| - %                         | 34       |         |

| Transit traffic as % of total port throughput | 4.4     | 7.6     |

<table>
<thead>
<tr>
<th>Transit traffic by destination-thous. tons</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Burkina Faso</td>
<td>304.3</td>
<td>Uganda 295.8</td>
</tr>
<tr>
<td>Mali</td>
<td>131.6</td>
<td>Rwanda 106.0</td>
</tr>
<tr>
<td>Niger</td>
<td>1.5</td>
<td>Zaire 54.0</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Tanzania 41.9</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Burundi 30.8</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Others 21.1</td>
</tr>
</tbody>
</table>

9.18 Transit traffic is well documented. However, in the case of Mombasa, it was not possible to document the volume of transit traffic moving in containers. In principle, transit traffic should show some breakdown by type of cargo, even if restricted to separating liquid bulk from other cargo. Abidjan does not appear to have any transit traffic in petroleum products, but the published data on Mombasa are insufficient to allow comment here. Incidentally, if Abidjan's transit traffic were related to traffic excluding liquid bulk and not to total port throughput, the
transit share of the traffic would increase to 9.4 percent from the 4.4 percent shown in Table 9.7.

9.19 In the case of Burkina Faso, it was possible for the consultants to compare estimates of transit traffic produced by the port of Abidjan with those recorded by the Conseil Burkinabé des Chargeurs. On transit export traffic in 1990, the correspondence between the two statistical sources was excellent - 92,000 tons according to the Port and 90,000 tons according to the Conseil. There was a problem on imports, with the Port recording 212,000 tons in 1990 and the Conseil 190,000 tons. (There was a comparable difference in the same direction in 1989.) This problem was not reported to the Port, as the consultants only became aware of this later when visiting Burkina Faso. Neither the Conseil nor the consultants are able to offer an explanation, other than the possible diversion of import transit traffic. The problem is noted for future resolution.

9.20 Table 9.8 shows ship arrivals, but definitions have yet to be standardized among countries. The objective is to count deep-sea vessels and coasters engaged in the four categories of trade listed, but to exclude movements of small vessels such as shows and schooners. This objective seems to have been achieved in the case of Mombasa, where there were 830 deep-sea vessels and 25 coasters. Figures for the Nigerian Ports may exclude small vessels, but Toamasina probably includes small vessels. Abidjan reports vessel types using a combined figure for arrivals and departures and the figures have therefore been halved. The Abidjan figure for dry bulk is in fact reported as "multi-purpose ships" and includes some vessels which should appear under general cargo. It is possible to standardize the definitions used in Table 9.8, but further work is needed.

<table>
<thead>
<tr>
<th></th>
<th>General Cargo</th>
<th>Container</th>
<th>Dry Bulk</th>
<th>Liquid Bulk</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Abidjan</td>
<td>415</td>
<td>484</td>
<td>348</td>
<td>330</td>
<td>1,577</td>
</tr>
<tr>
<td>Mombasa</td>
<td>347</td>
<td>369</td>
<td>63</td>
<td>76</td>
<td>855</td>
</tr>
<tr>
<td>Toamasina</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>495</td>
</tr>
<tr>
<td>Lagos</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1,217</td>
</tr>
<tr>
<td>Rivers</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>626</td>
</tr>
<tr>
<td>Delta</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>560</td>
</tr>
<tr>
<td>Calabar</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>80</td>
</tr>
<tr>
<td>Nigerian Oil</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Terminals</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>761</td>
<td>761</td>
</tr>
</tbody>
</table>

Note: Sources as in Table 9.1.

B.3 Financial Performance

9.21 Financial data for ports require considerable work and, as mentioned earlier, the assistance of an expert account will be required for the establishment of this part of the Sub-Saharan Africa transport database. The consultants obtained data only for Mombasa and for the
Nigerian Ports considered as an entity. An attempt has been made in Table 9.9 to present Mombasa results in the same format as that used by the Nigerian Ports Authority. The figures are given only for illustrative purposes as an aid to long-term data collection objectives. Nigerian data allowed the calculation of a financial ratio for net operating income before depreciation, but this could not be calculated for Mombasa.

<table>
<thead>
<tr>
<th>Table 9.9: Financial Performance</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
</tr>
<tr>
<td>Currency</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>Operating Income</td>
</tr>
<tr>
<td>Quays</td>
</tr>
<tr>
<td>Ports</td>
</tr>
<tr>
<td>Other</td>
</tr>
<tr>
<td>Total</td>
</tr>
<tr>
<td>Operating Expenses</td>
</tr>
<tr>
<td>Quays</td>
</tr>
<tr>
<td>Ports</td>
</tr>
<tr>
<td>Other</td>
</tr>
<tr>
<td>Total</td>
</tr>
<tr>
<td>Net Operating Income (N.O.I.)</td>
</tr>
<tr>
<td>Interest</td>
</tr>
<tr>
<td>Surplus (deficit)</td>
</tr>
<tr>
<td>Expressed as % of Operating Income</td>
</tr>
<tr>
<td>N.O.I. before depreciation</td>
</tr>
<tr>
<td>N.O.I. after depreciation</td>
</tr>
<tr>
<td>Surplus (deficit)</td>
</tr>
</tbody>
</table>

* This figure does not include interest which is indicated below: this is therefore excluded from total operating expenses. Available data did not allow this exclusion from individual expense heads, which therefore add up to more than the figures show.

Note: Source Mombasa as in Table 9.1, Nigerian Ports from Nigerian Ports Authority, 1987 Annual Report. Operating expenses include depreciation for both sources. In the case of Nigeria, other operating income excludes exchange rate gains and losses, which amounted to a net gain of 154 million naira in 1987, but a net loss of 17 million naira in 1986.

9.22 The financial ratios in Table 9.9 relating to net operating income before and after depreciation are obviously useful as key transport indicators. The ratio relating to the surplus (deficit) is more debatable, as it measures the available funds for a return on equity in relation to operating income, but not in relation to equity investment.
B.4 Damage and Missing Cargo Claims and Personnel Injuries

9.23 The only published information available to the consultants related to Mombasa, but these data are essential for corridor studies as well as to monitor UNTACDA II targets. Table 9.10 shows claims made for damaged and missing cargo and the number of personnel injured in port operations, although the severity of injury is not defined. Mombasa also provides data on the number of claims settled and the number of court cases, but these are not shown in the table.

<table>
<thead>
<tr>
<th>Table 9.10: Damage and Missing Cargo Claims and Personnel Injuries</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mombasa - 1989</td>
</tr>
<tr>
<td>Damage Claims</td>
</tr>
<tr>
<td>Ships</td>
</tr>
<tr>
<td>Number</td>
</tr>
<tr>
<td>19</td>
</tr>
<tr>
<td>Cargo - ships</td>
</tr>
<tr>
<td>48</td>
</tr>
<tr>
<td>Cargo - shore storage</td>
</tr>
<tr>
<td>51</td>
</tr>
<tr>
<td>Motor vehicles in port</td>
</tr>
<tr>
<td>18</td>
</tr>
<tr>
<td>Total</td>
</tr>
<tr>
<td>136</td>
</tr>
<tr>
<td>Missing cargo claims</td>
</tr>
<tr>
<td>124</td>
</tr>
<tr>
<td>Personnel injuries in operations</td>
</tr>
<tr>
<td>101</td>
</tr>
</tbody>
</table>

Note: Source as in Table 9.1.

C. KEY STATISTICAL INDICATORS

9.24 Management in the various ports visited was asked which key statistical indicators were used in managing and monitoring port performance. Many of the indicators examined later in this section were used, particularly berth occupancy and tonnage moved per gang hour. However, as in the railway industry, the most important indicator used by port management was comparing forecasts or targets of traffic, revenues and expenses against what was actually achieved. While recognizing the usefulness of forecast/actual comparisons, these cannot be used as key statistical indicators, mainly because of the difficulties that caused by variations in forecasting methodologies between different ports. As UNCTAD concluded in 1976, "indicators should be easy to calculate and simple to understand". The indicators in this section are developed with reference to the five targets from UNTACDA II, which have already been enumerated above. (Most of the illustrations in this section are confined to Mombasa, as comprehensive data were not available for other ports.)

C.1 Port Productivity

9.25 This subsection develops productivity indicators focusing on berth occupancy as a measure of facility utilization; average berth throughput per month and per ship working day, as a measure of intensity of use; and average tons handled per gang hour and per employee, as a partial labour productivity index. However, it must be recognized that these productivity

---

61 UNCTAD, Port Performance Indicators, New York, 1976, p. 3.
measures are not entirely under the control of port management. A reduction in trade due to macroeconomic factors will affect port traffic and produce a deterioration in performance on those indicators which are related to resource inputs which cannot be varied in the short period, such as the number of berths.

9.26 The gross berth occupancy percent is defined as the total number of hours that berths are occupied by ships, divided by the total number of hours in a year, multiplied by the number of berths available. In 1989, Mombasa recorded a berth occupancy rate of 59 percent for general cargo, 25 percent for bulk cement, 41 percent for the Shimanzu Oil Terminal and 72 percent for the container terminal. The four berths in Toamasina showed an average berth occupancy rate of 58 percent in 1989.

9.27 Ships are not being worked for the entire period that they are in berths. The net berth occupancy percent relates the actual time a berth is being worked to the total available time. These figures have not been published for any of the ports visited. An alternative index to net berth occupancy as a measure of idle time would be to show time worked in berths as a percentage of total time in berths.

9.28 Average annual tonnage per berth and per metre of quay are shown in Table 9.11. Most analysts insist on the two measures being shown, although they are closely correlated as average quay length shown in Table 9.2 was not subject to much variation between ports.

<table>
<thead>
<tr>
<th>Table 9.11: Throughput of Non-Tanker Berths</th>
</tr>
</thead>
<tbody>
<tr>
<td>Average annual tonnage per berth (excluding liquid bulk traffic and tanker berths)</td>
</tr>
<tr>
<td>per berth</td>
</tr>
<tr>
<td>Abidjan</td>
</tr>
<tr>
<td>Mombasa</td>
</tr>
<tr>
<td>Toamasina</td>
</tr>
<tr>
<td>Lagos</td>
</tr>
<tr>
<td>Rivers</td>
</tr>
<tr>
<td>Delta</td>
</tr>
<tr>
<td>Calabar</td>
</tr>
</tbody>
</table>

Note: Deep-water berths and length, excluding tanker berths, from Table 9.2. Cargo throughput of general cargo, container and dry bulk traffic from Table 9.4. It has been suggested by UNCTAD that, rather than showing straight tonnage in these three categories, they should be weighted 3:2:1, as described in paragraph 9.15 above. There is merit in this suggestions.

9.29 Annual throughput is much lower in Nigerian ports than in the others shown in Table 9.11. This was to be expected of all these ports other than Lagos, as they were explicitly recognized as underutilized in the 1987 Annual Report of the Nigerian Ports Authority (p. 28). Only Mombasa gave a figure of average tonnage per ship working day, i.e., 1,284 tons for dry cargo in 1989.
9.30 Output per employee is estimated in Table 9.12. Assuming that the conversion to output-units in Table 9.5 is realistic, the output-units column of Table 9.12 would be the more appropriate indicator, however, but the two columns are highly correlated. In making comparisons between ports, employment figures must cover the same extent of activities in all ports. Employment in an integrated port like Mombasa would be relatively higher than in Abidjan, where cargo handling is contracted out to private companies. There is also a possibility of variations in work coverage between the different ports actually shown in Table 9.12. In addition, productivity figures for Nigerian ports should all be reduced by roughly 8 percent, as headquarters staff were not apportioned to the individual ports in Table 9.3.

<table>
<thead>
<tr>
<th>Table 9.12: Throughput per Employee</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Annual Output per Employee</strong></td>
</tr>
<tr>
<td>Tonnage, excluding liquid bulk</td>
</tr>
<tr>
<td><strong>Output-units</strong></td>
</tr>
<tr>
<td>Abidjan</td>
</tr>
<tr>
<td>Mombasa</td>
</tr>
<tr>
<td>Toamasina</td>
</tr>
<tr>
<td>Lagos</td>
</tr>
<tr>
<td>Rivers</td>
</tr>
<tr>
<td>Delta</td>
</tr>
<tr>
<td>Calabar</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>327</td>
</tr>
<tr>
<td>271</td>
</tr>
<tr>
<td>313</td>
</tr>
<tr>
<td>271</td>
</tr>
<tr>
<td>366</td>
</tr>
<tr>
<td>53</td>
</tr>
<tr>
<td><strong>Note:</strong> Tonnage from Table 9.4, output-units from Table 9.5, employment from Table 9.3.**</td>
</tr>
</tbody>
</table>

9.31 A popular measure of port labor productivity is gang performance. This can be measured as average tons per gang shift or per gang hour and relates, of course, only to dry cargo. In 1989, the average tonnage of dry cargo handled per gang hour was 17.0 in Mombasa. Tons per net gang hour are available for the Nigerian ports in 1987. For most of the main ports, the figures are higher than in Mombasa - Apapa 15.2, Tin Can Island 19.0, Port Harcourt 21.0, Warri 22.0 and Calabar 8.1. It is thought that the Nigerian figures are net in the sense that time lost by gangs due to defective equipment or bad weather is excluded from the denominator of the calculation, while this time is included in the calculations for Mombasa. Clearly, the measures must be standardized; moreover, there is a case for measuring output per gang hour on both a gross and a net basis. It has been argued that productivity per gang hour is not a satisfactory indicator, as the size of gangs may vary from port to port, and that tonnage handled per man hour of direct labor would be conceptually better. On the other hand, gang size may be more a matter of institutional or labor union requirements than the result of managerial decisions; a change to tonnage handled per man hour of direct labor is not necessarily recommended. However, in the case of container traffic, the concept of a gang is no longer valid and must be replaced by a measure of work performed related to the number of cranes.

9.32 Unlike the situation in respect of most modes, UNTACDA II does not call for any targets in respect of overall port activity, measured in terms of traffic handled. However, there would be no problem in monitoring a target in this area or targets relating to container traffic or transit traffic.
C.2 Time Spent in Ports

9.33 Objective (b) of UNTACDA II is to reduce the time both ships and cargo spend in port. The only published information on ship times made available to the consultants related to Mombasa. No data were published on cargo delays in ports (known as dwell time). These delays should be measured separately for imports and exports by type of cargo (together with empty containers), recognizing that delays on imports are usually attributable to importers rather than to port management.

