INPUTS ACTIVITIES OUTPUTS OUTCOME IMPACT

In Search of Evidence to Define Transport Policies

Transport Sector Data Management Systems:
Policy Note & Guidelines

Alberto Nogales

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SSATP
Africa Transport
Policy Program

The SSATP is an international partnership to facilitate policy development and related capacity building in the transport sector in Africa.

Sound policies lead to safe, reliable, and cost-effective transport, freeing people to lift themselves out of poverty and helping countries to compete internationally.

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The SSATP is a partnership of

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Acronyms

AfDB	African Development Bank
AICD	Africa Infrastructure Country Diagnostic
AIKP	Africa Infrastructure Knowledge Program
COTS	Commercial off-the-shelf system
GIS	Geographic Information System
ICT	Information and Communications Technology
M&E	Monitoring and Evaluation
MDG	Millennium Development Goal
MOT	Ministry of Transport
NSO	National statistical office
NSS	National statistical system
SDG	Sustainable Development Goal
SSA	Sub-Saharan Africa
SSATP	Africa Transport Policy Program
TSDMS	Transport Sector Data Management System

Overview

Transport sector data management is at the heart of good sector policy development and contributes to measuring policy performance. SSATP advocates to its member countries that adequate and reliable data provide the foundation for evidence-based policy decisions, and for planning, monitoring and evaluating the impact of transport investments towards poverty reduction and growth. This includes the Millennium Development Goals (MDG) and the Sustainable Development Goals (SDG) for the post-2015 development agenda.

The international development partners are very supportive of using data to define transport policies, and the World Bank Strategy for Africa places an emphasis on building and strengthening statistical capacity as a long-term undertaking for the continent. The African Development Bank (AfDB) has taken over the Africa Infrastructure Country Diagnostic (AICD) database and transformed it into the Africa Infrastructure Knowledge Program (AIKP) as a long-term initiative for statistical capacity building and knowledge development on infrastructure. In this context, SSATP has been and continues to be highly committed to building the capacity of its member countries to achieve sustainable transport sector data management systems.

Transport sector policy framework

In most countries, there are mechanisms to deal with planning and management of the transport sector, through a *transport sector policy framework* that typically includes a *national transport policy*, a *national transport strategy*, and a *transport master plan*. Such policies, strategies, and plans become operational through the implementation of a set of *transport development programs and projects*.

A national transport policy outlines a set of key targets and objectives for the transport sector in a country. This is often done in line with a set of principles that are consistent with other areas of government policy and overarching development objectives. National transport policies are sometimes influenced by regional and international protocols on transport as they apply to subscribing countries.

They may include elements such as principles of competition between transport modes, cost recovery, transport as a driver or support of economic development, environmental protection, private sector participation or social inclusion.

The purpose of a national transport strategy is to provide a framework for delivering efficient, cost-effective, and safe transport systems, in line with the national policy. There may be both regional and national goals to consider and in some cases international ones like in the MDGs and post-2015 SDGs, especially where major transport corridors provide access to ports for landlocked States and facilitate trade with neighboring countries. A national transport strategy should cover financing, investment, regulation, and promotion of the transport sector, including reforms that may be required in order to implement these policies. The strategy requires good information on existing transport infrastructure and the efficiency and effectiveness of the sector. The strategy is typically the responsibility of the ministry of transport. A new strategy (or, major updates to it) will usually be produced every 10 years, with a thorough review of all transport sub-sectors and latest national and regional goals.

A national transport master plan is a long-term plan (often 20 years or more) containing a prioritized investment program consistent with the agreed strategy. It should identify major corridors, regional development plans, and describe intended investments at a summary level. It may contain a short-term program (e.g. first 5 years) and longer-term plans (e.g. years 6-10, and years 11-20). Separate plans may be developed for the different transport modes and services, or for specific transport agencies.

Individual transport sector programs are likely to be developed in line with the master transport plan. These programs may be geared towards specific objectives or funding sources (e.g. a road safety program, road maintenance programs, donor-funded network development programs, etc.). These programs should be more specific and detailed than those in the national transport plans. They will identify infrastructure projects and non-infrastructure projects. For infrastructure projects, for instance, they might define individual roads, and prescribed treatments or specifications for development, along with detailed costs.

Basic principles

SSATP advocates establishing a single highly specialized M&E Unit within the ministry of transport, with direct access to the national statistical office, and participating ministries and transport agencies generating the data required.

> *Design a sustainable TSDMS within the ministry of transport as an integral part of the national planning & policy framework and the national statistical office.*

SSATP advocates establishing TSDMS based on the following three principles that are likely to enhance its potential for success and maximize its use and impact to define transport policies based on evidence.

> ***Sustainability****: The design, scope, costs, and any achievements obtained as a result of the TSDMS should prove to be sustainable.*

> ***Transparency****: All data, indicators, analysis, evaluation findings, and recommendations should be made "publicly available".*

> ***Accountability****: The Ministry of Transport (or equivalent) is accountable for defining transport policies based on evidence provided by the TSDMS.*

What is a TSDMS?

A *transport sector data management system* (TSDMS) is a statistical system for production, management and dissemination of data and indicators. It is a tool to keep track of the progress achieved and to evaluate results obtained by transport strategies and policies. A TSDMS can also be part of the broader monitoring and evaluation framework set up by regional economic communities and countries, which is essential for sound sector management and governance.

The *transport sector policy framework* typically includes a *national transport policy*, a *national transport strategy*, and a *transport master plan* that become operational through the implementation of a set of *transport development programs and projects*. In most countries, there are *monitoring and evaluation (M&E) systems* in place to deal with the planning and management of the plans, programs, and projects in line with social, economic, and political goals.

Figure 1. Relation between transport data and national policy framework

National Transport POLICY		OUTPUT INDICATORS & TARGETS FOR POLICY AND STRATEGY

National Transport STRATEGY

National Transport PLAN

Transport Development PROGRAMS & PROJECTS

LAND TRANSPORT	AIR TRANSPORT	WATER TRANSPORT	OTHERS
Roads & Highways Rails	Civil Aviation	Ocean Rivers	Urban Rural Trade

POLICY

STRATEGY

TRANSPORT SECTOR DATA MANAGEMENT SYSTEM

MONITORING & EVALUATION SYSTEMS OF PLANS, PROGRAMS & PROJECTS

INPUT DATA FROM M&E OF PLANS, PROGRAMS AND PROJECTS

Figure 1 shows how transport data and indicators relate to a typical policy framework, and how they play a role in monitoring and evaluating the transport sector. The TSDMS uses the input data obtained from monitoring transport plans, programs, projects and operations and selects indicators and targets to evaluate the impact in order to then guide the definition of national transport policies and strategies.

Why a TSDMS is important for policy makers?

TSDMS can help policy makers answer the fundamental questions of whether promises were kept and outcomes achieved, and provide the means by which improvements—or lack of improvements—can be demonstrated.

If transport sector policy makers do not measure results, they cannot tell success from failure…

> *If transport sector government officials cannot see success, they cannot reward it; and if they cannot reward success, they are probably rewarding failure…*

>> *If transport sector operators cannot see success, they cannot learn from it; and if they cannot recognize failure, they cannot correct it…*

>>> *If transport policy makers can demonstrate results, they can satisfy the needs of transport users, and therefore win public support.*

Source: A. Nogales 2015 adapted from Osborn & Gaebler 1992

TSDMS are important for the monitoring and evaluation of development activities as they provide transport sector government officials and users the opportunity to learn from experience. The lessons learned are particularly useful to transport sector policy makers for improving planning, allocating resources, developing evidence-based policy, and improving transport service delivery. They are also useful for demonstrating results as part of accountability to their constituents, and for drawing support for on-going or planned projects.

What can a TSDMS be used for?

There are multiple uses for TSDMS, but for policy makers in particular, the most relevant uses are to:

- Respond to elected officials and public demands for accountability

- Make informed budget decisions, justify budget requests and allocate resources

- Measure performance of transport sector projects, programs, and policies leading to adjustments and corrective actions

- Provide the basis for short and long-term transport sector planning and strategic national planning

- Measure the contribution of transport sector to national development goals/objectives, as well as international development goals such as the MDGs and the SDGs

◆ Evaluate the relevance, efficacy, efficiency, and sustainability of transport sector policies.

The policy note section is directed mainly to policy makers, but is also useful for development partners, transport professionals, transport users, and civil society as illustrated in Figure 2.