9.34 A ship’s turnaround time can be defined as the amount of elapsed time from the ship’s arrival ready to enter the port to the time at which the ship quits the port to continue its voyage. There are four measures to be used as key indicators of the time ships spend in ports. These figures are available for the port of Mombasa (see below) and should be made available by the other ports. The measures are:

(i) Gross ship turnaround time: for Mombasa this was 6.92 days in 1989, of which 0.97 days represented the average waiting delay per ship before entry to the port. It should be noted that in some ports the waiting delay before entry can be caused by the ship awaiting instructions from its owners rather than by port management.

(ii) Average port days per ship: for Mombasa, this was the balance of 5.95 days to arrive at the total turnaround time.

(iii) Average berth occupancy days: this figure is not given in the Mombasa report, but represents average port days less time spent going to and leaving the berth. The distinction between (ii) and (iii) is not operationally important for Mombasa, but this is not necessarily true for all ports.

(iv) Average ship working days: this was 3.49 days in Mombasa in 1989 and covers the time when work is actually under way. If required, average ship working days can also be expressed as percentages of the other three time measures.

C.3 Losses Due to Damage and Pilfering

9.35 Information published for Mombasa in 1989 was presented in Table 9.10. It is suggested that damage on ships and damage to motor vehicles in port should be ignored and that the key indicators consist of:

(i) Damage to cargo occurring on ships and in shore storage - number of claims, which was 99 in Mombasa, and number of claims per million tons of throughput excluding liquid bulk, which gives a ratio of 27.5;

(ii) Missing cargo claims - number of claims, which was 124 in Mombasa, and number of claims per million tons of throughput excluding liquid bulk, which gives a ratio of 34.4;

(iii) Value of damaged and missing cargo claims as a percentage of the port’s operating income, which was 0.34 percent in Mombasa;

(iv) Fatalities and injuries - number, which was 101 in Mombasa, and number per million tons of throughput excluding liquid bulk, which gives a ratio of 28.0.
C.4 Average Cost per Output-Unit

9.36 From the earlier discussion of financial statistics, it is not considered feasible at this stage to calculate the cost of capital employed in port operations and this would be necessary to show average cost per output-unit. The measure will therefore have to be confined to operating expenses including depreciation, as shown for Mombasa and the Nigerian Ports in Table 9.9. These operating expenses are then divided by the number of cargo output-units as calculated in Table 9.5 in order to standardize for the different work requirements of different types of traffic.

9.37 The data to be collected would be very similar to those in the corresponding section of Chapter 7 on Railway Transport. A table headed “Average Expense per Output-Unit” would consist of:

- name of port;
- currency;
- average expense per output-unit in 1989-91; for illustrative purposes, this figure was 166 shillings for Mombasa in 1989 and of the order of 18.5 naira for the Nigerian Ports in 1987 (calculated quite inappropriately by dividing 1987 expenses by 1989 output-units);
- average expense per output-unit for the latest available year in the prices of that year;
- average expense per output-unit for the latest available year, deflated to 1989-91 prices, which raises the problem of establishing an appropriate price deflator;
- percentage change, comparing the average expense per output-unit in the latest available year, deflated to 1989-91 prices, with the figure actually recorded in 1989-91.

9.38 As in the discussion of port productivity, any deterioration in macroeconomic conditions and the volume of port business would have an adverse effect on average expense per output-unit, as a port cannot immediately adjust all of its inputs to declining demand. Comparisons of average expense between ports would require exchange rate conversions, where the difficulties have been addressed in earlier chapters.

9.39 In addition to average cost per output-unit, financial ratios are also needed as key indicators. The appropriate ratios, shown in Table 9.9, expressed net operating income, both before and after depreciation, as a percentage of operating income, together with the possible inclusion of a similar ratio in respect of the port's surplus (deficit) after interest payments.

C.5 Improved Maintenance of Port Equipment

9.40 Data on cargo handling equipment are fairly widely published and were summarized in Table 9.3. However, in the discussion of this table, it was explained that only the Nigerian Ports had published data on the proportion of equipment that was available for use. These figures suggested very considerable scope for reduction in the downtime of equipment and more systematic information will have to be collected to allow this target to be monitored. Hopefully the three key indicators could be confined to the equipment columns shown in Table 9.3 - cranes, forklift trucks and tractors/trailers.
D. SHIPPING

9.41 The UNTACDA II objectives for shipping are to increase African participation in international shipping and to improve the efficiency of national fleets and are stated as follows:  

(a) To achieve equitable participation in sea-borne liner trade under the conditions of the United Nations Code of Conduct for Liner Conferences;

(b) To increase significantly the participation of national fleets in non-liner trade under the conditions of UNCTAD resolution 120(V);

(c) To increase the competitiveness of national fleets through modernization and adaptation of tonnage to trading requirements and through adaptation of management techniques leading to reduced unit costs of transport; and

(d) To increase significantly the level of ownership and control by African countries of competitive tonnage adapted to the requirements of African trade.

9.42 Table 9.13 shows the nationality of shipping calling at the Nigerian Ports, Abidjan and the Madagascar ports. These figures were not published for Mombasa, but are available.

**Table 9.13: Nationality of Shipping**

<table>
<thead>
<tr>
<th>% of distribution</th>
<th>Nigerian Ports</th>
<th>Abidjan (a)</th>
<th>Abidjan (b)</th>
<th>Madagascar Ports</th>
</tr>
</thead>
<tbody>
<tr>
<td>Own nationality</td>
<td>13.9</td>
<td>2.3</td>
<td>4.3</td>
<td>9.4</td>
</tr>
<tr>
<td>Other African</td>
<td>1.0</td>
<td>3.4</td>
<td>0.9</td>
<td></td>
</tr>
<tr>
<td>Sub-total*</td>
<td>14.9</td>
<td>5.7</td>
<td>5.2</td>
<td></td>
</tr>
<tr>
<td>France</td>
<td>4.1</td>
<td>9.5</td>
<td>6.6</td>
<td>8.1</td>
</tr>
<tr>
<td>Holland</td>
<td>4.6</td>
<td>4.3</td>
<td>2.0</td>
<td></td>
</tr>
<tr>
<td>U.K.</td>
<td>3.4</td>
<td>2.4</td>
<td>0.9</td>
<td>2.2</td>
</tr>
<tr>
<td>Other Europe</td>
<td>28.9</td>
<td>15.6</td>
<td>30.7</td>
<td></td>
</tr>
<tr>
<td>Sub-total*</td>
<td>41.0</td>
<td>31.8</td>
<td>40.2</td>
<td></td>
</tr>
<tr>
<td>Others*</td>
<td>8.5</td>
<td>20.8</td>
<td>7.9</td>
<td></td>
</tr>
</tbody>
</table>

Flags of convenience

| Panama            | 8.9            | 14.3        | 10.0        | 15.4             |
| Liberia           | 13.3           | 10.3        | 21.6        | 15.1             |
| Bahamas           | 2.9            | 9.3         | 8.7         |
| Cyprus            | 7.6            | 6.3         | 5.3         |
| Singapore         | 2.9            | 1.5         | 1.1         |

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Subtotal 35.6 41.7 46.7

Total 100.0 100.0 100.0 100.0

* Excluding those flags of convenience listed in the table.

Note: Sources as in Table 9.1 for Abidjan and Madagascar, as in Table 9.3 for Nigerian Ports. Nigerian and Abidjan (a) figures based on vessels by number, Abidjan (b) and Madagascar figures based on tonnage. Madagascar excludes coastal trade, but this is included in Nigeria. Madagascar includes all ports on the island, but Toamasina accounts for the major part of the traffic.

9.43 Data on the nationality of ships calling at African ports do not allow separate monitoring of UNTACDA II targets (a), (b) and (d), but they do allow monitoring the total progress made toward these targets. It is suggested that monitoring targets represent the percentage of shipping at each port which has the flag of the country in which the port is situated and the percentage of shipping which has African flags, excluding the Liberia flag of convenience.

9.44 In francophone West Africa, i.e., the area covered by CEAO, the Côte d'Ivoire is the only country with a shipping line that actually owns a fleet of ships. The company is the parastatal Société Ivorienne de Transport Maritime (SITRAM). However, some countries have a shipping line which uses vessels belonging to partner lines, for example Burkina Faso with its line COFAMA. Data are available from the ConseilBurkinabé des Chargeurs on liner trade credited to COFAMA, and it would be possible, in due course, to develop these data into an index suitable for monitoring UNTACDA II objectives. Nigeria also has a parastatal national shipping line, together with three private companies; the 40 percent share of the liner trade under the Code of Conduct is allocated 19 percent to the parastatal and 7 percent each to the three private companies. Madagascar has a parastatal company, Société Nationale Malgache de Transports Maritimes (SMTM), providing liner service to Europe, and also the Compagnie Malgache de Navigation (CMNI), which carries out cabotage operations and liner services to East Africa and the Indian Ocean.

9.45 Objective (c) of UNTACDA II calls for increased efficiency and competitiveness in African shipping companies. The consultants were given detailed information on the operations of SMTM, although similar information was not collected elsewhere. Appropriate key indicators for monitoring efficiency in shipping operations can, therefore, not be specified at this time.

E. INLAND WATERWAYS

9.46 The UNTACDA II objectives for inland waterways are as follows:63

(a) To increase the total length of navigable inland waterways;
(b) To increase the number of ports within these waterways and also the capacity and performance of the ports;
(c) To increase the links between inland waterway routes through the various transport corridors;

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63 Ibid., p. 81.
(d) To increase the operational inland waterways fleet and improve the performance of handling equipment at inland waterways ports and their related terminals;

(e) To increase the number of inland waterways training institutions established and/or strengthened, with a corresponding increase in the number of personnel trained; and

(f) To increase the number of control mechanisms for the water level of navigable lakes and rivers.

9.47 Inland water transport in Sub-Saharan Africa is important in only a limited number of countries. There was very little inland water transport in the three West African countries visited - Burkina Faso, Côte d’Ivoire and Nigeria.\textsuperscript{64} Some limited information was provided to the consultants on the Canal des Pangalanes, Madagascar’s eastern intracoastal waterway; however, it was not clear how data for this waterway could usefully be consolidated into a transport database for the whole of Sub-Saharan Africa.

9.48 Lake transport is important in several landlocked countries, including Burundi and Uganda, which were visited in the course of the study. Considerable information was made available on the Port of Bujumbura in Burundi. The data included operations, physical facilities, employment, cargo throughput, daily and hourly handling rates for cargo and, most interestingly, length of time spent by cargo in on-shore storage. Because the marine cargo handled at Bujumbura - 178,000 tons in 1990 - was so much less than in deep sea ports, it would not be appropriate to examine this port in the same context as deep-water ports (See section A). Nevertheless, it will be possible in due course to develop key indicators for inland lake ports. Unfortunately, port facilities in Uganda were not examined by the consultants, except in the context of the operations of the Uganda Railways, already reported in Chapter 7.

9.49 Because of the sparseness of inland water data in the countries visited, Dr. J. Pihi produced a special report in August 1991 on river transport in Zaire and Congo. He visited the Office National des Transports (ONATRA) in Kinshasa and the Voies Navigables Ports et Transports Fluviaux (VNPTF) in Brazzaville. ONATRA is a publicly owned company providing water transport on the Zaire and Kasai Rivers, together with their tributaries. There are also much smaller private companies operating on these rivers. Extensive statistics are available on the network on which service is provided, vessels used, traffic and financial results. Performance indicators are not included in the company’s Annual Report although some indicators could be calculated. Similar information is available for VNPTF, including some indicators of labor productivity.

F. RECOMMENDATIONS

9.50 The following recommendations are derived from the analysis of statistics relating to ports, shipping and inland waterways:

1. In spite of UNTACDA II caution on the state of port statistics, data needs and key statistical indicators should be specified as soon as possible.

\textsuperscript{64} In francophone West Africa, inland water transport has been described as undeveloped, constituting only a localized and seasonal, means of transport in B.P. Bayatry, \textit{Enquête sur le secteur des transports dans la région de la CEAO}, Rapport de synthèse, CEAO Direction du Développement Industriel, janvier 1991, p. 35.
2. The analysis of ports should relate to individual ports, rather than to all ports aggregated for each country, and the criterion for including a port in the examination should be an annual handling of imports and exports of over one million tons.

3. Input data should continue to be collected on ports in respect of berths, cargo handling equipment and employment. Output data should continue to be collected in respect of tons of cargo moved with a breakdown by type of cargo, transit traffic and ship movements. The consultants would not see major problems in development of these data, if it were not for the fact that only limited progress has been made since the issuance as long ago as 1976 of the very useful UNCTAD primer entitled Port Performance Indicators, already referenced in footnote 2 of this chapter.

4. Given that financial data for ports are in a much less satisfactory state than data on physical inputs and outputs, it is recommended that this be rectified, particularly in establishing reliable measures of financial ratios.

5. The reporting of damaged and missing cargo claims should be standardized between ports.

6. It is recommended that key statistical indicators be compiled for ports to cover the areas of port productivity, time spent by ships in ports, losses due to damage and pilfering, average cost per output-unit and the state of maintenance of port equipment. Many of these indicators are publicly available for the Port of Mombasa; although similar data are often calculated for other ports for management use, they are not in the public domain and it is difficult to comment on the extent of statistical consistency in the compilation of these measures.

7. In shipping, the share of African nations in their overseas trade should be monitored, with data broken down to distinguishing liner from non-liner trade. The establishment of key indicators to measure the efficiency of national fleets will be a more difficult task and is not recommended at this time.

8. With respect to transport by inland waterways, the establishment of key indicators has been examined on a preliminary basis for river and lake transport. Because of limited river transport in Sub-Saharan Africa, intercountry comparisons may not be feasible for this transport mode; however, this reservation does not necessarily hold for lake transport.
CHAPTER 10: LANDLOCKED COUNTRIES

Chapter 10 addresses user requirements for statistics on transport corridors serving landlocked countries. Data and indicators are discussed under distribution of traffic, direct transport costs, indirect transport costs and container traffic.

A. USER REQUIREMENTS

10.01 The landlocked countries of Africa are faced with a major problem of efficient organizing their intercontinental transport. The organization of transit traffic, which, by definition, depends on the facilities of other countries is an important, but inherently difficult subject.

10.02 At the same time, transit countries are interested in recovering the full costs generated by transit traffic, including the costs of investments and use of infrastructure facilities. In the case of ports and trans-shipment points, the existence of transit traffic may also lead to the establishment of special reloading and storage facilities.

10.03 In view of the seriousness of the issues, traffic flows and costs of using alternative transport corridors, regulation of transit traffic and the development of special facilities have been intensively studied. The importance of this issue was brought to the attention of the consultants by many of those interviewed during the course of the visits to Sub-Saharan African countries.

10.04 From the point of view of data, information needed for corridor analyses can be summarized as follows:
- data on traffic distribution among different corridors;
- data on direct transport costs borne by different traffic;
- data on indirect transport costs, especially costs related to the time in transit and costs of insurance, where the latter reflect losses in transit; and
- container traffic.

Other information needs include the availability and condition of the relevant facilities (road, rail, ports and, in some cases, lake and river shipping), which have been addressed in the modal chapters. The present discussion also omits the estimation of costs caused by the existence of transit traffic through the transport corridors.

B. DISTRIBUTION OF TRAFFIC AMONG DIFFERENT CORRIDORS

10.05 Distribution of traffic among corridors is required for study of the "revealed preferences" of the users, thus providing a starting point for subsequent investigation. This type of analysis

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55 For example, World Bank and Preferential Trade Area for Eastern and Southern Africa (PTA), The Great Lakes Corridor Study (A report prepared by Simon Thomas on the findings of the Mission led by B. Chatelin and including as members Messrs. B. Bostrom, D. Havlicek, Ngwenya, Wertz and Thomas), Washington, D.C.: World Bank, March 1990. The transport corridor problem has also been extensively treated in République du Burundi, Ministère des Transports, Postes et Télécommunications, Plan National de Transport, Bujumbura, août 1990. Also studies sponsored by Southern African Development Conference (SADCC) should be noted, although the objectives and thus the scope of Mozambique-Malawi and Mozambique-Zimbabwe corridor studies have been different, concentrating predominantly on the rehabilitation of transport facilities through Mozambique.
requires data on the volume and type of import and export traffic moving through different corridors: and the data required relate to movements of commodities by major classes, for example, liquid fuel, containers, major bulk commodities, general cargo, distinguished by direction, i.e., import or export.

10.06 The sources of data are:

(a) Customs (especially for import traffic): customs declaration forms collected at the point of entry, indicate commodity classification and value for transit traffic. Usually (although not always), there exists a one-to-one correspondence between the point of entry and transport corridor. Often, customs forms provide an indication of transport mode and, by a relatively simple data processing routine, transport modes can be estimated.

(b) Port statistics usually identify in-transit traffic; this traffic is relatively easily identified because of the existence of special administrative procedures related to "in bond" movements.

(c) Transit traffic is identified in railway statistics for corridors served by rail and ferry statistics where a major ferry is involved. In some countries, where combined river-rail or lake-rail services are provided, the major transport enterprise can provide the data.

(d) Road transport. Unfortunately, reliable data on road transport tend to be relatively scarce. However, since long-distance movements by road are normally associated with the larger firms more capable of producing required information, potential for improvement of statistical coverage in this area exists. Also, in most countries, foreign vehicles engaged in international transport have to secure special permits. Such permits (Carte internationale: Autorisation de transport publique de merchandise, in francophone countries) contain information on the vehicles used. Proper tabulation of the data derived from such permits would make it possible to estimate the "static capacity", that is the load capacity of foreign vehicles engaged in international corridor traffic.

10.07 Essentially, well organized port and rail traffic statistics can usually provide most of the information needed for the study of transit flows by corridors. The upgrading of customs information systems provides an alternative and/or supplementary data source.\textsuperscript{56}

C. DIRECT TRANSPORT COSTS

10.08 From the user's point of view, direct transport costs consist of tariffs or transport charges and special costs associated with transit traffic. In the more detailed studies dealing with transport corridor options, the costs of providing transport services and the efficiency of transport service providers are both analyzed.

10.09 Meaningful collection of tariff information requires a carefully designed survey of carriers. The major commodity classifications have to be carefully identified and tariff items clearly defined in order to capture special carriage conditions. The sources of information are

\textsuperscript{56} In this context the UNCTAD project to improve customs procedures and information (SYDONIA/ASECUDA) should be noted.
major carriers, freight forwarders and shipper associations. In this area, an important problem relating to the confidentiality of collected information needs to be signalled. Lastly, it must be stressed that the interpretation of survey data, after the information is obtained, requires specialized skills. Subject to these qualifications, a systematic collection of tariff information has considerable merit as an instrument for monitoring transport prices.

10.10 Although outside professional assistance may be justified in organizing transport tariff surveys, it is doubtful whether, at this time, reliable data could be collected on a regional or subregional basis. On the other hand, much can be achieved by the encouragement of greater market transparency through standardization, or harmonization of tariff formats, conditions of carriage, and documentation. Some important work in this area is being done on a subregional basis, and this should be encouraged.

10.11 The Burundi transport corridor study provides the following list of items investigated as the determinants of transit costs by road:\footnote{République du Burundi, \textit{op.cit.}, Annexe 2.9.}

- vehicle operating costs, which are obviously affected by road conditions, vehicle limitations on axle and total loads, and other legal requirements;
- toll road payments;
- parking fees at compulsory stops;
- documentation costs (visas, entry and exit certification, etc);
- overtime payments to customs;
- police escorts, when required; and
- vehicle permits or licence fees on transit vehicles.

The same study also examines port tariffs and applicable fees on handling in-transit traffic, together with port efficiency indicators, namely tonnage handled per hour and per day for loading and unloading.\footnote{\textit{Ibid.}, Annexe 2.9, Tableau 2.1, "Rendement de la manutention portuaire".}

10.12 From the point of view of data requirements, the following conclusions can be drawn:

(a) Well organized transport statistics systems and appropriate data dissemination would provide most of the information needed for corridor studies.

(b) Additional information required, which can be produced in a standardized manner includes:

- tabulation of vehicle regulations (axle loads, total weight limitations and, if applicable, minimum power to weight ratio, and vehicle or tractor-trailer maximum length);
- tabulation of toll charges;
- tabulation of customs charges;
- requirements and costs for police escorts; and
- vehicle permit fees applicable to transit vehicles.

10.13 This type of information, regularly produced on a standardized basis, would not only facilitate corridor studies, but would also be of great value in studying practices in different countries — a logical starting point for the harmonization of national practices. In this context
a simple tabular presentation used in the World Bank and P.T.A. "The Great Lakes Corridor Study" may serve as a model and is thus reproduced as follows in a schematic form:\textsuperscript{88}

<table>
<thead>
<tr>
<th>Types of Charges</th>
<th>Countries</th>
</tr>
</thead>
<tbody>
<tr>
<td>Charges on foreign vehicles</td>
<td></td>
</tr>
<tr>
<td>Road service licenses (permits)</td>
<td></td>
</tr>
<tr>
<td>Entry fees</td>
<td></td>
</tr>
<tr>
<td>Foreign commercial licenses</td>
<td></td>
</tr>
<tr>
<td>Transit goods licenses</td>
<td></td>
</tr>
<tr>
<td>Road tolls</td>
<td></td>
</tr>
</tbody>
</table>

\textbf{Note:} The table notes the existence, but not the level of charges. It could be expanded to include this information by providing a listing, by countries concerned, of the level of charges. The presentation would be manageable; for example, only 50 percent of PTA countries charge foreign road service permit fees, 21 percent entry fees, 21 percent transit licenses and 14 percent toll charges. A similar table was also produced for axle weight and maximum load limits which indicates significant variations.\textsuperscript{80}

D. INDIRECT TRANSPORT COSTS

10.14 Indirect transport costs are always difficult to estimate. They relate mainly to time in transit and loss and damage of cargo.

10.15 Some shipping/forwarding organizations (e.g., Conseil Burkinabè des Chargeurs in Burkina Faso\textsuperscript{81}) monitor closely the movement of cargo by recording time in transit for all the major activities. These include time spent in customs processing, the time in the warehouse until release to the carrier, the time moving in a railway wagon or a truck from port to the frontier control post, and the time from the frontier control to the final destination. Large forwarding organizations also obtain this information as a part of control of their operations. Time spent during the actual commodity movement is also recorded by the larger transport organizations (e.g., the railways) as a by-product of their wagon or shipment tracing system.

10.16 During a meeting with a leading motor carrier in Uganda, the measurement of time delays at frontiers on transit traffic to and from landlocked countries was discussed. The possibility was raised of obtaining estimates of these delays on an informal but periodic basis from leading carriers located in each landlocked country. Although these estimates may not always be based on complete statistical documentation, they would still give an informed indication of changes in transit time delays at frontiers. Informal methods of measurement are worth exploring further in areas where documented measurement would be extremely expensive.

\textsuperscript{88} World Bank and PTA, op.cit., Annex 12, Table 1, p. 133.

\textsuperscript{80} ibid., Table 2, pp. 134-5.

\textsuperscript{81} Conseil Burkinabè des Chargeurs is a semi-public organization comprising delegates of the ministries concerned with transport and external trade, public and semi-public bodies concerned with import and export issues, and importers and exporters domiciled in Burkina Faso.
10.17 The UNCTAD developed Advance Cargo Information System (ACIS) should be noted in the context of transit delays. The ACIS cargo information system covers "basic manifest data, tracking data, status, transport mode, location and dates of events". In fact the ACIS system covers basically the same elements as the less formal Conseil BurkinaFaso des Chargeurs system, however in an integrated, computerized and consistent manner, which has considerable advantages. Because of the increasing number of ACIS applications in Africa, the summary of information flows generated by the system is relevant, with the extract quoted below for imports also accompanied by similar procedures for exports.

For imports (following the consignment before its arrival at port of discharge up to destination); this includes unique identification ID (Bill of Loading (B/L) and item number), information from shipping and clearing and forwarding agents on the planned routing of the consignment, information from B/L completed with ID of documents, dates/flags of events, information sufficient to keep track of a consignment, which is split-up and regrouped, transport means used (wagon/lorry), vehicles and additional information for operational aspects at main terminals. This information can also be used for statistical purposes and for reconciling data on same consignment across modes/borders/organizations. (p. 190)

10.18 The general introduction of the ACIS system would produce most of the information required on volume of traffic, modal choice and time spent in transit. Therefore, statistics derived from ACIS can be most useful for corridor studies and international comparative analysis. However, it is likely to be several years before ACIS is fully implemented and before the statistical material generated can be used in a major way to supplement, and perhaps even replace, traditional data sources.

10.19 A more difficult aspect of indirect transport costs concerns the loss and damage in transit. Theoretically, a good indication of such costs is provided by the insurance rates applicable to traffic moving by different modes through different corridors. In practice, a survey of applicable rates is most difficult: individual rates depend on the overall bargaining position of the shipper or the exporter; practices regarding deductibility and self-insurance vary, and the data tend to be highly confidential and not easy to interpret.

E. **Container Traffic**

10.20 Information regarding container traffic is normally available through the ports. Railway commodity statistics also often treat containers as a commodity class. More difficult is the determination of containers carried by road transport. It is not necessarily correct to assume that containers handled by a port and destined for a landlocked country, if not carried by the railway, are carried by road: containers not moved by rail during a particular time period may be stored at the port and some containers may be stuffed or unstuffed at the port and moved as conventional traffic.

10.21 In analyzing container traffic, attention should be drawn to shifts between different container classes which occur over time. Such shifts (from smaller to larger containers and the increased employment of refrigerated containers) have important implications for planning of container facilities. Therefore, there exists a definite need for monitoring of the patterns of
container use and shifts between container classes and container ports. This observation has
an implication for the details required in the statistics of container traffic. It is arguable whether
container traffic data should be summarized in TEU, or disaggregated by container sizes, with
a further indication of refrigerated or "controlled temperature" units.

F. **RECOMMENDATIONS**

10.22 The following general conclusions emerge:

(a) Statistics necessary for corridor studies can be obtained for the most part
through well organized modal statistics, supplemented by import and export
statistics from customs.

(b) Additional data necessary for the analysis of comparable costs of alternative
corridors can be derived from shippers' organizations, where exist, or freight
forwarders. Progressive introduction of the ACIS system will provide a strong
basis for more reliable information.

(c) Given the importance and changing structure of container traffic, container flows
and their distribution by container types warrant special attention.

10.23 As a model of presentation of transit traffic statistics for landlocked countries, Sections
4.4 and 4.5 of a recent CEAO study⁶³ warrant a brief review. In the general part of the study,
international trade distribution by subregion and region is summarized, providing a context for
the presentation of transport statistics and more detailed information. The statistical section on
transit traffic is prefaced by a short summary of the situation of landlocked countries in the
region. It also documents the evolution of transit traffic of landlocked countries by ports,
disaggregated by imports and exports (Table 11). Container traffic and "conventionally handled
cargo" are separately distinguished by port for the years 1983 to 1988 (Tables 12a-12c).
Chapter 6 of the study deals in a descriptive manner with the organization and functioning of
transport chains (Organisation et fonctionnement des chaînes de transport). This chapter
summarizes:

- institutional and regulatory frameworks;
- facilities provided for maritime traffic of landlocked countries in the ports serving the
  identified corridors;
- facilitation procedures; and
- actual performance of different corridors, measured by the time taken by different
  operations.

10.25 It is suggested that this CEAO model be used as a starting point for the elaboration of
transport corridor statistics on a comparable, continent-wide basis.

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⁶³ B.P. Beylasy, *Enquête sur le secteur des transports dans la région de la CEAO*, CEAO Direction du
CHAPTER 11: ORGANIZATIONAL ISSUES

Chapter 11 examines organizational issues relating to the transport statistics improvement program and the establishment of a transport database for Sub-Saharan Africa. The section on transport statistics is followed by discussion of the roles which the Economic Commission for Africa, specialized modal organizations and the subregional organizations should play in such a program. The current situation regarding transport statistics collection in the African countries visited is reviewed.

A. TRANSPORT STATISTICS

11.01 The need for transport statistics in Sub-Saharan Africa was outlined in Chapter 1 of this report. Reference was made to the information system requirement contained in Objective 5 of UNTACDA II, specifically: 64

Establishment of information systems on transport and communications as a basis for analysis and better planning and management of investments.

Long Term: Promoting the establishment of information systems geared towards the demands of the market, traffic flows, operating results of transport enterprises, costs and conditions for the development of transport infrastructure and equipment;

Areas of immediate concentration:

(a) Establishment of harmonized and standardized transport and communications database system at national, subregional and regional levels as well as on the movement of goods and people at subregional and regional levels;

(b) Establishment of computerized management information systems in national transport and communications organizations and in IGOs in order to improve management;

(c) Introduction of the United Nations Rules for Electronic Data Interchange for Administration, Commerce and Transport (UN/EDIFACT) standards in all electronic data interchange communications; and

(d) Establishment of a UN/EDIFACT Rapporteur Group.