Figure 2. Sample uses of TSDMS

SAMPLE USES OF TSDMS	KEY TSDMS CLIENTS
Generate indicators that measure the contribution of the transport sector to the economy, or economic benefits for the population at large	Ministry of planning, National statistical office
Provide data on historical budget & actual expenditure against actual allocations & needs, across transport modes to prepare future budget allocations	Ministry of finance with funding sources & transport agencies
Generate key transport indicators to monitor and evaluate the performance of transport sector agencies	Transport agencies or authorities
Provide information to carry out in-depth transport sector studies to formulate pilot projects or large-scale programs	Transport agencies & international development agencies
Use data sources to generate indicators and apply them to inform policy decisions and clearly illustrate the use and impact of proper data collection and reporting	Transport sector policy decision makers & primary data sources
Periodically report on transport safety records on various transport modes	Media & transport users
Publish average costs of road works for new construction, rehabilitation, periodic & routine maintenance by type of road	Construction industry, road agencies and road funds

Policy Note

Introduction

This *Policy Note* focuses on key challenges faced by Sub-Saharan African countries when attempting to implement a TSDMS, and proposes ideas to overcome them.It also presents SSATP's proposed approach and principles to implement a sustainable TSDMS. This note has been prepared in conjunction with the *SSATP Guidelines for Establishing a Sustainable TSDMS* that provide more detailed guidance on the necessary steps to establish a TSDMS.

It is widely believed, among transport sector professionals, that even when a well-designed and modern M&E system is in place, the decision makers do not take full advantage of its potential. This note presents the argument that policies should be defined based on evidence; however, it does not suggest that a TSDMS is the solution to all challenges presented, but rather an effective tool to improve the policy decision process.

The policy note also provides guidance to decision makers and high-level government officials to help them set up a transport sector data management system in order to increase the quantity and quality of transport sector policies with the use of high quality and reliable data as the evidence base.

> *The analysis and use of data is not only important for policy decision makers; but for senior transport officials, road agency staff, road fund managers; railroads, ports, and aviation authorities; academics, researchers, journalists; managerial & technical staff in transport agencies; and most importantly, for transport users and the public in general.*

Key challenges and proposed approach

The following paragraphs list challenges with M&E frequently found in Sub-Saharan Africa. It is the result of extensive consultation with key stakeholders. The list attempts to characterize typical M&E systems in the transport sector, and

therefore it is not comprehensive, nor is it intended to imply that all countries face all these issues. The challenges are first presented, and then a preferred approach to overcome them is suggested[1].

Ownership of M&E systems

The very nature and primary objectives of M&E systems are often not well understood and the incentives to establish them are inadequate.

Many M&E systems in the transport sector that have emerged due to demand from the development community are less likely to be sustainable.

Few M&E efforts which respond to an internal demand from transport agencies that are genuinely demand-driven are more likely to become sustainable.

> **Establish** *M&E systems in direct response to the needs of the transport agencies generating the data.*
>
> **Promote** *demand-driven M&E systems (internally driven) that use the data extensively in order to make them sustainable.*
>
> **Adjust** *M&E systems imposed by the international cooperation (externally driven) to respond to local needs, while continuing to satisfy the external data and information requirements.*
>
> **Combine** *these two generic models (internally and externally driven), which are not mutually exclusive, to generate a solid base to establish a sustainable M&E system in the transport sector.*

Assessments of existing M &E systems

Very few countries carry out assessments of their M&E systems, and those few are limited in their scope.

Assessments of existing M&Es are rarely comprehensive. In most cases their scope includes only one or two of the following five dimensions: institutional, human resources, technical , financial, and political.

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[1] To avoid repetition, some issues or suggestions relevant to multiple points like use of technology or improved transparency, , are only presented under a single heading.

Some transport agencies have very sophisticated M&E systems, while others might not have an operational system in place.

There is often confusion about the M&E roles and responsibilities of key agencies, as these are not always clearly defined.

> *Carry out a realistic assessment by expanding their coverage beyond the technical, institutional, human resources, and financial aspects and including the "political" dimension (not mere politics).*

> *Carry out a comprehensive assessment of existing M&E systems by including all modes, thematic areas, and government levels.*

> *Measure the effectiveness and efficiency of existing M&E systems working together, and rate the performance of key transport agencies.*

Goal of a TSDMS and its relation to existing M&E systems

There are multiple M&E systems in place that do not complement each other and do not work in a coordinated fashion. There is insufficient monitoring efforts and as a result, the effectiveness of transport sector policies is not evaluated.

In most cases the individual M&Es work well, but not as a whole. There is hardly ever coordination on the design and implementation of M&E sytems, leading to the duplication of efforts and inefficient allocation of limited resources.

Most existing M&E systems aim only at generating data, few actually are used to produce indicators, which are seldom analyzed and hardly ever used to define or improve transport sector policies.

There is a huge imbalance between monitoring and evaluation. Most of the efforts so far, have only reached the monitoring dimension, barely touched the evaluation dimension, and hardly ever attempted to measure the impact of transport policies.

> *Conceive and design a Transport Sector Data Management System (TSDMS) that provides a framework in which multiple M&E systems complement and support each other.*

> *Clearly explain to policy makers and government officials how a good set of M&E systems contributes to achieve a sustainable TSDMS.*

Aim at a TSDMS that completes the entire cycle of data collection, analysis and evaluation by: using the indicators for planning, generating evidence to influence policies, and evaluating their effectiveness and impact.

Responsiveness to decision makers and transport users

Current M&E systems may not address the decision makers' needs, nor properly respond to transport users' demands.

There is ineffective communication between the transport specialists and decision makers.

The timeline and priorities of decision makers and transport specialists are not the same, not in sync, and often face conflicting deadlines. The reports, findings, and recommendations are not ready at the time when the policy makers need them.

The data, analysis, and even the format of results are often inappropriate for the decision makers' needs.

The transport users do not have any means to influence the design, or play a role in the generation of data that might be useful to them.

Establish clear lines of communication between transport staff and decision makers, and to the extent possible, with transport users.

Attend the needs of policy makers and transport users in terms of data, indicators, analysis, and their preference in terms of format, access, and presentation.

Align the data generation, analysis, outputs, and results to the timeframes required by the decision makers.

Design of a TSDMS

Several TSDMS designs have been inadequate, primarily due to unsuitable approaches; and for the most part, unrealistic, due to underestimated costs.

Several TSDMS initiatives have chosen a comprehensive approach by attempting to cover all transport modes at once, and have been developed from scratch. Most of such initiatives have taken too much time to finish, or were not completed at all.

The expectations about the quality of the TSDMS, and corresponding time and cost for its implementation have been unrealistic.

Begin building the TSDMS based on a single mode or sub-sector that is ready to start and is more likely to succeed. The others will most likely follow if the initial sector or mode is successful.

Build upon the vast amount of experience and achievement gained, instead of generating new M&E systems every time.

Ensure that key stakeholders understand upfront that establishing a well-functioning TSDMS system is a very long-term and costly effort.

Appropriation and allocation of funds for a M&E system

The allocation of resources for M&E in the transport sector has been insufficient and inappropriate.

A well-established and effective functioning M&E system is "costly". Often the allocation of funds does not reflect the needs and is insufficient. Moreover, many times resources are wasted collecting data never used.

The M&E resources allocation is disproportionately directed to higher levels of government or "data users" and the lower levels, tipically transport agencies generating the data, or "data generators" are heavily under-funded. Overall, the allocation of funds does not prioritize the generation of high quality data.

Ask essential questions about the data to provide a solid foundation for all M&E systems, such as: What data are needed? How to collect the data? How often? How much does it cost? How to analyze and use it?

The answers to these fundamental questions provide clarity, realistic expectations, and lead to the proper allocation of funds for M&E.

Data quantity, coverage, quality & collection

Available transport data is often very limited in number and scope. The available data is generally of poor quality, not regularly generated, not standardized, nor properly collected.

The quantity of data & indicators is insufficient and its coverage & scope are limited particularly in some transport modes (i.e water transport), or at lower levels of government.

The definitions of data & indicators are not standardized across countries, not even within a single country, thus significantly restricting a comparative analysis.

The quality of data & indicators is poor, particularly at lower levels of government.

The frequency of data collection is inappropriate, and in many cases there is no baseline data to use as a reference.

The methods of data collection are antiquated, generating potential problems with data accuracy and flexibility with data management.

> *Cover all modes and government levels in the scope & data selection.*
>
> *Clearly establish the definitions and objectives for each data and indicator—concurrently with the selection process—in order to standardize their collection and improve their quality and usefulness.*
>
> *Define a proper set of incentives, and combine them with effective use of latest technology to improve the data quantity & quality.*

Data collection priorities

The data collection varies widely by government level, and the priorities have been biased towards transport infrastructure with limited information available on transport services.

The quality and availability of data on the main transport networks under the responsibility of the central governments has improved in most countries, yet there is ample room for improvement.

The data from sub-national government levels, on the secondary and tertiary transport networks is often of very poor quality, requires extensive work, and sometimes is unavailable.

Moreover, the emphasis has been and continues to be on capturing data to model the "transport infrastructure", but not the "transport services".

Combine and complement the existing data at the national level with data from lower levels of government to capture a complete and more accurate picture of transport systems.

Provide greater emphasis to transport services to better attend the data needs of users and decision makers; and to explain the performance, effectiveness, and efficiency of the transport infrastructure.

Data storage, sharing & use of technology

Most transport data is scattered in numerous transport agencies that lack proper storage facilities, fail to be aggregated into a central database, and are not properly shared.

Data is located in multiple transport sector agencies, with a wide mix of procedures and standards, and much of the data is still recorded on paper.

Some countries have created their own technology platforms to store and manage their data. Others are adapting to existing software. Overall, there is ineffective use of latest technology.

Data is not shared within the transport sector agencies, and evenless so outside.

Establish a single M&E Unit within the Ministry of Transport (or equivalent) to collect and centralize all data generated by transport and other agencies.

Clearly define the procedures and apply the latest technologies for data accessibility, sharing it internally & externally, and for its dissemination.

Data validation, analysis & findings

There is a lack of transparency in every phase of the data cycle. The agencies responsible for the collection, analysis and evaluation have limited capacity and in most cases lack independence.

Data validation is seldom performed, and analysis is not carried out regularly.

Findings and recommendations are not generated based on evidence. If recommendations exist, they are not adequately disseminated, or nor are followed.

A truly independent instance with the capability to validate the data quality, and then conduct a balanced and unbiased data analysis is rarely found.

> *Add transparency to the entire data cycle -generation, collection, analysis, evaluation, and impact- to dramatically increase its use, and improve governance and accountability.*

> *Define a set of incentives for policy decision makers to use the findings and follow evidence-based recommendations.*

> *Identify or establish an "independent" instance to validate, monitor, and analyze the data in order to generate findings & recommendations useful to evaluate transport sector policies.*

Guidelines

These guidelines were prepared to design and implement a national transport sector data management system (TSDMS). A TSDMS is a statistical system for production, management and dissemination of transport data and indicators. Its ultimate aim is to manage transport data and indicators, and to feed them back to policy makers for the monitoring and development of the transport sector. These Guidelines describe good practice in conducting a realistic assessment of existing monitoring and evaluation (M&E) systems, and focuses on presenting the key elements and procedure to establish a TSDMS. They also provide details about designing and implementing a TSDMS, through the definition of policies and procedures, inter-agency agreements, staff responsibilities, budgets, and information and communications technology (ICT) requirements. They are based on extensive experience of SSATP initiatives on transport performance indicators, and the establishment of a TSDMS in various Sub-Saharan African countries. These guidelines, prepared in conjunction with the Policy Note presented above make emphasis on key challenges and proposes ideas to overcome them.

Realistic assessment of existing M&E systems

A three-dimension realistic assessment should be conducted to obtain a correct diagnosis of the existing M&E systems in place, as follows:

- An assessment of existing M&E systems by mode, subsector & government level of *institutional*, *human resources*, *technical*, *financial*, and *political capabilities*.

- An assessment by mode, subsector & government level of integrated systems in terms of *relevance*, *effectiveness*, *efficiency*, and *sustainability*.

- A performance assessment of key agencies on their participation in the *design*, *implementation*, *utilization*, and *maintenance & improvement* of existing M&E systems.

A comprehensive assessment of individual M&E systems – that in most cases work isolated – will lead to clearly identify the strengths and weaknesses of transport sector agencies. The results of this assessment will ultimately guide a proper design of a sustainable TSDMS.

These guidelines propose to carry out the assessments applying clearly specified "criteria" that lead to a given "rating" based on information received. If the criteria and corresponding ratings are applied consistently, the assessment results and diagnosis will be standardized, and thus could be subject to comparative analysis, if needed.

Assessment of existing M&E capabilities

Institutional elements

The institutional assessment should identify the agencies or departments involved in M&E activities in the transport sector, and determine how each agency or department collects and manages the data that are necessary to reaching its assigned objectives. It should identify the arrangements and responsibilities, as well as strengths and weaknesses.

As part of this assessment, it is important to explore the legal and regulatory basis that defines the role of each agency in the TSDMS. This is especially important considering the fact that agencies outside the direct supervision of the ministry are to be fully involved in the TSDMS daily operations. In addition, private concessionaires for port or airport facilities and railways should be part of the framework. It is essential to assess the legal base that governs the relationship between all these agencies, with the ministry of transport (or equivalent) in terms of data issues and M&E. It is evident that building a TSDMS on its members' goodwill alone is unlikely to be sustainable and the procedures that govern the relationships between agencies in terms of data exchange should be agreed upfront.

Human resources

A working TSDMS does not necessarily require many staff once operational, at least in terms of data management. If some statistical expertise does exist as part of a M&E unit, it should be identified at this stage so that it could be put to good use

in the overall TSDMS. It is essential to assess the existing human resources in terms of number and skills to estimate how they can be better used in a TSDMS.

Although simple ICT solutions are favored, solid ICT skills are needed to run a TSDMS and to facilitate the exchange of data between agencies. This requires skilled staff that are comfortable with database applications to implement simple and sustainable solutions in line with the needs and resources of each agency. ICT and statistical skills are scarce in developing countries and they may be easily attracted to the private sector. The human resource assessment should also review the local private sector and assess what statistical and ICT skills are available in the local market to lead the collection of primary data and the production and analysis of transport indicators.

Technical elements

Assessing the M&E technical capabilities of each agency is also important. This should cover communications networking, hardware, application software, and the ability of the agency to manage its ICT infrastructure.

Network communications should be assessed for production, analysis and dissemination of data, both internally within each agency, and externally through the Internet. This should include bandwidth, redundancy, failover mechanisms, etc. The assessment of hardware should include a number of servers, computers, data storage, backup devices, etc.

Regarding computer applications, some agencies may have basic Excel spread sheet and database packages, while others will have developed more sophisticated applications. Data exchange and integration between agencies need investigation.

In addition, an assessment of the network and systems administration capabilities of each agency is needed to test its ability to securely manage and operate its systems. This should include the implementation of anti-virus measures, backup and recovery mechanisms, network security, etc.

Financial elements

Lack of resources is often cited as a constraint in implementing and sustaining a M&E system. It is therefore important to get a good estimate of what financial resources are currently spent in data collection and management. This is often

difficult because data management may have no specific budget, often being regarded as part of a set of functions performed by a given agency. Ideally, the TSDMS should not impose significant additional burden to what a line agency already spends for data collection and management. The majority of any additional costs to implement a TSDMS is likely to be the result of extra staffing and ICT resources within the ministry of transport. Any financial assessment should clearly differentiate between funding for investment and funding for operation.

Political elements

Most M&E assessments have focused their attention on institutional, human resources, technical, and financial aspects and have not included the *political dimension* (not mere politics)—paramount to carry out a realistic assessment.

It is widely believed among transport sector professionals that even when a well-designed and modern M&E system is in place, the decision makers do not take full advantage of its potential. These guidelines present the argument that policies should be defined based on evidence; however, they do not suggest that a TSDMS is the *solution* to all the challenges presented, but rather a *fundamental element* to improve the policy decision process.

Most existing M&E systems do not address the decision makers' needs, and not to their timeline. Moreover, the transport users do not have any means to influence the design or generation of data that might be useful to them. Therefore, it is important that the assessment determines: (i) if there are clear lines of communication between transport staff and decision makers; (ii) if the needs of policy makers and transport users in terms of data, indicators, analysis and preference on format, access, or presentation is taken into account; and (iii) if the data generation, analysis outputs and results are properly aligned with the timeframes required by the decision makers.

In sum, the political assessment should provide light on the strengths and weaknesses of key actors, and set of incentives (or disincentives) to use data for a proper functioning TSDMS. It should include specific recommendations on opportunities to improve the sustainability, transparency, and accountability of the TSDMS.

Ratings. The Qualitative Assessment should be rated on a three-point scale as follows: (i) Acceptable [AC], if only minor changes are required; (ii) Needs Improvement [NI], if major changes are needed; and (iii) Urgent Attention [UA], if

there are no capabilities or the situation requires extensive resources. Whenever there is insufficient information, or other circumstances, that make it impossible to assign one of the above ratings, "Not-Assessed [NA]" should be recorded.