11.02 In addition to the objectives expressed in the UNTACDA II document, there is another strongly felt objective, namely the improvement of transport statistics at the national and subregional levels to meet the needs of transport management and planning. As a part of various multilateral and bilateral assistance programs and project financing, the element of "institutional strengthening" is often included. Institutional strengthening subsumes improvements in planning and management methods, better project identification and evaluation, more effective monitoring of the functioning of the transport system and transport enterprises, and strengthening of the organizations entrusted with such tasks. Clearly, good planning and

good management require the existence of reliable and timely key data, which often do not exist or are not disseminated and utilized properly. This objective of strengthening national transport statistics systems is fully consistent with the "establishment of harmonized and standardized transport and communications data base system". In fact, the proper functioning of the database depends on the capacity of national statistical systems.

11.03 An adequate information system is also necessary to monitor progress made in achieving the other objectives of UNTACDA II, as well as the objectives set by subregional organizations, the Sub-Saharan Africa Transport Program, and specific programs financed by the international lending agencies and by multilateral or bilateral initiatives. These objectives have already been specified in the modal chapters of this report, and the need for an adequate transport statistical system to monitor progress and to identify problems is self-evident.

11.04 The establishment of a transport database is no trivial task. In order to clarify the issues involved it is useful to begin the discussion by distinguishing two basic concepts of a database:

(a) A system which simply acquires and stores available information and thus makes it more accessible to users; this can be described as a "data library concept", which is increasingly used by international and national research organizations.

(b) A system which collects specified data on a regular and formalized basis according to set norms; development and maintenance of such a system includes continuous interaction with the producers of statistics in order to maintain and improve the data quality and enhance the reporting capacity of data producers (UN trade statistics and ICAO civil aviation statistics are examples of such a concept).

11.05 The objective of "establishment of harmonized and standardized transport and communications data base system" implies the adoption of the second concept. This involves significant, long-term, continuous development work, both at the international and national levels, and a considerable effort to assist individual countries in upgrading their transport statistics capacity. A program aimed at the improvement of national statistical capacity is justified not only to establish a harmonized international or regional database, but also as an instrument of better planning and management of national transport systems within member states.

11.06 There is a general impression that African transport statistics are inadequate for planning, managing and monitoring the transport sector and subsectors. The present review indicates that indeed serious gaps exist and that much improvement is required. However, this generalization is subject to important qualifications: the availability of data for some subsectors is much better than for others. In the countries surveyed, railway and port statistics are generally adequate, and an air transport statistical reporting system is in place, although in each of these areas specific improvements are needed. In the important road infrastructure, road transport and urban transport subsectors, the situation is generally unsatisfactory. However, there is a reasonable understanding of the need for the data on these subsectors and considerable progress is being made to improve the situation. There is a clear need for assistance in the problem areas identified in the present report.

11.07 It is important to stress that improvements to the existing statistical systems should recognize and build upon areas of strength. This task should also include a significant element of technical assistance and an organized exchange of experience between African countries. The upgrading of transport statistical systems should be designed as an evolutionary program.
It should proceed through a series of specific improvements, filling the gaps, upgrading data collection methodologies, promoting adequate norms (definitions, quality control mechanisms, etc.) towards the development of adequate national systems on a harmonized and standardized basis. Throughout this process, the transport policymakers, planners and managers in the individual countries should be sensitized to the need and the usefulness of improved information systems. Subsequent parts of this chapter will address the organizational requirements and options to meet these requirements.

B. ROLE OF ECA

11.08 The United Nations Economic Commission for Africa (ECA) has been designated as lead agency for UNTACDA II activities. The following paragraphs from the programme document develop this mandate with respect to a transport database:

187. ECA, as lead agency and charged with the monitoring functions shall, in co-operation with the specialized agencies, subsectoral and subregional/regional intergovernmental organizations, be responsible for establishing the parameters for monitoring and evaluation and for setting up a data base system for this purpose.

188. In this regard, it will be the responsibility of the NCCs, subsectoral and subregional working groups as well as specialized agencies to provide ECA with the necessary information and data according to the established format from time to time and as agreed or when requested by ECA.

189. It is apparent that at the initial phase ECA would carry out extensive data gathering activities in order to acquire the base year data once the parameters have been established and will subsequently and periodically update the information.

190. It is envisaged that in order to do this properly ECA would need to acquire and maintain a modern data collection system.

11.09 The ECA expertise in respect of transport is contained in three divisions. The Transport, Communications and Tourism Division (TCTD) has both academic and practical expertise in all aspects of transport and a thorough understanding of the uses and limitations of transport statistics. The Statistics Division has expertise in statistical methodology and maintains a Regional Statistical Data Base, which includes time series on transport. It has ongoing relations with statistics offices throughout Sub-Saharan Africa and it organizes statistical conferences and workshops. The Pan African Development Information System (PADIS) is responsible for computer operations in ECA, including long-established relations with "national focal points" in member countries for the receipt of data and the provision of training in many areas of computer operations.

11.10 In order to carry out the UNTACDA II mandate relating to a transport database, the following functions must be discharged in cooperation with relevant specialized organizations and subregional organizations:

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(a) develop both short-term and long-term programs for the collection and improvement of transport statistics;

(b) identify and define organizational and administrative tasks, budgets and staffing required for program implementation;

(c) develop statistical norms and definitions and establish the parameters for monitoring and evaluation;

(d) collect and maintain quality control on data as received and process data;

(e) disseminate data by electronic methods and through the production of a Transport Statistics Yearbook for Sub-Saharan Africa; and

(f) analyze data and evaluate progress in the overall UNTACDA II program.

11.11 However, as already stressed, the success of the program will depend on the upgrading of the national transport statistics systems. The production of a transport database from statistics of variable quality can be an unproductive exercise. The improvement of national transport statistics systems is also an important objective in its own right. The key elements in this endeavour are: (a) development of statistical norms and definitions, and (b) preparation of adequate transport statistics manuals (see Appendix 2). Further preliminary work is necessary in these areas before the full implementation of the transport database.

C. ROLE OF SPECIALIZED MODAL ORGANIZATIONS

11.12 The transport statistics project must take into account ongoing work of specialized modal organizations and the Sub-Sector Working Groups already established to develop the objectives of UNTACDA II. In particular, input is required from these bodies in refining the transport data and key indicators identified in the present report; in establishing statistical norms and methodologies; in preparing the Transport Statistics Manual and component modules; and in organizing workshops for specific modes. Although the consultants have not surveyed all the relevant organizations in this field, the contacts made have indicated a willingness to cooperate.

11.13 In the air transport mode, the role of the International Civil Aviation Organization (ICAO) is well known and was discussed in Chapter 8. The findings of that chapter indicate that there is no need to duplicate the work of ICAO. It would also be counterproductive to institute a system of double reporting. At the same time, no problems exist in obtaining from ICAO corrected extracts from data on civil aviation activities. ECA would, of course, also cooperate with the Air Transport Sub-Sector Working Group set up for UNTACDA II under ECA leadership. The compilation of additional information through standardizing and processing immigration and tourist forms has been suggested. This could be tried at the subregional level, with the long-term goal of expanding the system on an Africa-wide basis and including the results in the centralized transport database.

11.14 In the rail transport mode, the Union of African Railways (UAR) has been active for many years in rail transport statistics and has examined statistical indicators relating to the functioning of African railways. As a forum of African railway management, the UAR is well suited to sensitize the African railways to the need for adequate railway data and the ways in which such data and railway management information systems can be most meaningfully employed. Unfortunately, the consultants did not have the opportunity to visit the organization’s head office at Kinshasa. However, from a subsequent conversation with the UAR, this
organization is very interested in working on the transport statistics project. In addition, inputs can also be obtained from the Railway Transport Sub-Sector Working Group set up for UNTACDA II.

11.15 In shipping, ports, multimodal transport and inland waterways, the UNTACDA II Sub-Sector Working Group has been set up under the leadership of UNCTAD, which has long experience with statistical problems in this area. It may be recalled that favorable reference was made to earlier UNCTAD publications on ports in Chapter 9 of the present report.

11.16 In roads and road transport, there is no specialized modal organization comparable to what has been described for air, rail and marine. The Sub-Sectoral Working Group for Roads and Road Transport has been set up under the leadership of the World Bank. As explained in Chapters 4 and 5 of the present report, the inadequacies in transport statistics are particularly severe in this area. ECA already has representation on this Sub-Sector Working Group and this will ensure the continued liaison essential to the overall transport statistics project.

11.17 In urban transport, the problems are similar to roads and road transport. The Urban Transport Sub-Sector Working Group of UNTACDA II has been established under the leadership of the World Bank and the Baseline Assessment prepared by the Group in October 1990 has already been referenced in Chapter 6. Again, as on all the UNTACDA II Sub-Sector Working Groups, ECA is a member and the liaison process is already established.

11.18 The specialized modal organizations discussed in this section obviously have a vital part to play in implementation of the transport statistics and database project. However, the UNTACDA II document has wisely centralized the overall responsibility of a transport database. In the opinion of the consultants, this was essential in order to coordinate development throughout the various transport modes and to ensure the resources were not spent excessively on some modes at the expense of others. While no statistical system is ever perfect, the most pressing needs are in the areas of roads and road transport and urban transport. The allocation of resources over the next few years should reflect these priorities for development of transport statistics.

11.19 Before leaving the present section, reference should also be made of the UNCTAD initiative in respect of its project on Advance Cargo Information System (ACIS). The objective of this system is to make information on cargo available in advance to all operators before the cargo reaches any transport interface. The system links marine and surface transport operators, shippers and their agents and all those involved in the movement of goods into, out of and within Africa. Operating through a series of data processing units, ACIS would allow goods to be monitored along every link in the transport chain. A by-product of full implementation of ACIS would be a substantial body of transport statistics. So far, ACIS has been implemented in transport operations in different parts of Africa and ACIS offices in Geneva, Mombasa and Abidjan were very helpful in making information available to the consultants. However, it is likely to be several years before ACIS is fully implemented and before the statistical material generated can be used in a major way to supplement and perhaps even replace traditional data sources. The consultants therefore recommend that the transport statistics and database project should keep in close contact with ACIS, but that work should not be delayed pending full implementation of ACIS.

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86 For a description of this project see UNCTAD, Advanced Cargo Information System August 1990, an updated revision of an earlier Presentation Paper dated October 1989. A useful introductory brochure on ACIS has also been produced by the UNCTAD Shipping Division in Geneva under the reference INT/0817.
D. ROLE OF SUBREGIONAL ORGANIZATIONS

11.20 During the course of the study, visits were made to three subregional organizations - the Preferential Trade Area for Eastern and Southern Africa States (PTA) in Lusaka; the Economic Community of West Africa States (ECOWAS) in Lagos; and the Communauté Économique de l'Afrique de l'Ouest (CEAO) in Ouagadougou. Time constraints did not allow for visit to the Economic Community of Central African States (ECCAS) in Libreville. A visit was made to the Lusaka ECA subregional office, the Multinational Programming and Operational Centre (MULPOC), but the itinerary did not allow visits to the three other MULPOCs in Cameroon, Niger and Rwanda. Time constraints also prevented a visit to the Southern African Transport and Communications Commission (SATCC) in Mozambique, thus, no comments are offered on the SATCC transport data bank. As the consultants were in Abidjan, a visit was made to the African Development Bank (ADB). The mandate of this organization is not strictly part of the present study, but the visit was useful particularly with regard to training needs.

11.21 The subregional organizations have their own mandates and priorities in the field of transport and transport statistics. They have also close relations with most of the countries in the subregions. Thus, their participation in planning the improvements of national transport statistical systems, as well as in the developing of the transport database for Sub-Saharan Africa, is important.

11.22 The PTA became operational in 1982 and covers a subregion comprising 23 countries in Eastern and Southern Africa. Of these countries, 18 are members; the five which are not members are Botswana, Madagascar, Namibia, Seychelles and Zaire. The geographical area includes all ten countries served by SATTC and, while PTA made no comment on possible duplication, a newspaper report while the consultants were in Zambia indicated that Kenneth Kaunda, then President of Zambia, was currently raising the duplication problem.87

11.23 PTA is active in a number of areas ranging from banking facilities to tariff reductions in its overall objective of promoting subregional trade. The Transport and Communications sector is small with only four professionals and occasional contract staff, and emphasis is on transit corridors and national transport routes. The achievements include a standardization of road transit documents for all countries in the region; introduction of a yellow card for minimum third-party coverage in motor insurance; harmonized road user charges to prevent discrimination against foreign vehicles, standardization of railway documents; and participation in preliminary attempts at cooperation between member states to provide joint airline services.

11.24 PTA has acquired considerable statistical material in the course of its work, but it does not maintain a formal data bank. PTA stressed the importance of standardized statistical definitions and the need for technical assistance to member states in the development of transport statistics. PTA expressed the view that ECA should delegate to subregional organizations this technical assistance to member states, the continuing dialogue with member states both individually and in collective workshops, and the collection of data, with all these activities linked closely to ECA headquarters in Addis Ababa. PTA specifically requested that these views be quoted in the present report.

87 The need to rationalize regional institutions has been highlighted in World Bank, Sub-Saharan Africa: From Crisis to Sustainable Growth. Washington, D.C., 1989, p. 152, as follows: "More than 200 regional organizations for cooperation and integration exist in Sub-Saharan Africa. Proliferation and duplication of functions give rise, at the regional level, to conflicts over mandates and to divided loyalty among governments". Although this statement did not refer to subregional organizations, the same danger can exist at the subregional level.
11.25 The functions of ECOWAS are very similar to those of PTA and, although there are fewer landlocked countries in West Africa than in PTA, same concern applies to the three countries in this situation. ECOWAS has been active in highway transport addressing types of licenses, maximum vehicle axle loads and configurations. Considerable attention has been paid to the development and evaluation of the Trans West African Highway Network and to railway service to landlocked countries. Like PTA, ECOWAS staffing levels are modest, with only three professionals in transport.

11.26 ECOWAS has not compiled a formal database for transport statistics, although it is currently pressing this issue on vehicle registration with member states, with the recovery of stolen vehicles a major motivation. The problems of collection of transport statistics were well appreciated, given the previous experience of ECOWAS in trying to obtain a wide range of socioeconomic data from member states (including transport statistics). ECOWAS was anxious to see a data bank of transport statistics established in Lagos and felt that ECA should work through subregional organizations in establishing the various projects related to the transport database.