Figure 3. Assessment of existing M&E capabilities

Mode or sub-sector or government level	Institutional	Human resources	Technical	Financial	Political	Overall
Roads & highways	☐AC ☐NI ☐UA ☐NA	☐AC ☐NI ☐UA ☐NA	☐AC ☐NI ☐UA ☐NA	☐AC ☐NI ☐UA ☐NA	☐AC ☐NI ☐UA ☐NA	☐AC ☐NI ☐UA ☐NA
Railways	☐AC ☐NI ☐UA ☐NA	☐AC ☐NI ☐UA ☐NA	☐AC ☐NI ☐UA ☐NA	☐AC ☐NI ☐UA ☐NA	☐AC ☐NI ☐UA ☐NA	☐AC ☐NI ☐UA ☐NA
Waterways & ports	☐AC ☐NI ☐UA ☐NA	☐AC ☐NI ☐UA ☐NA	☐AC ☐NI ☐UA ☐NA	☐AC ☐NI ☐UA ☐NA	☐AC ☐NI ☐UA ☐NA	☐AC ☐NI ☐UA ☐NA
Air transport	☐AC ☐NI ☐UA ☐NA	☐AC ☐NI ☐UA ☐NA	☐AC ☐NI ☐UA ☐NA	☐AC ☐NI ☐UA ☐NA	☐AC ☐NI ☐UA ☐NA	☐AC ☐NI ☐UA ☐NA
Multimode & logistics	☐AC ☐NI ☐UA ☐NA	☐AC ☐NI ☐UA ☐NA	☐AC ☐NI ☐UA ☐NA	☐AC ☐NI ☐UA ☐NA	☐AC ☐NI ☐UA ☐NA	☐AC ☐NI ☐UA ☐NA
Urban transport	☐AC ☐NI ☐UA ☐NA	☐AC ☐NI ☐UA ☐NA	☐AC ☐NI ☐UA ☐NA	☐AC ☐NI ☐UA ☐NA	☐AC ☐NI ☐UA ☐NA	☐AC ☐NI ☐UA ☐NA
Rural transport	☐AC ☐NI ☐UA ☐NA	☐AC ☐NI ☐UA ☐NA	☐AC ☐NI ☐UA ☐NA	☐AC ☐NI ☐UA ☐NA	☐AC ☐NI ☐UA ☐NA	☐AC ☐NI ☐UA ☐NA
Multinational government	☐AC ☐NI ☐UA ☐NA	☐AC ☐NI ☐UA ☐NA	☐AC ☐NI ☐UA ☐NA	☐AC ☐NI ☐UA ☐NA	☐AC ☐NI ☐UA ☐NA	☐AC ☐NI ☐UA ☐NA
National government	☐AC ☐NI ☐UA ☐NA	☐AC ☐NI ☐UA ☐NA	☐AC ☐NI ☐UA ☐NA	☐AC ☐NI ☐UA ☐NA	☐AC ☐NI ☐UA ☐NA	☐AC ☐NI ☐UA ☐NA
Sub-national government	☐AC ☐NI ☐UA ☐NA	☐AC ☐NI ☐UA ☐NA	☐AC ☐NI ☐UA ☐NA	☐AC ☐NI ☐UA ☐NA	☐AC ☐NI ☐UA ☐NA	☐AC ☐NI ☐UA ☐NA

Note: The assessment in its first dimension (see Fig 3) aims at evaluating the performance of each individual self-standing M&E measured by its existing capabilities (institutional, technical, financial, etc.). The assessment of integrated M&E systems by sector is done in the second dimension (see Fig 4), to evaluate the performance of all M&E systems in each sector (Highways, Railways, etc.) when working as integrated systems. The scope of the assessment would lead to reduce or expand the modes, sub-sectors, and/or government levels.

Overall

The result of a realistic assessment should produce a summary that could be presented as suggested in Figure 3. Depending on the initial scope of the assessment it should cover all modes, sub-sector (themes), or government levels. It should provide the evidence "for each of the cells in the matrix" to conclude on whether the existing M&E have or not have the capabilities in each dimension (institutional, human resources, technical, financial, and political). This type of table provides a good overall picture of the M&E capabilities in place.

Assessment of integrated M&E systems

In most cases each individual M&E element works well, but not as an integrated system. A realistic assessment of existing M&E systems working together in terms of Relevance, Effectiveness, Efficiency and Sustainability should be conducted.

Depending on the initial scope of the assessment, it should cover a larger number of areas; however, it is suggested to focus on assessing primarily: (i) the relevance of the M&E design; (ii) the effectiveness of the M&E implementation; (iii) the efficiency in the M&E utilization; and (iv) the overall M&E sustainability. The Figure 4, provides a good overview of the assessment of integrated M&E systems that should provide the basis for the design of a TSDMS.

Relevance of design

Definition. Relevance of design is the extent to which the M&E design (i) is consistent with the country's current development priorities and its transport sector strategies and plans; (ii) includes measurable indicators that enable tracking of all key links in the causal chain, and arrangements and responsibilities for data collection, analysis, and utilization of the data; and finally (iii) provides decision-makers, methodologically sound assessments of the specific mode, theme, or government level under study.

Criteria. Relevance of design is assessed with respect to the current country conditions at the time when the assessment takes place and responds to the following specific questions:

- To what extent were the objectives of the M&E clearly specified in terms of data to be collected, or outcomes to monitor, within a given mode, theme, or government level?

- To what extent was the production of the selected indicators measurable in terms of numbers of indicators produced, timing, and location?

- To what extent were the proposed data collection methods and analysis appropriate for the M&E purpose?

- How was the data designed to be collected?

- To what extent did the design ensure that a baseline, if relevant, would be available in time?

- To what extent was the M&E design well embedded institutionally and have sufficient stakeholder ownership?

Ratings. Relevance of design is rated on a three-point scale: Relevant [RE], Modestly Relevant [MR], or Not-Relevant [NR]. Whenever there is insufficient information, or other circumstances, that make it impossible to assign one of the above ratings, "Not-Assessed [NA]" should be recorded.

Effectiveness of implementation

Definition. Effectiveness of implementation is defined as the extent to which the selected objectives were achieved, or are expected to be achieved. The M&E implementation assessment is to what extent the data on inputs, activities, outputs, outcomes and impact evidence anticipated in the design were actually collected and analyzed in a methodologically sound manner.

Criteria. The effectiveness of each mode or government level is assessed based on the level of achievement by the actual data collection, data use to generate indicators, and their utilization to evaluate transport policies.

But more specifically to what extent:

- was the planned baseline data collection carried out?

- were the indicators actually measured?

- were any weaknesses in design, including indicator specification, fixed during implementation?

- did the agency responsible for M&E function effectively in its specific M&E role?

- was M&E owned by the various stakeholders, measured by the use and application of data collected, and indicators generated?

- Is the data reliable and of good quality – what evidence is there of sound methodology, independence of analysis, and quality control?

- were beneficiaries involved in defining target indicators and assessing their achievement?

Ratings. The efficacy of each M&E (by mode or government level) is rated on a three-point scale: Effective [EFe], Modestly Effective [MEFe], or Not-Effective [NEFe]. Whenever there is insufficient information, or other circumstances, that make it impossible to assign one of the above ratings, "Not-Assessed [NA]" should be recorded.

Efficiency of utilization

Definition. Efficiency in the utilization of a M&E system asks first, whether the costs involved in its implementation were reasonable in comparison with recognized norms or "value for money"; second, to what extent the data, indicators, analysis and recommendations were actually communicated to the various stakeholders; and third, to what extent these were used to provide strategic redirection and resource reallocation, or are expected to lead policy decisions.

Criteria. The measures of efficiency should indicate if the resources were used efficiently, and the M&E implemented cost-effectively. The specific questions to be answered in assessing M&E utilization are:

- To what extent were M&E efficiently used to lead to any specific decision on policy or strategy?

- To what extent can positive (or negative) shifts in the definition of transport policies be reasonably attributed to M&E utilization?

Ratings. Efficiency should be assigned an overall rating based on a three-point scale: Efficient [EFi], Modestly Efficient [MEFi], or Not-Efficient [NEFi]. Whenever the lack of sufficient information, or other circumstances, makes it impossible to assign one of the above ratings, "Not-Assessed [NA]" should be recorded.

Sustainability of the system

Definition. The sustainability of the M&E system at the time of assessment is the extent that achievements (or expected achievements) will be maintained.

Criteria. The overall sustainability is rated by assessing both the probability and likely impact of various threats to the achievements, taking into account the following dimensions:

- Institutional support (e.g. from project entities or related to legal/legislative framework)

- Human resources (e.g. staff where ICT or Statistical skills will remain, or will be available)

- Technical (e.g. where innovative technology and systems are involved)

- Financial (e.g. the robustness of financial flows and financial viability)

- Political (e.g. volatility of political situation, in terms of the strength of stakeholder support, government ownership/commitment, or governance issues)

Ratings. The overall M&E sustainability should be rated using a three-point scale: Sustainable [SU], Modestly Sustainable [MS], or Not-Sustainable [NS]. Whenever there is insufficient information, or other circumstances, that make it impossible to assign one of the above ratings, "Not-Assessed [NA]" should be recorded.

Figure 4. Assessment of integrated M&E systems

Mode or sub-sector or government level	Relevance of design	Effectiveness of implementation	Efficiency of utilization	Sustainability of the system
Roads & highways	☐RE ☐MR ☐NR ☐NA	☐EFe ☐MEFe ☐NEFe ☐NA	☐EFi ☐MEFi ☐NEFi ☐NA	☐SU ☐MS ☐NS ☐NA
Railways	☐RE ☐MR ☐NR ☐NA	☐EFe ☐MEFe ☐NEFe ☐NA	☐EFi ☐MEFi ☐NEFi ☐NA	☐SU ☐MS ☐NS ☐NA
Waterways & ports	☐RE ☐MR ☐NR ☐NA	☐EFe ☐MEFe ☐NEFe ☐NA	☐EFi ☐MEFi ☐NEFi ☐NA	☐SU ☐MS ☐NS ☐NA
Air transport	☐RE ☐MR ☐NR ☐NA	☐EFe ☐MEFe ☐NEFe ☐NA	☐EFi ☐MEFi ☐NEFi ☐NA	☐SU ☐MS ☐NS ☐NA
Multimode & logistics	☐RE ☐MR ☐NR ☐NA	☐EFe ☐MEFe ☐NEFe ☐NA	☐EFi ☐MEFi ☐NEFi ☐NA	☐SU ☐MS ☐NS ☐NA
Urban transport	☐RE ☐MR ☐NR ☐NA	☐EFe ☐MEFe ☐NEFe ☐NA	☐EFi ☐MEFi ☐NEFi ☐NA	☐SU ☐MS ☐NS ☐NA
Rural transport	☐RE ☐MR ☐NR ☐NA	☐EFe ☐MEFe ☐NEFe ☐NA	☐EFi ☐MEFi ☐NEFi ☐NA	☐SU ☐MS ☐NS ☐NA
Multinational government	☐RE ☐MR ☐NR ☐NA	☐EFe ☐MEFe ☐NEFe ☐NA	☐EFi ☐MEFi ☐NEFi ☐NA	☐SU ☐MS ☐NS ☐NA
National government	☐RE ☐MR ☐NR ☐NA	☐EFe ☐MEFe ☐NEFe ☐NA	☐EFi ☐MEFi ☐NEFi ☐NA	☐SU ☐MS ☐NS ☐NA
Sub-national government	☐RE ☐MR ☐NR ☐NA	☐EFe ☐MEFe ☐NEFe ☐NA	☐EFi ☐MEFi ☐NEFi ☐NA	☐SU ☐MS ☐NS ☐NA

Note: The assessment in its second dimension (See Fig 4) aims at evaluating the performance of the all the M&E in a given sector/gov. level working as a whole in a integrated fashion and measured by its process of implementation (design, utilization, etc.). The assessment of individual self-standing M&E system is done in the first dimension (See Fig 3). The scope of the assessment would lead to reduce or expand the modes, sub-sectors, and/or government levels.

Performance assessment of key agencies

The M&E roles and responsibilities of key agencies are not always clearly defined; their performance should therefore be properly assessed.

Ratings. With respect to the relevant criteria either in identifying opportunities for resolving threats to, achieving objectives, or sustainability, the Government, transport agencies or development partners' performance should each be rated using a three-point scale: Good [GO], Fair [FA], or Poor [PO]. Whenever there is insufficient information, or other circumstances, that make it impossible to assign one of the above ratings, "Not-Assessed [NA]" should be recorded.

Definition. The overall performance is defined as the extent to which the government, transport agencies, and development partners participated and contributed to the design, implementation, utilization, maintenance and improvement of the M&E systems. The rating of the overall agency performance is based on the ratings of each of the individual following entity: (i) National Statistical Office, or equivalent; (ii) Ministry of Transport, or equivalent; (iii) Other Ministries (Finance, Sub-National Governments, etc.); and (iv) transport agencies or authorities.

Criteria. Government and transport agencies' performance is rated against the following criteria, as applicable to a particular M&E system. The mode, sector, or level of government context should be taken into account in weighing the relative importance of each criterion of performance.

- Ownership and commitment to achieving the M&E objectives

- Enabling environment including supportive institutional policies, legislation, regulations and data accessibility;

- Willingness to participate in M&E activities, readiness for implementation arrangements, and appointment of key staff;

- Timely resolution of M&E implementation issues;

- Compliance with financial management, provision of funding, procurement, reimbursements for M&E;

- Adequacy of evaluation arrangements, including the utilization M&E data in decision-making and resource allocation;

◆ Relationships and proper coordination on M&E with others (authorities/donors/partners/stakeholders, etc.)

Figure 5. Performance assessment of key agencies

ASSESSMENT	DESIGN	IMPLEMENTATION	UTILIZATION	MAINTENANCE & IMPROVEMENT	OVERALL PERFORMANCE
National statistical office [or equivalent]	☐GO ☐FA ☐PO ☐NA	☐GO ☐FA ☐PO ☐NA	☐GO ☐FA ☐PO ☐NA	☐GO ☐FA ☐PO ☐NA	☐GO ☐FA ☐PO ☐NA
Ministry of transport [or equivalent]	☐GO ☐FA ☐PO ☐NA	☐GO ☐FA ☐PO ☐NA	☐GO ☐FA ☐PO ☐NA	☐GO ☐FA ☐PO ☐NA	☐GO ☐FA ☐PO ☐NA
Other ministries [finance/sub-national government]	☐GO ☐FA ☐PO ☐NA	☐GO ☐FA ☐PO ☐NA	☐GO ☐FA ☐PO ☐NA	☐GO ☐FA ☐PO ☐NA	☐GO ☐FA ☐PO ☐NA
Transport agencies & authorities	☐GO ☐FA ☐PO ☐NA	☐GO ☐FA ☐PO ☐NA	☐GO ☐FA ☐PO ☐NA	☐GO ☐FA ☐PO ☐NA	☐GO ☐FA ☐PO ☐NA
International development partners	☐GO ☐FA ☐PO ☐NA	☐GO ☐FA ☐PO ☐NA	☐GO ☐FA ☐PO ☐NA	☐GO ☐FA ☐PO ☐NA	☐GO ☐FA ☐PO ☐NA

Note: The scope of the assessment would lead to reduce or expand the number of key agencies that should be subject to evaluation.

Key elements and procedure to establish a TSDMS

Once a realistic assessment has been successfully completed, it is suggested to proceed with the following ten key steps to establish a TSDMS.

1. **Design a sustainable TSDMS** within the Ministry of Transport as an integral part of the National Planning & Policy framework and the National Statistical Office.
2. **Prepare a realistic timeframe** and **Cost Estimate** to establish a TSDMS and identify sustainable **funding** sources.
3. **Implement the information, communication, and technology** infrastructure required to start the first phase or pilot program.
4. **Select outcomes** to monitor & evaluate the performance of the sector.
5. **Identify and define key indicators** for the selected outcomes.

6. **Define details for each indicator** on source, frequency, cost, financing, analysis and use.
7. **Generate the baseline data** and set realistic **targets** for key indicators.
8. **Identify and define the assumptions** for each outcome. Generate the reference data, and monitor the results of the assumptions.
9. **Use the data to evaluate and report findings** to influence the policy decisions, planning and allocation of resources
10. **Maintain**, expand, and improve the **TSDMS frequently**

Design a sustainable TSDMS within the ministry of transport

The Figure 6 illustrates a model institutional framework for a Transport Sector Data Management System, based on the country assessments conducted under the SSATP program. This model is generic and can be applied or adapted to each country as necessary. The diagram is indicative only, as it does not show all of the agencies involved. The TSDMS should cover all public and private agencies involved in the transport sector. It should define the mandate of each agency, the relationship between the agencies, the production, and management and dissemination of data.