11.27 CEAO is a subregional organization serving francophone West Africa. The membership consists of seven states - Benin, Burkina Faso, Côte d'Ivoire, Mali, Mauritania, Niger, and Senegal - representing all West African francophone states except Guinea and Togo. All CEAO member states are also part of the ECOWAS region. The CEAO mandate is very similar to PTA and ECOWAS, and the professional resources engaged in transport are of comparable size to these other two organizations.

11.28 CEAO has a very good understanding of the transport sector and recently sponsored an excellent study of transport in the region; in addition to the analytical content, this study also contained a large body of transport statistics. CEAO has computer expertise, but so far most of the computerized material has related to foreign trade. CEAO wishes to develop a transport database for its region, but it appears prepared to delay this, if an ECA database is imminent and compatible with CEAO computer systems. CEAO expressed strong interest in being involved with ECA as a subregional agency in the transport statistics work. It did not see any conflict with an ECOWAS involvement on the same lines, suggesting that CEAO would attend to francophone West African states and ECOWAS to anglophone countries.

11.29 The results of the consultant visits to PTA, ECOWAS and CEAO were almost identical. All three subregional organizations had small but competent transport sections and expressed interest in participating in the ECA transport statistics project. None of the subregional organizations presently has a computerized database and they do not wish to duplicate work to be carried out in the near future by ECA. Given the size of their transport staffs, additional resources would be needed if they were to embark in any significant way on training and the improvement on transport statistics in member states. Unfortunately, the consultants were not able to visit the remaining subregional organization, ECCAS. However, given the absence of information to the contrary, it is presumed that ECCAS would have views similar to those of the subregional organizations visited.

11.30 Only one of the ECA regional offices was visited — the MULPOC in Lusaka. It was explained to the consultants that the Lusaka MULPOC had not done very much work in transport as this had been carried out primarily at ECA headquarters in Addis Ababa. However, the MULPOC has an excellent understanding of the transport problems of landlocked countries, the

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difficulties in obtaining transport data, and the need to strengthen national statistical offices within the member states. In particular, the MULPOC stressed the need for attention to transborder data sources in the present study and the consultants hope that they have met some of these very legitimate concerns in Chapter 10.

11.31 The subregional organizations can play an important part in programs aimed at the improvement of transport statistics and implementation of a transport database project. The major tasks which the subregional organizations should assume are:

(a) to sensitize their member countries to the need for the improvement of national transport statistics systems;
(b) to assist in improvement of the quality of transport statistics collected in member countries and the development of adequate transport statistics programs;
(c) to organize, in cooperation with the central group, transport statistics workshops and to test and improve the manuals developed by the central group; and
(d) to cooperate in the execution of the database project.

11.32 Regarding the functioning of the proposed database, the question has been raised as to whether the reporting of data by individual African states should be made directly to the database, or indirect via the subregional organization, or simultaneously to ECA and the subregional organizations. Each option has some advantages. However, strong arguments exist for reporting center. Transmitting data, together with monitoring the timely receipt, form only one element in the functioning of the database. The other functions relate to the edit, the removal of obvious errors, clearing up inconsistencies and possible errors with data producers, signalling changes due to variations in coverage or definitions, etc. The performance of all of these functions in a consistent, professional manner is essential for the existence of a worthwhile database.

11.33 Inconsistencies in performing these tasks in a uniform manner would raise the risk that more than one set of "official figures" would co-exist, which would bring all the systems into disrepute. The data needs of subregional organizations could be easily met by the electronic transfer of the relevant parts of the master transport database from the reporting centre. It is possible that in addition to the standard data available through the central database, additional information may be required. In such cases, specialized surveys would need to be organized by subregional organizations. The important principle to follow is to decentralize what can be meaningfully decentralized, to build up a strong central group to deal with issues and programs which can be more economically centralized, and to assure the cooperation between ECA, subregional organizations, and the member states.

11.34 It is clear that the subregional organizations visited have a need to be involved in the transport statistics program and the desire to cooperate in the development and execution of such a program. What is required is a proper assignment of responsibilities to subregional organizations and the establishment of a workable coordination mechanism.

E. ORGANIZATION OF NATIONAL TRANSPORT STATISTICS

11.35 It is recognized in the UNTACDA II document that the ECA member countries must take primary responsibility for the collection of transport data and hence the improvement in the quality of transport statistics. As in many areas of economic statistics, the collection of transport data can be done in a centralized fashion by a Central Statistical Office or on a decentralized basis, where each government department collects the statistics pertaining to its own activities. The organizations responsible for the collection and dissemination of transport
statistics in the countries visited are reviewed below, starting with the anglophone and then the francophone countries.

11.36 Of the countries visited, the organization and quality of transport statistics are probably best in Uganda. In 1984, an IGA credit was assigned to establish a national transport database as a component of the Third Highway Project in Uganda. The objective of the database project was to establish within the Uganda Ministry of Works, Transport and Communications (MWTC), a statistical unit to collect and analyze transport data needed to support policy and investment decisions and to train local staff. Expatriate experts were recruited but, by August 1991, these had all departed, apart from specialist staff of Louis Berger International Inc., who were in the final stages of completion of studies on highway statistics. The statistical unit is now being run very efficiently by Ugandan staff in MWTC.

11.37 The database in Uganda covers a wide range of transport data: it is computerized and there is ready access to the database for MWTC and other government departments and international organizations. Extensive reviews of the Ugandan transport database have already been carried out by the World Bank (in June 1990) and by MWTC (in May 1991). The database is impressive and, during the course of the consultant visits in Uganda, it became clear that this achievement was very much appreciated by users of transport statistics in both the public and private sectors. Nevertheless, there are problems of which the most pressing is to ensure the availability of resources to continue the work. Originally, the budget for the project was somewhat informal, and cashflow difficulties were frequent, a problem which has not yet been completely solved. Office space is limited and the statistical unit is desperately in need of a motor vehicle to carry out its work effectively; however, the computer situation is much more satisfactory. Manpower has been a problem with the unit consistently operating below the allocated staff level, aggravated by staff losses to more remunerative employment elsewhere.**

11.38 There are still gaps in the available transport statistics in Uganda, most notably the lack of a firm measure of the number of motor vehicles on the roads, a problem which Uganda shares with all the other countries visited in the study. Computer access to the transport database is good, but the unit needs to produce a hard copy yearbook for public distribution both in Uganda and outside the country. The statistical unit has already considered publications of “pamphlets and brochures” and to sell these to cover the costs: however, this would be essentially cost recovery rather than a source of additional revenue.

11.39 The statistical unit of the MWTC is able to function effectively partly because all transport activities in Uganda are organized within a single Ministry. Formerly, the Ministry of Works was a separate department, but was consolidated with Transport and Communications in mid-1991. Consequently, the statistical unit of MWTC has a clear mandate to cover all forms of transport.

11.40 The (central) Statistics Department of the Uganda Government publishes information provided by MWTC, but does not do any original work in transport. Until approximately 1987, the Statistics Department was somewhat inactive due to lack of resources, and it is now concentrating on the restoration of major economic series, with a fair degree of success as shown in the very rapid publication of preliminary results for the 1991 Census of Population.

** The consultants note that the problem of retaining competent staff tends to be endemic in all statistical organizations in Africa and is not confined to transport statistics. High calibre staff are needed to run a statistics unit effectively and, after proving their competence in a statistics unit, such staff are very attractive to employers in other government departments, parastatal organizations and the private sector. While encouraging to the career prospects of statisticians, frequent turnover of staff obviously adds to the difficulties in organizing a statistics unit.
The attitude in the Statistics Department is that, given other priorities, there would be little point in devoting resources to transport statistics in view of the good work already carried out by MWTC. Relations between the two organizations are clearly cordial, although the forty kilometre distance between MWTC offices in Kampala and Statistics Department offices in Entebbe can present a logistical problem. Statistics Department staff are available for consultation with MWTC and ministry staff are considered for vacancies within all statistical units of government. There does not appear to have been any official ruling by government on whether transport statistics should be located centrally or in MWTC, but the view of the Statistics Department was that MWTC would continue to be responsible for transport statistics for at least the next five years and possibly permanently.

11.41 In Nigeria, each ministry is responsible for organizing its own statistical unit. Transport functions in Nigeria are not centralized in one ministry, but are located in three different ministries - Transport, Public Works and Civil Aviation. Nevertheless, the Federal Ministry of Transport produces a Digest of Statistics, which uses computerized data on all modes obtained from the three ministries operating in the transport area. Unfortunately, the consultants were unable to obtain a copy of this publication.

11.42 The Federal Office of Statistics (FOS) is Nigeria's central statistical office. Until 1988, the FOS had satellite statistics units in other government departments, but these units are now under the control of the various ministries and no longer part of FOS. Nevertheless, there is still considerable collaboration between FOS and the Ministry of Transport. In particular, FOS carries out considerable work on highway transport and, in July 1991, it was in process of conducting a survey on highway motor carriers, covering the usual information on fleet size, employment, routes served, revenue and expenses. An earlier survey of this type had been undertaken in 1984, but the methodology was considerably updated for the 1991 survey. While the purpose of this survey was partly related to work on National Accounts and the motor transport section contribution to GDP, the information was obviously of value to the Ministry of Transport.

11.43 The FOS has a long tradition of publishing statistical data and the Annual Abstract of Statistics contains extensive data on railways, ports and air transport. Data are given on new motor vehicle registrations but, as in all the countries visited in study, the total fleet size is not known. Rather surprisingly, no data were given on the length or condition of roads, but road accidents are quite extensively documented.

11.44 With respect to Kenya, earlier chapters of this report have indicated the relatively high quality of statistics, particularly as concerns railway and port operations. However, the focal point for transport statistics is less clear. The Ministry of Transport and Communications deals with all transport modes except roads, which are a responsibility of the Ministry of Public Works, and urban transport, which is the responsibility of the Ministry of Urban Development. From discussions with the Ministry of Transport and Communications, it is clear that an ongoing evaluation is undertaken for the air, rail, ports, shipping and licensing of motor vehicles and buses, with this requiring considerable analysis of transport statistics. However, it does not appear that the Ministry places these statistics in the public domain.

11.45 The Kenya Central Bureau of Statistics is located in the Ministry of Planning and National Development. The annual Statistical Abstract published by the Bureau contains extensive data on railways and ports, provided respectively by Kenya Railways Corporation and Kenya Ports Authority; air transport; road kilometrage, imports and new registrations of road vehicles, and road traffic accidents; and the contribution of the various transport modes to GDP. Users calling at the Bureau's offices are provided with published data and with more detailed, non-confidential, unpublished data, with the written authorization of the Bureau's Director.
11.46 The Central Bureau of Statistics also carries out survey work in transport and was in process of designing a survey of highway carriers, both freight and passenger, as a follow-up to previous work in this area. However, although the survey included questions on resources used by carriers, the main focus was on financial data rather than on traffic and operations since the Bureau wanted this information mainly as an input to GDP estimates. It was the impression of the consultants that there was only limited contact between the Central Bureau of Statistics and the Ministry of Transport and Communications. This is unfortunate, as surveys designed and carried out by the Bureau could very easily include questions more specific to the work of the Ministry of Transport and Communications.

11.47 In Zambia, the Central Statistical Office (CSO) publishes a report entitled *Transport and Communications Statistics* roughly every two years, giving considerable detail on civil aviation, railways, roads, motor vehicle registrations and road traffic accidents. The main sources for the statistics are the Department of Civil Aviation, Zambia Railways, the Roads Department and the Road Traffic Commissioner. Unfortunately, the latest statistics published are somewhat out of date, but further reports are currently being printed and non-confidential information is available to users at the CSO. In addition to this specific publication dealing with transport statistics, the CSO also publishes a *Monthly Digest of Statistics* covering a number of socioeconomic fields and including more recent statistics on civil aviation, registrations of new motor vehicles, road accidents, and railway traffic. The CSO also assists other government departments in survey methodology.

11.48 All ministries in Zambia are required to have statistical units within their organizations, but this has only been implemented recently for transport. The Ministry of Power, Transport and Communications (MPTC) has a Transport Planning Office Information Centre within its Transport Planning Unit. Transport data are collected monthly for all modes including roads which fall under the aegis of the Ministry of Works and Supply. The database is already in place in MPTC and, although no statistical abstract has yet been published, the objective is to do so every three months. The audience will be primarily policy makers and planners, but the abstract will also be available to outside users. The establishment of the Transport Planning Unit was funded by UNDP until the end of 1990. Funding in 1991 was being provided by the Government of Zambia, and UNDP is reviewing the project and assessing the possibility of renewed funding in 1992.

11.49 Overall, it was the impression of the consultants that the concept of a central statistical office was less developed in francophone than in anglophone Sub-Saharan Africa. (It should be noted, however, that only a small number of countries were visited.) In the Côte d’Ivoire, the formal re-establishment of a central statistical office is being reviewed; at present, statistical data collection, other than census and demographic statistics, takes place within a division of the Planning Ministry. The consultants were informed that a transport database existed in the Direction et contrôle des grands travaux, the government agency which produced the *Plan National de Transport* in 1988. However, although the agency has carried out many transport studies, it does not maintain a formal transport statistics database. Transport statistics are available for the Côte d’Ivoire from the Ministère de l’Equipement, des Transports et du Tourisme and from carriers.

11.50 In Burkina Faso, the Institut National de Statistiques et de la Démographie (INS) is the central statistical organization. However, INS has very limited resources and personnel. The primary demands on INS are for statistics on national income, foreign trade and population, but ad hoc advice has been provided to other government departments, including assistance in the development of the methodology for a survey of highway carriers. Limited transport data from administrative sources is included in the INS publication *Annuaire Statistique du Burkina Faso*, but the latest figures, which relate to the registration of new motor vehicles, number of driving
licenses, the structure of the highway network, air transport and foreign trade by mode of transport, are somewhat dated.

11.51 Transport responsibilities in Burkina Faso are divided among three Ministries - Transport, Public Works and Civil Aviation. In July 1991, the Ministry of Transport was in process of overhauling its database in cooperation with INSD. This database was envisaged to cover all modes, but implementation has been hindered by lack of qualified personnel. The Department of Civil Aviation has excellent statistics on airport activity, although these are collected manually and the need for computerization was stressed to the consultants. In the Ministry of Works, data are available on roads, road equipment and traffic counts, but the Ministry felt that there was considerable need for more formal consolidation of the statistics in a database. Extensive data on transit traffic are produced by the Conseil Burkinabè des Chargeurs.