In a national statistical system (NSS), the national statistical office (NSO) is usually the leading coordinating authority. In a TSDMS, the coordinating authority would usually be the ministry of transport (MOT) or equivalent, with support and assistance as necessary from the NSO. The ministry usually has the mandate for sector monitoring and policy analysis. The NSO, on the other hand, brings experience in statistical analysis, data management, dissemination and publication from a national perspective.

The remainder of the model is straightforward. Each set of indicators (e.g. air transport) is assigned to an agency (e.g. the civil aviation authority), or in some cases, to a set of agencies. It is suggested to create or strengthen the M&E Unit within the MOT that should lead the establishment of the TSDMS.

Figure 6. TSDMS within the ministry of transport
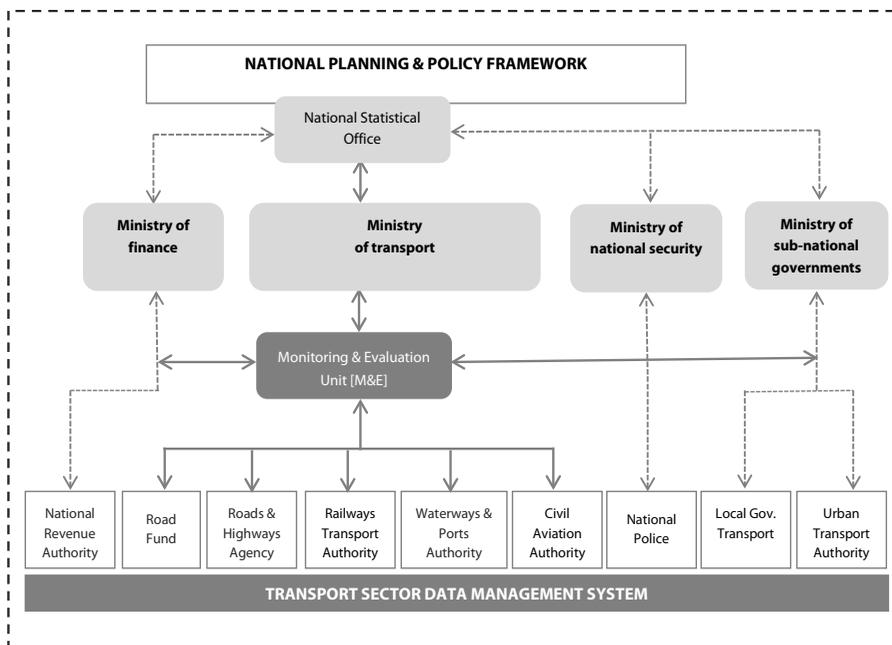
Source: A. Nogales 2014

Notes:
  The graph does not imply that the line ministries depend, or report to the NSO, but rather that the latter collects and centralizes data at the national level coming from these ministries and other sources.
  The denomination of ministries varies by country, and typically involves a larger number of ministries.
  The graph does not imply that the transport authorities or agencies depend or report to the M&E Unit of MOT, but rather that it collects and centralizes data generated by transport agencies.
  The names and selection of transport and other related entities is only indicative, as it varies by country, and typically involves a larger number of agencies.

The lead agency, typically the ministry of transport or equivalent, should design and implement the TSDMS. The design may be conducted by a consultant on its behalf and in close cooperation with the ministry, associated line agencies, and other stakeholders. This phase will issue Terms of Reference to implement a TSDMS, with ownership of the MOT and the consensus of major stakeholders.

It is strongly advised that a progressive approach be adopted in the design. It is often unrealistic to attempt the implementation of an all-encompassing TSDMS from scratch. A more sustainable strategy might be to focus on starting with only a

core set of data and indicators. It may also be useful to implement an initial TSDMS in only two or three line agencies, with others to follow at a later date once the pilot phase is complete, or when the lead agency has become fully operational.

Technology requirements

It is recommended that a set of technical and functional requirements for TSDMS software is drawn up and included as part of the Terms of Reference for the project. This will help focus all TSDMS agencies on the type of application that they envision. It will also enable a future bidder for the project to understand the intended scope of the system.

It is also recommended that the lead agency consider the implementation of a commercial off-the-shelf (COTS) system. Several are available that can meet typical TSDMS requirements, and this should save significant time, effort, and cost by choosing such a software rather than developing one from scratch.

TSDMS software requirements should be described following these headings.

Technical requirements

- Language of the user interface (e.g. English, French, other)

- Number of users

- Operating system

- Database management system

- Mapping / Geographical Information System (GIS)

- Email integration

- Web architecture

Functional requirements

- Ability to define unlimited numbers of data sets / indicators

- Ability to define metadata

- Application and data security

- Logging of changes to data

- Data entry mechanisms, e.g. desktop client interface, web interface, import from standard file formats, automatic data exchange with other applications.

- Data validation

- Data analysis functions

- Data presentation

- Data export formats

- Schedules for update of data

Define Required Elements of the TSDMS

The implementation of a typical TSDMS might require the following elements. Depending on the readiness of the country, certain elements can be omitted, or replaced with minor recommendations, which could be sufficient.

The major elements for the implementation of the TSDMS should include:

- Establishment of an inter-agency steering committee with high-level representation from the line transport agencies, with NSO/MOT as chair

- Formalization of any legal agreements or memoranda of understanding between agencies for operation of the TSDMS

- Review of all data and indicators in line with those of other countries in the region, and recommendation of additional data and indicators

- Written procedures that define the data requirements, the communication paths, frequency of submission, etc.

- Written procedures for validation, and cross-checking with other sources

- Implementation of an information and communications technology system to support data collection, analysis, production & management

- A management and monitoring process for the submission of data from agencies, and as a feedback mechanism from the ministry

- A mechanism to transmit data or information from the MOT to the NSO

- Staff training at all levels – including internal and external stakeholder awareness, technical training, data quality assurance training, preparation of transport statistical yearbook, etc.

- Training manuals for future training of new staff once the TSDMS is operational

- Review procedures to assess the effectiveness and efficiency of the M&E, and to assess the quality of statistics being produced. This may include user surveys as applicable

- Publication of a Transport Statistical Yearbook for the first year of TSDMS operation, to include direct outputs from the TSDMS

Transport statistical yearbook

If not already existing, a transport statistical yearbook should be introduced as a publication by the ministry of transport (MOT) or equivalent. This will help focus its efforts and generate a useful annual product based on the TSDMS.

A template transport statistical yearbook should be agreed early on in the design of the TSDMS. It should include the presentation of available data and statistics, along with an analysis of trends. It should remind the main policy objectives and targets defined in the policies or strategies. It is recommended to be highly graphic, with charts, maps, and tables where appropriate. It should also be in a comparable format with other statistical yearbooks produced for other sectors. The availability of such a template can also be used to give line stakeholders and other agencies a flavor of the type of statistics, which they will be able to receive under an operational TSDMS, in order to raise awareness and generate enthusiasm for the implementation of the TSDMS.

Set a realistic timeframe & cost estimate to establish a TSDMS

The design of a TSDMS system has often generated false expectations in terms of time of implementation by assuming that all modes have the same level of performance. These false expectations are compounded by aiming at comprehensive systems attempting to cover all modes and government levels at the same time. These initiatives were also characterized by proposing new systems every time without regard to those already in place.

Instead, it is important to realize that establishing a well-functioning TSDMS is a long-term and costly effort, and it is reasonable to start with a single mode or sub-sector, the others will follow. Some sub-sectors are more prepared than others to

contribute to the implementation of a TSDMS, particularly if the M&E system is already in place on working properly. More importantly, there is a vast amount of experience and achievement gained in the past that must be taken advantage of and should be built upon, instead of generating new ones every time.

Implement the ICT infrastructure

Each country's TSDMS includes a set of agencies whose ICT infrastructure and capabilities vary greatly. Some agencies may have strong ICT divisions and dedicated budgets with long-term ICT strategies in place, while others may not.

One of the first ICT goals for the TSDMS should be to exchange information electronically. At present, various methods do not involve costly private networks or leased lines.

At the most basic level, spreadsheets are the simplest and easiest approach to sharing data. Without exception, all organizations have spreadsheet programs available, such as Microsoft Excel. Spreadsheets have limitations in terms of volume of data that can be stored in a single sheet, validation control, security, and operation in multi-user scenarios. However, as an entry-level method of data storage and dissemination they are by far the easiest and cheapest to implement. One important advantage is that they do not require frequent major upgrades, and are almost always compatible without expensive and complex data conversion.

Almost all organizations have basic e-mail capability. Some have their own domain name and internal e-mail servers so that staff have official accounts in their organization, while many have private e-mail accounts on public servers (usually free) that they use for work purposes. While public e-mail servers are not ideal (because of security and potential viruses), they tend to be used extensively in the SSATP member countries due to the lack of strict ICT policies and because of a lack of ICT infrastructure in the participating agencies.