11.52 On one hand, Burundi's central statistical office is a small organization working under serious personnel and material limitations. On the other hand, good progress in being made in Burundi to improve road inventory, the public transit bus enterprise operates a well-designed management information system, the airport statistics system is excellent, and statistics for the port of Bujumbura are more than satisfactory for a small lake port. It appears that the logical point of contact in Burundi would be the Ministry of Transport.

11.53 In Madagascar, the statistical system is centralized in the Banque des données de l'Etat. This is a larger organization than the central statistical offices of francophone West Africa, and it publishes extensive transport data. The Bulletin Mensuel de Statistique covers several areas of economic activity, including transport data from administrative sources for air, rail and ports. Considerable detail on these three modes is given in the annual Situation Economique, but highway information is limited to registrations of new vehicles. The Banque is also involved in examining methodologies and quality control for surveys to be carried out by other government departments, including motor carrier studies.

11.54 The second source of transport data in Madagascar is the Ministère des Transports de la Météorologie et du Tourisme (MTMT). This includes a Service de la coordination des transports, whose functions include the collection of transport statistics. The Service has a microcomputer and collects data from carriers in the air, rail, port and shipping modes, together with highway data from the Ministry of Works and vehicle inspection data, administered by the Ministry of Defense. The Service also carries out transport surveys. All data are validated by a committee of the departments concerned with transport before publication by the Banque des données. MTMT also places a considerable volume of transport data in the public domain through its own publications, such as the Préparation du Plan de Transports, last issued in April 1991, and a series of reports on individual modes such as the Evolution des Transports Ferroviaires of March 1991. The statistics contained in these publications are up-to-date.

11.55 The institutional arrangements for the collection and dissemination of transport statistics vary considerably in Sub-Saharan Africa. This has important implications for the organization of a program aimed at upgrading national transport statistics systems and establishing an African transport database. In the case of a technical assistance program aimed at the improvement of transport statistics, there is a clear need for the identification of a lead agency or ministry in each country which would work in cooperation with other government entities in this area. In the case of the centralized database, it would be possible for the ECA to cooperate with more than one government entity, provided that the system of reporting is clearly defined.

11.56 The problem of dealing with different points of contact to collect statistics for a central transport database has been discussed with ECA. PADIS, which is the ECA computer section, generally receives economic data from the central statistical offices of member countries.
However, there is no problem for PADIS in receiving transport statistics either from a central statistical office or from a department of transport. This allows considerable flexibility in the logistics of information transfer from member countries and, given the diversity in the compilation of transport data observed in the present study, this flexibility is essential. On the basis of the information given above, it appears that the contact should be the Ministry of Transport in Uganda, Nigeria, Burundi and Madagascar, with the proviso that the Banque de données also be able to fulfill this role in Madagascar in the near future. In Zambia, the Central Statistical Office seems to be the most appropriate contact, while in Kenya the contact could be made either centrally or departmentally.

11.57 The Côte d’Ivoire and Burkina Faso pose a more difficult problem, and it may be necessary, at least initially, for ECA to hire a national consultant in each country to gather the necessary data. This would not be a new departure for ECA, as similar action has been taken in the past. During the course of the study, the consultants were made very aware of the problems faced by most governments in finding adequate salaries for professional staff. A recent report in The Economist stated that "The real value of African civil servants’ salaries has fallen by half in the past five years" and that consequently "professionals are walking away".70 The ECA must consider the need to pay honoraria, at least in some countries, in order to facilitate the flow of data envisaged in paragraph 188 of the UNTACDA II document quoted in section B of this chapter.

11.58 It is not the intention of the consultants to recommend a centralized system of collecting statistics through a central statistical office as opposed to a decentralized collection through a ministry of transport. In the immediate future, the arrangements actually in existence in member countries will be have to be accommodated.71

F. RECOMMENDATIONS

11.59 Detailed recommendations on the upgrading of transport statistics, the organization of the transport database, and activities over the next two years are presented in Chapter 12. This conclusion to Chapter 11, therefore, consists of some general recommendations based on the following assumptions:

(a) a comprehensive program will be developed to improve national transport statistics and establish a transport database for Sub-Saharan Africa;
(b) the program will involve ECA, specialized modal organizations, and the subregional organizations; and
(c) an adequate organizational framework will be established.

70 The Economist, August 31, 1991, p. 33.
71 As general background, the advantages of a centralized system include availability of statistical expertise on a scale which cannot be provided in each individual government department; application of the highest statistical standards of methodology and quality control across activities; a comparative freedom from government interference; the ability in times of budget cuts to reallocate funds rather than cut across the board; and a career path for statisticians within their own discipline. The disadvantages are lack of subject matter knowledge of transport; failure to rank transport data high among the competing priorities of statistics on gross domestic product, population, external trade and consumer prices; collection of transport data limited to statistics provided by carriers and other government departments; and possibly less protection for transport statistics in times of budget cuts than would occur in a ministry of transport, which knows first hand how much the data are needed.
11.60 The program to improve national transport statistics should have two major elements:
(a) development of statistical norms and data collection methodologies;
(b) carrying out programs aimed at the improvement of national transport statistics, including development of short-term and long-term transport statistics plans and resolution of major problems identified in the modal chapters of the present report.

11.61 The objectives of the national programs are:
(a) meeting user needs for data required for transport planning, policy development, management and monitoring;
(b) developing national expertise to be used for the needs of the country involved, as well as providing the base for a meaningful inter-country transfer of experience; and
(c) improving the quality of data transmitted to the centralized transport database.

11.62 In order to meet the objectives of improving the quality and the coverage of transport statistics, the following steps are needed:
(a) selection of a group of "pilot countries", which have a capacity to carry out and sustain a meaningful transport statistics program;
(b) sensitization on a national scale as to the need for adequate transport data;
(c) designation by each national government of a lead agency in transport statistics, either the Ministry of Transport or the Central Statistical Office, and ensuring the co-operation of other government agencies;
(d) organization of specialized seminars and short training courses; and
(e) compilation of Transport Statistics Manual, as described in Appendix 2.

11.63 Parallel with the work on upgrading of national transport statistical systems, the development of the transport database for Sub-Saharan Africa is required to meet the objectives of UNTACDA II. Successful implementation of the database depends on the improvement of national transport statistical systems. The organization and the management of the database will be within ECA. Required data should be routed directly to ECA, with the exception of civil aviation data to be provided by ICAO. At this stage, the consultants are unable to address the possibility of having UAR provide railway data in a way similar to that recommended for ICAO.

11.64 The following needs relate to the establishment of the transport database:
(a) development of short-term and long-term programs;
(b) identification and definition of administrative tasks, budgets and staffing required for program implementation;
(c) establishment of the necessary formal agreements with the offices of the member countries charged with the responsibility for the submission of data, as well as the necessary cooperative arrangements with subregional organizations; and
(d) establishment of the format for data dissemination by electronic methods and through the production of a Transport Statistics Yearbook for Sub-Saharan Africa.
CHAPTER 12: RECOMMENDATIONS

12.01 The need for improvement of transport statistics and organization of a transport database for Sub-Saharan Africa is well established. The modal chapters of this report contain specific recommendations regarding improvements in transport statistics. Recommendations in Chapter 11 deal with the organizational measures needed for the implementation of the program. These specific recommendations are not repeated in this chapter. Rather, the general context for development of a program to improve transport statistics is restated and, in section C, suggestions are made regarding the next stage of the project.

12.02 The implementation of the well-articulated goals of UNTACDA II should proceed along two lines, which are mutually supportive and should form part of an integrated long-term program: (a) organization of a sustained, continuous program for transport statistics improvements, and (b) establishment of a transport database within ECA.

A. UPGRADING OF TRANSPORT STATISTICS

12.03 Compilation of adequate transport statistics depends on the efficiency of national system designs and the organization of data collection and processing. Specific gaps in transport data have been identified in the modal chapters of the report, together with resource inadequacies, relating to personnel, salaries and equipment, especially microcomputers and motor vehicles. The current review indicates considerable differences in the capacity of national systems to produce and report adequate data. It is relevant to note here that even the most mature international transport statistics, namely civil aviation statistics, suffer from major basic data reporting failures. The compilation of data of doubtful accuracy for the various transport modes, even if organized in the most impressive data banks, is of doubtful utility and may result in misleading comparisons and erroneous interpretations. Most important, adequate national transport statistics systems are an essential element in the improvement of transport planning and management, thus the upgrading of such systems should be considered a major objective in itself.

12.04 In order to make a serious improvement in this important area of transport statistics a well designed, consistent long term program is strongly indicated. Such a program should, as its principal focus, work at strengthening the foundations of the system, that is improving the management information systems and data collection methods in a coherent, integrated manner. Only if the basic data are correct, only if the most important surveys are properly organized and executed, can meaningful aggregates be properly derived.

12.05 Much effort has been spent on designing and improving specific information systems. Therefore, the present challenge is to build upon the best available practices and to facilitate the application of the best information systems, in other words, to consolidate and generalize specific achievements, to make them better known, more understandable and better applied.

12.06 The important programs essential to achieve these objectives are:

(a) assistance in national transport statistical systems design;

72 The present study is confined to Sub-Saharan Africa and excludes the five states of North Africa. In terms of comprehensiveness, there could be merit in extending the coverage in due course to the whole of Africa.
(b) upgrading of professional capability through well targeted and prepared workshops and development of longer term training when appropriate; and
(c) development of an adequate transport statistics manual.

12.07 **Statistical systems design.** Although many elements of national transport statistics systems and some management information systems are already in place, there is a need for development of an overall system, specifying objectives, interrelationships, and links between individual elements and long-term improvement targets for closing the existing data gaps. Since, in most countries, the responsibility for different elements of transport statistics and data collection are distributed among different ministries and other government entities, an obvious need exists for coordinating these different efforts and establishing a proper consultation mechanism among the users and producers of data. In other words, a formal statistical plan is required which would realistically specify tasks to be performed by the participants involved.

12.08 It is likely that many countries will require technical assistance to help develop transport statistics programs. It should be noted that, in addition to the benefits accruing to the country from the preparation of a realistic and fully documented transport statistical plan, much of the experience obtained would also benefit other countries. While copying a plan developed elsewhere may be inappropriate, a well designed and well documented program for one country would be helpful in developing a program in another. Furthermore, African specialists who successfully developed a plan should be effective advisors and agents for experience transfer. It would be useful for ECA to monitor such developments and, in cooperation with subregional organizations, to facilitate subsequent experience transfers.

12.09 **Workshops.** The system of statistical workshops has been well developed by different organizations for a variety of socioeconomic statistics, e.g., International Statistical Programs Centre, ICAO, UNCTAD. In the case of the ICAO program, former African participants in these workshops, interviewed during the present study, expressed their satisfaction with the program, which they found useful in a practical sense. The ICAO Statistics Division found that such workshops considerably improve statistical reporting from participating countries and reduce errors.

12.10 The conditions which have been found essential for the success of the workshop program are:

- Participation of at least from six to four countries; groups of 12 to 20 participants appear most effective.
- Participants should be selected from senior working-level professionals (division chiefs, unit heads, senior professionals) directly involved in the statistical program.
- The scope of subjects selected for a particular workshop should be relatively restricted, except at the "Executive Level" seminar, which may be useful at the beginning of the program. Evaluation of the International Statistical Programs Centre’s assistance to population census programs indicates that more selective, specific needs directed workshops tend to be more effective.
- The workshops have to be well prepared and geared to practical problems encountered. Methods of presentation are extremely important; involvement of the participants in problem solving, frank discussion of their difficulties and a search for solutions are crucial. Given the nature of the subject, keeping the participants’ interest and desire to find solutions demands high presentation skills. Therefore, a
successful workshop program requires both careful preparation of material and training of trainers.

12.11 In the case of transport statistics development, two types of workshops would be appropriate: (a) workshops on overall development and design of transport statistics programs, and (b) workshops on specific aspects of the program, that is subsectoral or modal statistics and management information systems. There are obvious economies of scale in preparing material, training the trainers, and documenting the progress and problems of the program. In this field the role of ECA and the need for cooperation between ECA and subregional organizations appears self-evident. There may also be a need for more long-term training, but this is not examined at length in the present report.

12.12 Transport statistics manual. As noted, much of the material useful for data collection and analysis systems exists, but not necessarily in a generally usable and "user friendly" form. This represents a serious obstacle for the rational, long-term development of transport statistics and information systems. Under conditions of high staff turnover and uneven distribution of professional capability in Africa, the full documentation of methods and processes is particularly necessary.

12.13 The proposed manual should be developed in "modular form". The modules corresponding to the major needs and gaps should be self-contained, thus permitting the organization of a staged work program for the preparation of the manual. The modules would, of course, draw heavily on previous work in documenting best methods for compilation of transport statistics. The consultants did not carry out a complete survey at this work, but they were favorably impressed by several earlier initiatives in this area, such as the UNCTAD work on port statistics. A general specification of the proposed manual is contained in Appendix 2, but the preparation of this manual would not be a completely new endeavor and would build on past work. The preparation of the manual and the workshop program are, of course, mutually supportive.

B. ORGANIZATION OF THE TRANSPORT DATABASE

12.14 The recommendations related to the implementation of the transport database are as follows:

(a) There can be no useful database without good data, and considerable work on data quality is still needed.

(b) When the transport database is established for Sub-Saharan Africa, it should contain basic data for each mode relating to physical inputs used, physical outputs produced, financial performance and accident statistics. It should also contain key transport indicators, partly derived from these basic statistics and partly obtained from other sources, to be used to monitor the efficiency of the transport sector and progress towards the UNTACDA II goals and targets. The basic data and the key statistical indicators have been identified in Chapters 4 - 10.

(c) ECA headquarters in Addis Ababa were identified in UNTACDA II as the lead agency, cooperating with relevant international agencies, subregional organizations and national states. Implementation of a program for the improvement of transport statistics and the establishment of a transport database will require overall coordination of the work of subregional, specialized modal and
national participants; standardization and harmonization of statistical definitions; improvement of the quality of transport statistics in member states; training and workshops in transport statistics; receipt of transport statistics from national states and quality control examination of the data received; computerization of the data; analysis of the data with particular reference to monitoring the efficiency and productivity of transport systems and the progress achieved towards the objectives of UNTACDA II; and dissemination of the data both by electronic means and by publication of a Transport Statistics Yearbook.