Figure 7. Some methods of sharing electronic data between agencies
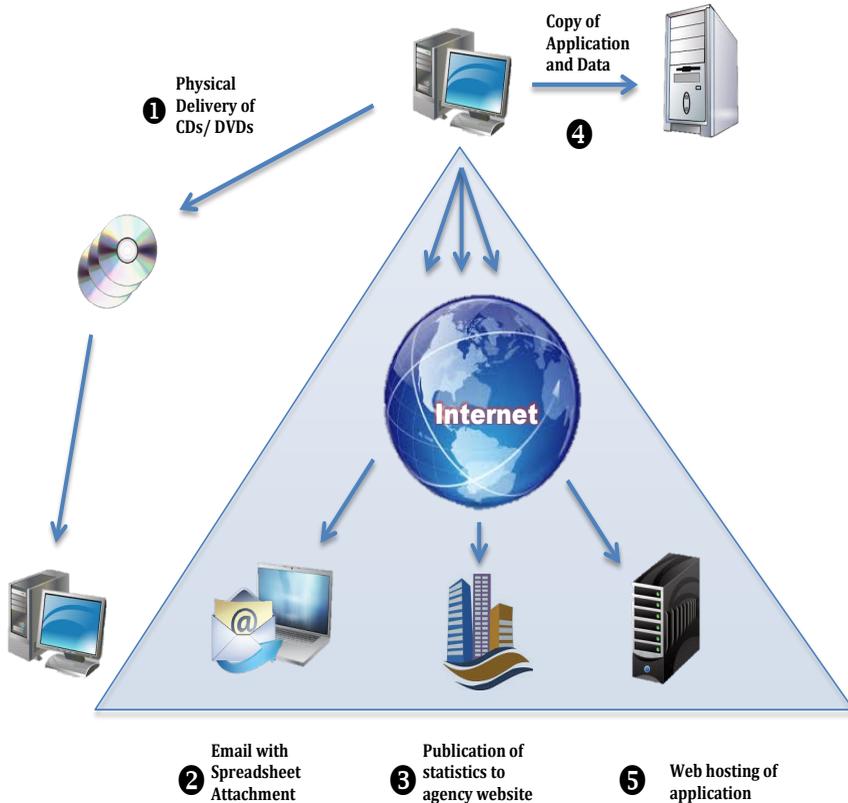
Spreadsheets can be used to exchange data in most data categories of the TSDMS, and they can either be sent on CD/DVD (❶) or as attachments via e-mail (❷).

Source: A. Nogales 2015

Most organizations have their own websites and, in some cases, publish statistics to those websites (❸) that can be copied or downloaded by the public.

The above methods can be used to cater for most types of data sharing in a TSDMS. However, there are some areas for which spreadsheets or downloads of data from a website are probably not sufficient. These include road and traffic accident data. In these cases, the MOT should require the ability to perform sophisticated analysis on voluminous data sets that by their complex nature need to be stored in more sophisticated databases. Database management systems are rec-

ommended even for entry-level road management systems. These types of situations may be covered in scenarios (❹) or (❺).

The main point is that the TSDMS may operate differently in different agencies. Whichever software chosen, it should be capable of operating in different ways for different agencies. The technology requirements need to be very clear and carefully assessed for the best method to utilize during the initial implementation. The costs of each method will vary depending on the technology used.

The costs of implementing technology (servers, internet bandwidth, network administration staff, ICT support, etc.) should not be attributed only to the TSDMS, but can be allocated among the different departments or offices within an agency.

ICT support

Special care should be given to adequate ICT support, be it housed in the MOT or in a line agency. Users should not be left without any support to operate databases or applications, or to deal with communications problems. Support should also translate into training of any new staff in operation of the TSDMS procedures and software. ICT support will also be needed to develop new tools or to modify existing ones as requested by users.

Select outcomes to monitor & evaluate transport sector policies

It is suggested to apply the results chain concept to the implementation of TSDMS in order to properly link the results expected from a given transport policy with specific inputs and outputs. The long-term improvements are often difficult to measure or evaluate, however these should be clearly specified upfront.

Use the existing knowledge to define a logical sequence that is likely to explain or predict an event based on a policy decision. Use this knowledge to develop a "theory" of how the policy will achieve an intended change.

The results chain visually demonstrates how a sequence linking inputs to activities, activities to outputs, and the results-outcomes expected from them. These should be presented with critical assumptions (presented below) and other factors in the context of the selected transport policy.

Apply the results chain concept to TSDMS

Figure 8. Results chain

INPUTS	ACTIVITIES	OUTPUTS	OUTCOME	IMPACT
Resources to produce outputs	Tasks to transform inputs into outputs	Products or services delivered by programs	End results of programs attributed to outputs	Long term improvement for beneficiaries
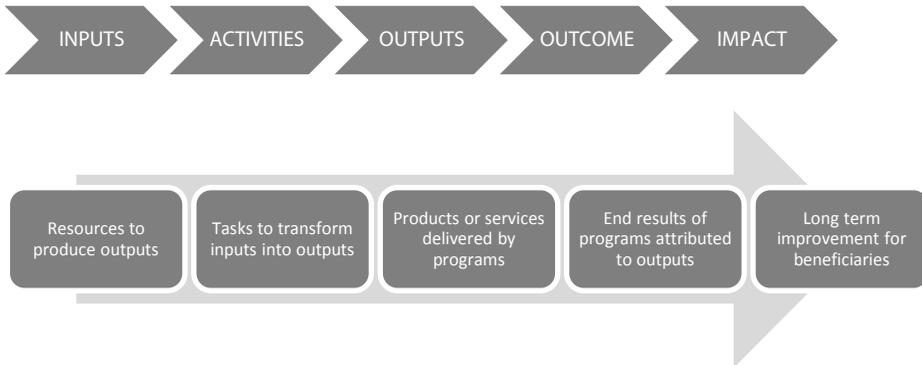
In selecting the outcomes for a given transport policy it is important to consider that the data collection varies widely by government level. The quality and availability of data from main transport networks of central government levels has improved in most countries, yet there is ample room for more improvement. The data from sub-national government levels, secondary and tertiary transport networks is often of very poor quality, it requires extensive work, and sometimes is not available. Moreover, the emphasis has been and continues to be on capturing data to model the "transport infrastructure", but not the "transport services".

In order to capture a complete and more accurate picture of transport systems, the existing data at the national level must be complemented with data from lower levels of government. It is also important to provide greater emphasis to modeling "transport services" to better attend the data needs for users and decision makers; and to explain the performance, effectiveness, and efficiency of the "transport infrastructure" in place.

Figure 9. Results chain: Example for road preservation
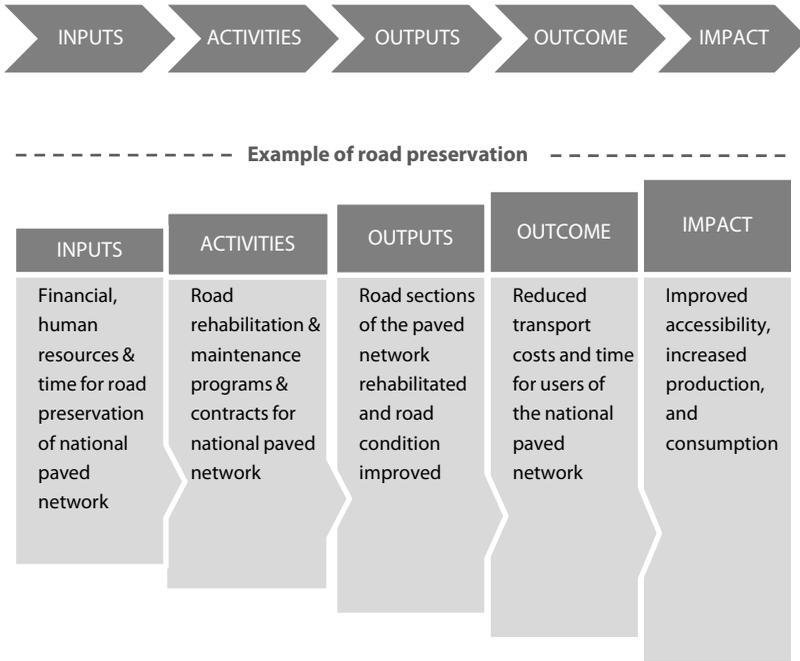
Identify and define key indicators for the selected outcomes

In defining and selecting indicators for the outcomes in relation to a specific transport policy, it is important to overcome the following challenges with data.