(d) Subregional organizations have a role to play in implementing the transport database. PTA, ECOWAS, and CEAO have expressed strong interest in an involvement in this process and it is presumed that this would hold for ECCAS, although this organization was not visited by the consultants. It is recommended that subregional organizations be involved in the implementation of the transport statistics program and that their functions focus on improving the quality of statistical data in member states and the organization of subregional training courses and workshops.

(e) The collection of transport statistics in each country must clearly be the responsibility of the country itself. In some countries, this currently means collection by a central statistical office and in others collection by a ministry of transport and possibly other government departments. This diversity in the organization of the collection of transport statistics is likely to continue and there is no strong reason to promote any one model.

(f) The establishment of a transport database is a major task, which requires the formal adoption of well designed long-term and short-term programs, and this should proceed in stages.

(g) The logical way to begin implementing the program is to have a group of African countries build up the required African expertise to test the collection system and to improve the generation of transport data. Such countries should have reasonable transport data systems already in existence; a commitment to the maintenance and improvement of national transport statistics systems; and reasonable expectations that the necessary resources for transport data collection and analysis with continue to be available.

C. RECOMMENDED SUBSEQUENT ACTIVITIES

12.15 The presentation of this report should be followed by activities leading to the improvement of transport statistics systems in Africa and the establishment of an African transport database. These activities are detailed as follows:

1. Dissemination of the consultant report and assurance of collaboration from African countries;
2. Establishment of program execution capacity within ECA;
3. Improvement of transport data collection and analysis; and

In order to facilitate program management and control, the relevant "milestones" and outputs are identified. The "milestones" should be interpreted as logical points for program review, which would permit making subsequent adjustments and revisions.
12.16 Dissemination of Consultant Report and Assurance of Collaboration from African Countries

This activity involves the following:

(a) The present report would be distributed to interested parties, as determined by the Steering Committee, for comment.

(b) A relatively short document summarizing the major findings of the report and proposed action would be prepared, incorporating the inputs obtained under (a) above. This report would be geared to senior transport administrators at a decision-making level. The objective of the document would be to inform all countries of the work undertaken on transport statistics and to serve as the base for subsequent implementation steps.

(c) A seminar would be held for interested countries, which were willing and able to participate in the transport statistics improvement program. The criteria for the selection of such pilot countries should be their capacity and commitment in respect of statistical improvement. In order to make the program administration easier, the selection of the pilot countries could also use geographical criteria: location within the same subregion, and interest and capacity of subregional organizations to participate and assist in the program.

12.17 The output of this activity would be a commonly agreed action plan, a clear indication of priorities, and commitment of the pilot countries to implementation through formalized memoranda of understanding. From the point of view of the supporting organizations, completion of these activities would make it possible to determine the level of serious interest and to make the consequential decisions regarding the continuation and the scope of the program. Thus the results of the suggested seminar and evaluation of such results would clearly define the first milestone of the program.

12.18 Establishment of Program Execution Capacity within ECA. In parallel with the activity described above and in anticipation of positive results of the review, ECA would undertake the following:

(a) Key consultants would be recruited to work as program animators, technical advisers and problem solvers. The consultants would be hired on 12-18 month contracts, rather than as permanent staff given: (i) the difficulty in establishing permanent positions within a short time period; and (ii) the differences between the desired qualifications of permanent staff members charged with the responsibility of continuing program management, and the special qualifications required during the program start-up. In practice, it could be that the same persons would fit in both situations; this indeed would be desirable, but cannot be predicted at this stage.

(b) Long-term and short term plans and arrangements for the success of the program would be specified.

12.19 It may be argued that this activity should await the results of the first activity identified, or in other words postponed until after the first milestone will have been reached. The justifications for the implementation of these activities in parallel are: (i) a reasonable expectation that the transport statistics improvement program would meet the needs and correspond to the interests of a significant group of African countries, i.e., that a decision to carry out the program is significantly more probable than a negative decision; and (ii) the work
to be undertaken by ECA is time-consuming, thus programming such activities in parallel rather
than sequentially would result in significant time-saving. The output of this work would be
creation of the necessary program execution capacity, or at least its nucleus, within ECA.
Establishment of such a capacity would be the second milestone of the program.

12.20 Improvement of Transport Data Collection and Analysis. The main components are as
follows:

(a) A transport statistics manual would be developed in a modular manner, with
each module related to a particular set of statistics, their collection, processing
and utilization, as described in Appendix 2 to this report. This would be
undertaken in cooperation with specialized organizations, utilizing earlier work
in this area and codifying the best existing practices employed in African
countries.

(b) Appropriate workshops and seminars would be organized.

(c) Advisory services on transport statistics would be undertaken.

(d) Information transfer to other African countries would be facilitated, using the
experience gained through working with pilot countries.

12.21 While the implementation of this activity would constitute the third milestone, much of
this work would have to be continued as long-term improvement of transport data of direct use
to the countries, the subregions and the region.

12.22 Design of an African Transport Databank. This activity would take place in parallel with
the work specified under transport data collection and analysis and involves the following:

(a) Transport data and key indicators suggested in the modal chapters of the
present report would be refined, in close association with modal and
subregional organizations.

(b) The transport databank would be implemented.

(c) The format of the proposed yearbook or compendium of African transport
statistics would be designed.

12.23 The output of this activity would comprise the fourth milestone, namely an operational
databank for the ongoing program of production and analysis of transport data at ECA, together
with publication of the yearbook.

12.24 The activities noted under points 1 and 2 complete Phase I of the Transport Database
Project. Activities specified under points 3 and 4 form the core of Phase II to be implemented
at ECA.
APPENDIX 1: LIST OF PERSONS CONSULTED

1. The consultants are very appreciative of all the help given to them by so many people in Sub-Saharan Africa, in the sponsoring agencies represented on the Steering Committee for the project, and in the European organizations visited. Without the knowledge and insights of these people and the generosity with which they made their time available, it would not have been possible to have produced this report. While the consultants take full responsibility for all the contents of the report, they would like to acknowledge the impressive expertise that has been made available to them.

2. The list in this Appendix follows the time sequence of the consultant visits, with persons interviewed in each location listed alphabetically. There are two exceptions to this. Because of multiple contacts with ECA, all staff from this organization are listed together early in the Appendix. Similarly, for convenience, all UNCTAD staff are listed together under Geneva, even though all the meetings did not take place in this location. The list of persons by location follows and the consultants apologise for any omissions or misspellings.

3. World Bank, Washington

Infrastructure Division, Technical Department, Africa Region
Richard Barrett, Principal Urban Transport Specialist
Bernard Beccq, Transport Engineer/Economist
Karim-Jacques Budin, Senior Railway Engineer
Bernard M. Chatelin, Senior Economist in charge of SSATP
Jean Doyen, Division Chief
Ian Heggie, Principal Infrastructure Economist
Sture Karlsson, Port Engineer
Stein Lundebye, Transportation Engineer
John D.N. Riverson, Transportation Engineer/Economist
Jean-Claude Vichet, Transport Engineer

Other Divisions
Rodrigo Archondo-Callao, Systems Analyst, Transport Division, Policy, Planning and Research Staff
Bengt Bostrom, Senior Transport Economist, Eastern and Southern Africa Projects, Transportation Division
Imogene R. Burns, Economist, Infrastructure Operations Division, Southern Africa Department
Louise Lasson, Technical Assistance Officer, Africa Region Technical Department
Timothy Marchant, Sr. Economist/Statistician, Statistics Division
Brigitta Mitchell, Principal Economist, AF5IN, Africa Region Infrastructure Division
Alfred Nickeson, Transport Specialist, AF4IN, Africa Region Infrastructure Division

Others
Vincent Hogg, Retired World Bank Official
Joseph Pihi, Professor of Economics, University of Brazzaville

4. United Nations Development Programme (UNDP) - (meetings in Washington)

Damian Lascu, Principal Technical Advisor
5. United Nations Economic Commission for Africa (ECA), Addis Ababa - (meetings also held in Washington and Nairobi)

**Transport, Communications and Tourism Division**
- Mpekesa Bongoy, Director
- Robert M. Okello, Chief Technical Adviser, UNTACDA Project
- Tunde Oladumiye, Information Systems Officer, UNTACDA Project
- Daniel Ngangmuta, Economic Affairs Officer
- Paul T.A. Were, Economic Affairs Officer

**Statistics Division**
- E.F. Chinganda, Trade Statistician
- A.E.F. Cummings-Palmer, Chief, Statistical Development
- Arif M. Farozi, Chief, Statistical Data-Base

**Pan African Development Information System (PADIS)**
- Francis K. Inganji, Officer-in-Charge

**Technical Cooperation and Coordination Division**
- Mamoudou A. Toure

6. United Nations Conference on Trade and Development (UNCTAD), Geneva

- John Burley, Chief, Joint Technical Co-operation Unit
- Jacques Cambon, Chief, Ports Section
- Gary Crook, Economic Affairs Officer
- Bernard Defalque, Information Resources Specialist
- Peter Fröhler, Head, Research and Technical Development Unit
- Coll M. Hunter, Senior Advisor to Director, Shipping Division, and Co-ordinator, Advance Cargo Information System (ACIS)
- Roger A. Longhorn, Information Systems Consultant
- Anthony Ngororano, Chief, Landlocked and Island Developing Countries Section
- Eric Williamson, Co-ordinator, Technical Co-operation and Training Programme, Shipping Division

**ACIS, Mombasa, Kenya**
- Augustin Ndabihore, Chief Technical Adviser

**ACIS, Abidjan, Côte d'Ivoire**
- Mamadou Mbaye, Chief Technical Adviser

7. Economic Commission for Europe (ECE), Geneva

- M. Magold, Transport Division
8. European Communities Commission (ECC), Brussels

Keith Crawford, Transport Directorate

9. Paris, France

Gérard Olivier, Ministère de la Coopération et de Développement

10. Nairobi, Kenya

Bill Harris, Programme Co-ordinator, Kenya Railways
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APPENDIX 2: TRANSPORT STATISTICS MANUAL

Justification and Objective

1. Preparation of a transport statistics manual is justified on the following grounds:

   (a) There exists a lack of easily accessible and easily understandable documentation on the collection and needs of transport statistics. Some valuable material which exists is scattered in different publications, not always easily available for prospective users, especially a few years after the original publication. Much of the otherwise excellent material is presented at a technical level which many users would find difficult to absorb.

   (b) In many African countries, there exists a high turnover of experienced staff. This has an adverse effect on the accumulation of organizational experience and learning-by-doing. The experienced staff is often too busy and too overstretched to be able to document fully the processes, methods and shortcomings needing further attention. Given such conditions, a simple, basic document would help to address existing problems and provide an incentive for more disciplined development of appropriate documentation in the future.

   (c) There exists a diversity of practices and traditions arising from ad hoc efforts of consulting missions, special studies etc. Such diversity adversely affects the development of common standards and compatible data. Advice received from different experts can often seem conflicting and this affects the continuity of the development of adequate systems. Therefore, a basic framework for data collection and data handling would be a contribution to continuity in the development of statistical systems.

   (d) The success of workshops, seminars and training courses depends inter alia on the availability of adequate and practical material. Such material is not always available. (ICAO workshops supporting a common, well documented system are an exception and indication of what could and should be done.)

2. In order to deal with such problems, the preparation of a practical transport statistics manual is recommended. The manual should be simple to understand and therefore of direct usefulness to the working level professionals (chiefs of units charged with responsibility for data collection and analysis and the professional staff of such units). It should address the following problems:

   - usefulness of data collected: why specific data should be collected? what needs such data are aimed to satisfy?
   - data presentation: how to present the data to satisfy the user requirements? how should the data be referenced? how should important qualifiers (changes of definitions, coverage, adjustments, etc.) be signalled?
   - definitions of terms used, which should be easy to understand and easy to apply;
   - sources, their nature and limitations;
   - descriptions of recommended methodologies, with clear explanations of the advantages and disadvantages of alternative methodologies and how they may affect the nature of the data produced;
   - recommended classifications and coding structures;
3. Offices charged with data collection, processing and analysis should be sensitized to the need for proper documentation of surveys and data collection procedures, which would supplement the manual. The manual itself should contain examples of such documentation. This documentation should include a statement of requirements which resulted in a survey or a data collection process; the authority to commence and execute the program; the methodology used with forms, instructions, etc; resources employed; difficulties encountered and changes introduced; and recommendations for future improvements.

4. It should be emphasized that the suggested manual would not be a substitute for statistical workshops, training courses and seminars, nor for keeping a useful and usable statistical system documentation. On the contrary, it should be viewed as an important element in establishing such a system. Material collected at seminars, workshops and training courses should be kept accessible for all potential users within the organization. (At present, such documentation and papers are often kept in personal collections of the officers attending such meetings; if the officer attending a program moves, such documentation is often lost.)

Manual Format

5. The principle to be adopted in the preparation of the manual should be "sophistication makes it simple". The document would be addressed to busy professionals with different backgrounds and levels of technical knowledge. This implies clear and concise explanation, especially of technical terms, and avoidance of unusual words and technical jargon. Excessive use of abbreviations and cross referencing should also be avoided. It can be better to repeat the same term every few pages than to force the reader to look back for a specific reference. In many cases, graphics and even cartoons have proved to be extremely useful in increasing the readability and user interest in the text. In any case, careful attention to all methods and techniques to improve the presentation is essential.

6. It is also essential to explain fully the reasons for using a particular method, as well as the nature and the importance of all the tasks to be performed. If the user fully understands the objectives, the process and the tasks to be performed, he can adjust the system to his needs and/or make changes to resolve his particular difficulties without affecting the system's integrity. By establishing a firm base of understanding, rational evolution of the system from rudimentary to more comprehensive can take place.

7. The need to explain "why?" before suggesting or specifying "how?" merits emphasizing. Many manuals, which score very highly as "how to do it" guidelines, fail to explain "why to do it" or "why to do it in a particular way" or fail to do it in a manner credible and understandable to the user. Thus, they become "foreign transplants" not integrated into the national working environment. Furthermore, a good explanation of reasons and stressing importance of this work for producing data is an important factor in motivating personnel engaged in this sometimes unglamorous task.

8. The manual should provide necessary examples. Here again, clarity of presentation and apparent relevance to the actual work to be done should be stressed.

9. Unfortunately, the manual should also be detailed. The difference between a statistical system which works well and one which presents an impressive facade is largely a matter of discipline and attention to detail. Experienced organizations develop formal and informal traditions for dealing
with details; where such strong traditions do not exist, additional care to provide detailed documentation is needed.

10. Lastly, the manual should be organized is almost self-contained parts to avoid cross-referencing. The adoption of the modular format has an additional advantage of gradual development of the manual and producing parts or modules which are particularly needed to fill the most important current gaps first.

Suggested Modules

11. The suggested structure of the manual is presented below. It should not be interpreted as a final table of contents, but rather as a preliminary sketch from which a detailed plan of the manual should emerge.

12. A. General Content

1. Uses of transport statistics.

2. Elements of a statistical system: from source document or observation through data processing to the "final product" (tabulations, data banks).

3. Administrative statistics generated by administrative activities and/or the control of transport operations.

4. Accounting data.

5. Surveys.

6. General issues related to the organization and working of an information or a statistical system:

   ° quality control,
   ° definitions, classifications and coding,
   ° documentation,
   ° questionnaire design,
   ° graphical methods.

In view of the imperfect availability of textbooks and useful specialized monographs, this module may usefully include specialized technical appendices or reproduction of selected teaching material. A short useful bibliography containing only items which are in fact accessible should also be appended.

13. B. Specific, Sub-sector Module Content

The suggested specification of the specific, sub-sector modules is as follows:

1. They should build up the systems from the "bottom up", that is from management information systems at the operating level to more comprehensive and more aggregated systems. This implies consolidating and making more accessible different information systems developed for different countries and/or industries. Although the
full documentation for such management information systems should not be reproduced, the general characteristics should be presented with proper references.

2. Some management information systems are formulated in a modular form (for example, D. Porter, Modular Management Information System for Railways, Washington: The World Bank, Planning and Research Staff, Infrastructure and Urban Development Department, Report No. 30, September 1988). This appears to be the proper way to develop and inform the prospective users of the manner in which information systems should be introduced and managed. In this way, the proper foundation for transport statistics could be established. In using and incorporating this material, the basic desiderata of a useful manual should be kept in mind: simplicity of exposition and full explanation of reasons for the application. As a condensation from Porter, the design principles in the development of the modules are:

- importance (priorities to be given in areas of greatest needs for managerial action and control),
- economy and flexibility (use of micro-computers, possibility for subsequent expansion of detail),
- aggregation (modules to be compatible with each other to permit aggregation of data for higher level use),
- simplicity (each module to be designed and specified so that it is easy to understand and use; in this way the training requirements could be minimized).

3. Although each module and sub-module would be organized to meet the specific needs of a transport mode and transport data collection program, the following common elements should be preserved:

- A clear description of data or information to be generated and its relationship to other parts of a statistical system,
- Indication of uses and users, with clear answers to the questions: who are immediate users? what are the applications of data? who are indirect and higher level users? what is the level of detail required for each use? how are the data to be aggregated for "higher level" use?
- Basic sources and collection methods, reporting forms,
- Methods of data processing,
- Methods of information dissemination (publications, information sheets, specific computer print-outs),
- Indication of possible pitfalls and difficulties.

Comments on Manual Preparation

14. Clearly, the preparation of the suggested manual would represent a serious undertaking. It would require co-operation of specialists from different areas and serious editorial effort to make the final product useful and user-friendly.

15. Fortunately, there exist factors which would make such an effort less costly and easier than it may appear. Such factors are:
(a) Considerable material already exists in the form of manuals, and consultant reports, especially those dealing with "institutional strengthening" aspects of transport planning or specific rehabilitation projects. Most of this material has been prepared by competent specialists. The major problem is not the paucity of existing material, but its accessibility, both in the physical sense (it is not always easy to locate and often even more difficult to obtain) and in the "readability" sense (some otherwise excellent reports or manuals are difficult for the user to understand and are not presented in a "user-friendly" manner).

(b) Adequate or very good practices already exist; therefore a large part of the task would be consolidate and properly present the already existing "best practices".

(c) By adopting the method of "modular presentation", the preparation of modules can be stretched over time, with highest priority given to areas of greatest need.

(d) Preparation and testing of the manual, and its modules can be integrated into a program of workshops and other technical assistance.
APPENDIX 3: SELECTED STATISTICAL SOURCE DOCUMENTS

1. Final data produced by a statistical system depend on the methods of obtaining information and on the forms or records used. The selection of forms presented here is indicative, but by no means complete. The designers of statistical systems should find this small sample useful, as representing both good and poor practices. It is hoped that, as systematic work on transport statistics progresses, a more complete survey of basic documents and instructions will emerge.

   A. Road Inventory and Road Condition Forms

2. The forms presented are all reproduced from the OECD manual "Road Monitoring for Maintenance Management", which is a product of a group of highly experienced specialists. In view of increased employment of computerized systems, an interested specialist should also consult manuals produced by the authors or organizations selling such systems.

   B. Vehicle Registration Forms

3. Two forms used for vehicle registration and licenses of motor vehicle in Kenya are selected as an illustration of the documents which should provide the basis for vehicle fleet statistics. Of course, only parts of the forms are relevant for statistical data collection, since the purpose includes owner identification and revenue collection. The forms are designed for machine processing, but there is not fully consistency between Forms A and B and this has implications on the ease with which an appropriate data file can be created.

   C. Road Accident Reports

4. The "Model Accident Reporting Forms" follows on two pages from the study by Tore Vaaje "Road Accident Recording Systems in Southern Africa". This is not a reproduction of a form actually used; the final design would consider elements such as the size of the page, carbon copies, numbering and details of the layout. The importance of such apparently trivial matters cannot be over-emphasized.

   D. Airport Traffic

5. The selected examples of the forms used by airport authorities, both for their own purposes and for ICAO reporting, are:

   Burkina Faso:
   
   Daily arrival record,
   Daily traffic arrivals and departures by flight,
   Monthly summary of airport arrivals and departures.

   Burundi:
   
   Daily airline reporting traffic form.
6. The Burkina Faso collection system is manual and consecutive summaries of data are therefore necessary. The Burundi system is on a micro-computer. Thus, the comparison of the forms also indicates the results of a change-over from a manual to a computerized system. The Burundi form contains information on the hour of arrival or departure of flights, which is potentially useful information for planning. It should be noted that information on in-transit passengers does not exist in Burundi.

E. Tourist Card

7. The immigration/tourist card of Burkina Faso is a format also employed in other francophone West African countries. It consists of two detachable parts, the second part used by the tourist office.

Because the format is standardized in one group of countries it could serve - with some changes - as the source document for compiling both international air traffic flow and tourist statistics.
APPENDIX 4: TRANSPORT SECTOR STUDIES

1. In order to round out the review of transport statistics by modes, this appendix presents a short survey of transport sector studies and transport statistics projects. This survey does not pretend to provide an exhaustive review of these studies; its objective is to use the material examined as an indication of data needs.

2. An important qualification must be made, if the studies are to be taken as the "revealed preference" of the users for transport data and indicators. By their very nature, the studies completed had to rely on data already existing, supplemented by special surveys. With the noted exception of Nigeria, the studies examined did not concentrate on the design of the transport information systems to meet future requirements; their major objective was to support national transport planning and transport policy development, or, as in the case of Kenya survey, to provide the background material for national economic planning.

Studies Examined

3. The following is the list of the studies examined:


Furthermore, the authors of the present study used their own experience and knowledge acquired during their work in other countries.
4. The above noted studies vary in scope, objectives and methodologies, as well as in quality of statistical compilations and presentation of transport data. As noted, the purpose of the present review is not to provide a critical survey, but rather to further statistical work. Although some studies made useful comments regarding future needs and included proposals for improvement, data collection specifications were rarely explicitly given. When future data needs were examined and priorities suggested, such as in Farahat report prepared for the Government of Nigeria, the stress was on the computerization of data processing and creation of formal data banks. Data processing and storage are important; however, in most cases, the fundamental problems relate to the improvement of the collection system.

5. A specific, problem or issue directed study must, by necessity, rely on the available data and/or special surveys which can be undertaken during the study period. However, it is incorrect to suppose that the method adopted by necessity as a short term solution is necessarily the best way of obtaining information in the long run. From the point of view of information system design, one wishes not to repeat second best solutions, but to progress towards the creation of a rational permanent system.

Data Presented and Implied Priorities

6. A. General Economic Context

Most of transport studies include a section on general economic conditions and presented such statistics as GNP, population and basic trade statistics. The general indicators which are useful to relate transport sector to the national economic indicators are:

(a) percentage of GDP generated by transport sector;
(b) transport employment as percentage of total employment;
(c) import of transport equipment, spare parts and fuel as percentage of total imports;
(d) government expenditures on transport sector as a proportion of total government expenditures;
(e) government tax revenues from the transport sector.

7. Employment and income generated by transport sector statistics are generally of poor quality. Figures produced in Kenya and in francophone West Africa were discussed in Chapter 3, paragraphs 3.08 to 3.10. Employment data are also unreliable, but the other measures identified in the previous paragraph can usually be produced without major difficulties.

8. The Nigerian Report of the Committee of Experts contains a useful table of allocation of public investments to transport (by sub-sectors) as a percentage of total public investments (Table 1.1). This table indicates that, between 1962 and 1986, the transport sector as a whole received between 15% and 25% of total public investment funds, with the roads subsector obtaining more than 60% of transport investment allocations. International comparisons of both total government expenditures and investment allocations would be of interest.

9. The CEAO study provides a useful table of the major trade flows for the countries surveyed for the years 1987-1990. Although data in value terms are less appropriate than data in tonnage, the table is of interest as indicating the relative importance of sub-regional, continental and inter-continental trade. It may be noted, in passing, that sub-regional commerce has accounted for less than 25% of trade of CEAO trade (with Mali being a notable exception), which indicates the importance of external links.
10. There appears to be a strongly perceived need to provide general economic data and to relate these to statistics of the transport sector as a whole. The key problem relates to the accuracy of the estimates of both national aggregates and transport statistics.

2. Prices and User Fees

11. Transport price (tariff) indicators have been included in transport tables in the Madagascar study and sporadically in other studies. These indicators would be potentially useful and obtainable for transport modes dominated by large enterprises. In order to be useful for inter-temporal comparisons, they would have to be adjusted for inflationary changes. The alternative, commonly employed in international statistics, is to present the data in dollars, ECU or SDR, with the U.S. dollar being the most widely used currency. The method used by ICAO is to convert national currencies by the average rate of exchange on the last day of the month.

12. Comparative data on user charges are not frequently presented. The CEAO study contains a brief section on "taxation et tarification", which also includes data on commissions charged by Freight Offices and Shippers Councils.

3. Road Infrastructure

13. All major studies contain information on the length of the road network by type of pavement and/or by functional classification. In some cases, cross-classification (functional road classification by pavement) is also used. Functional road classifications vary between countries. For example, CEAO countries use two classes for the national system, namely the principal and secondary roads, while Kenya employs six classes, namely: international truck roads, national trunk roads, primary roads, secondary roads, minor roads and special purpose roads.

14. Estimates of road kilometrage by condition exist only in the road studies based on a road inventory conducted at the time of the study. Since such tabulations are of considerable importance for road planning and budgeting purposes, one would hope that, with the improvement of road inventory systems, such data would be available. Kenya also produces data on "roads completed, started and in progress", giving both road length by class of roads and costs.

4. Vehicle Fleet and Vehicle Operations

15. The following studies contain information on the vehicle fleet:
   - Kenya: vehicles with current licenses by type;
   - Madagascar: vehicle fleet by type, two selected years;
   - Nigeria: estimate of the vehicle fleet;
   - Zambia: number of registered vehicles in use, private and government.

The CEAO study contains a frank statement that "le parc circulant de véhicules routiers est très mal connu dans tout les pays enquêtés" (p. 45), but recognizes the utility of such data. All studies reviewed contain data on new registrations.

16. Some studies include estimates of annual kilometrage per vehicle. The Madagascar study contains estimates — obtained from Origin and Destination surveys — of vehicle utilization, kilometrage and traffic carried. Similar estimates are noted in the Côte d'Ivoire study and in the Zambia Management Information System. Kenya statistics include information on revenues earned by road transport enterprises, derived from a survey of establishments.
17. Given the sources of information and estimating methodology, one should treat these data as rough approximations. Potentially, such data are of significant interest and the fact that considerable effort has been expended in obtaining the estimates indicates the importance of obtaining this information.

5. Rail Transport

A4.18 As can be expected, the higher level of quality and better organization of railway statistics provides a richer material for the analysis of this sub-sector. Furthermore, efforts undertaken with the assistance of international financial organizations, as well as bilateral and multilateral aid programs, to improve the African railway systems resulted in greater sensitivity of railway managements and governments to the data needs in this sub-sector and improvement of management information systems. The data used in national reviews follow, with varying degree of detail, the prescriptions of transport economists and have already been reviewed in Chapter 7.

6. Air Transport

A4.19 Air transport data reproduced and used in different studies and surveys represent a selection of standard ICAO statistics and have been reviewed in Chapter 8.

7. Ports and Water Transport

A4.20 The information used in major studies contains the selections of data normally produced by ports and were reviewed in Chapter 9.

8. Data Priorities

A4.21 The only study examined which addresses specifically the problem of priorities in transport data collection is that by A.M. Farahat in Nigeria (1980). Data prioritization is made by listing major types of data by modes and sub-classifications and assigning priorities 1, 2 and 3 to each item.

A4.22 It is easy to argue about the relative priorities assigned to each data class. However, in the process of information system design, it is useful to produce a reasoned priority listing with a clear indication of the uses and difficulties related to the data produced. Such a document can help users to determine their priorities and also open up useful discussions in some areas.

A4.23 The utility of this approach is likely to vary from one sub-sector to another. In well organized sub-sectors, such as railway transport, air transport and ports, information systems exist and function and the users have revealed their needs through practice. In sub-sectors where basic data problems exist and where the issue is primarily system design and major system improvement, user participation -- on an informed basis -- is quite crucial in priority determination. Set in this context, the approach in the Farahat study is useful, provided that it leads to user questions: "Why are the data classified, grouped and identified in this way rather than in some other way?" and "Why was this priority assigned to a class of data rather than some other priority?"

Conclusion
A4.24 The studies reviewed indicate a general agreement with the proposals derived from the modal reviews in Chapters 4 to 10 of the report. Considering that the material reviewed is highly heterogeneous and represents the views of a wide range of practitioners, this finding should be of interest for those responsible for transport statistics improvements and database design.