* Data & indicators. *Quantity* is *insufficient and its coverage & scope are limited* particularly in some transport modes like water transport, or for lower levels of government.

* Data & indicators. *Definitions* are *not standardized* across countries or within a single country, significantly restricting a comparative analysis.

* Data & indicators. *Quality* is *poor*, particularly at lower levels of government.

* Data **collection**. *Frequency* is *inappropriate*, and in many cases, there is no baseline data to use as a reference.

* Data **collection.** *Methods* are *antiquated*, generating potential problems with data accuracy and flexibility with data management.

Defining indicators and data can be very time-consuming and repetitive, and can divert focus from the implementation of the TSDMS. In order to avoid this danger, it is strongly recommended that the first phase of the implementation concentrates on defining a core set of indicators and on defining them properly. A good set of metadata should be developed for indicators, including the purpose of the indicator, its coverage, and any constraints on its production.

Figure 10. Outcome and indicators: Example for road preservation

OUTCOME	INDICATORS
Reduced transport costs and time for transport users of the National paved network (due to road preservation)	• Road condition on national paved network
	• Annual road preservation requirement and actual expenditure on national paved network
	• Paved network allocation using HDM-4 and/or RONET

Too many indicators collected are useless. Therefore, in addition to "useful" that leads the user to understand how the indicator is going to be used, to analyze what, and how the indicator contributes to policy decision, it is worth remembering the concept of SMART indicators for monitoring performance (used by the European Union). Indicators should be:

- Specific (clearly and precisely defined)
- Measurable
- Affordable
- Relevant (coherent with poverty reduction, economic development and policy priorities)
- Time-bound (measurable on at least an annual basis)

Key indicators:

- Provide the means to generate evidence to monitor and evaluate progress
- Should generate information about changes due to specific policy interventions or planned outcomes
- Indicate progress (or lack thereof) toward an outcome

The data on road condition combined with the road preservation requirements, and actual allocation provide the inputs to calculate time reductions and estimate road user transport costs applying the HDM-4 and RONET models.

Define specifications for each selected indicator

Defining the details of the selected indicators is essential. The most important questions about generating basic data are rarely asked, like: Where and how to collect the data? How often? How much does it cost? Who collects and analyzes the data? The answers to these questions provide the needed specificity and level of detail that translates into a solid foundation of a TSDMS. Specifications required for a typical indicator are presented below.

Indicators' specifications: Example for road preservation

Road condition on national paved network

Data source → *National road agency*

Collection method → *Survey on part of the network and complement it with visual inspection & extrapolation*

Collection agency → *National road agency*

Collection frequency → *Survey every 4 years with visual inspection and extrapolation every year*

Collection cost → *Survey 30% ($2M) – Visual inspection 40% ($1M) – Extrapolation 100% ($100,000)*

Financing source → *Development cooperation, public funds, road agency*

Data analysis & reporting → *Ministry of transport, national road agency*

Data users and application → *Ministry of transport, national road agency, road fund, development cooperation*

Annual road preservation requirement and actual expenditure on national paved network

Data source → *Road agency, road fund, ministry of transport, ministry of finance*

Collection method → *National budget allocation procedures, public expenditure report*

Collection agency → *National road agency*

Collection frequency → *Requirement estimate every year, actual expenditure every 6 years*

Collection cost → *RONET estimate $2,500, actual expenditure $5,000*

Financing source → *Development cooperation, ministry of finance*

Data analysis & reporting → *Ministry of transport, national road agency*

Data users and application → *Ministry of transport, national road agency, road fund and development cooperation*

Paved network allocation using HDM-4 and/or RONET

Data source → *National road agency*

Collection method → *HDM-4 and RONET*

Collection agency → *National road agency*

Collection frequency → *HDM-4 every year, RONET every 6 months*

Collection cost → *HDM-4 run $5,000, RONET run $2,500*

Financing source → *Road agency, development cooperation*

Data analysis & reporting → *Ministry of transport, national road agency*

Data users and application → *Ministry of transport, national road agency*

Generate the baseline data & targets for key indicators

A frequently found challenge is that once the indicators have been selected, insufficient efforts or resources are allocated to generate the baseline data. There are multiple factors that contribute to this situation, but it is primarily due to a lack of quality data and lack of primary data collection. This compounded with the fact that data is located in multiple transport sector agencies; it is not properly stored, nor shared within the sector (even less so outside). The other often missing element is the lack of realistic targets. Both of these elements can be improved by establishing guidelines for data accessibility, for sharing it internally & externally, and for its dissemination. An effective application of the latest technologies can be effective in generating the baseline data and defining realistic targets. It is particularly important to make the baseline and targets publicly available to improve the overall transparency, governance, and accountability of transport policy makers.

Baseline & targets

  · Baseline data: Provides the measurement of a specific indicator to inform about the current status (or the status on a previous date) that can be used as a reference.

  · Target: Provides the level of achievement desired at a certain point in time.

Figure 11. Baseline & targets: Example for road preservation

OUTCOME		
Reduced transport costs and time for transport users of the National paved network (due to road preservation)		
INDICATORS	**BASELINE**	**TARGET**
Road condition on national paved network	· % poor condition · % fair condition · % good condition **YEAR 2014**	· % poor condition · % fair condition · % good condition **YEAR 2020**
Annual road preservation requirement and actual expenditure on national paved network	Total preservation actual expenditure as % of requirement · 30% routine maintenance · 40% periodic maintenance · 50% rehabilitation **AVERAGE 2010-2015**	Total preservation actual expenditure as % of requirement · 50% routine maintenance · 60% periodic maintenance · 70% rehabilitation **AVERAGE 2015-2020**
Paved road network allocation using HDM-4 and/or RONET	30% of the paved network subject to HDM-4 optimal allocation **YEAR 2014**	100% of the paved network subject to RONET optimal allocation **AVERAGE 2014-2020**

Identify & define the assumptions for each outcome

In the process of defining transport policy, it is always required to make assumptions. These are however, hardly ever made explicit. It is therefore, essential to identify them and monitor their actual results. These can be treated in a similar fashion as any other data, but they are characterized as those that remain outside of the control of the transport sector. This concept is better understood with the example provided below.

Figure 12. Assumptions: Example for road preservation

OUTCOME		
Reduced transport costs and time for transport users of the National paved network (due to road preservation)		
ASSUMPTIONS	**REFERENCE**	**MONITOR RESULTS**
Annual increases of preservation costs of road works on the national paved network are reasonable	Road works costs for paved road with asphalt concrete and surface treatment · Rehabilitation $/km · Periodic maintenance $/km · Routine maintenance $/km-year **Average 2010-2014**	Unit road works costs for preservation of the network do not increase to the extent that eliminate the increase on resources available **Monitor every year 2015-2020**
Preservation road works costs are bid competitively and awarded transparently	50% preservation works > $5M subject to international competitive bidding (ICB) Average number of acceptable bids in > $2M contracts: 3 or more Year 2014	· 80% preservation works > $5M subject to international competitive bidding (ICB) · Average number of acceptable bids in>$2M contracts: 5 or more Average 2015-2020
Paved road network condition changes du to other than preservation is not significant	Change of length of paved network due to · Re-classification · New construction · Upgraded to paved · Extraordinary events Year 2010-2014	Improved road construction due to other than preservation no more than 50% net change Year 2015-2020

Assumptions

· Provide further clarification on the context and the variables that are not likely to be under control of the transport sector

· Require a reference point (similar to baseline)

· Should be qualified or quantified in order to monitor the actual results.

Sample set of Assumptions: Example for road preservation

· Road works costs on the national paved network do not increase to the extent that it substantially affects an increase on resources available.

- Road works costs for rehabilitation and maintenance are bid and awarded competitively and in a transparent manner.

- Changes in network conditions due to re-classification, new construction, road improvements (paving or upgrading), or extraordinary events (like earthquakes) are not significant, or are fully accounted for.

Use data to evaluate and report findings

Most existing M&E systems aim only at generating data, few actually are used to produce indicators, which are seldom analyzed and hardly ever used to define or improve transport sector policies. There is a huge imbalance between monitoring and evaluation. Most of the efforts so far, have only reached the monitoring aspects, only touched the evaluation dimension, and hardly ever attempted to measure the impact of transport policies.

Current M&E systems do not address the decision makers' needs, nor do they properly respond to transport users' demands. There is ineffective communication between the transport specialists and decision makers. The timeline and priorities of decision makers and transport specialists are not the same, not in sync, and often face conflicting deadlines. The reports, findings and recommendations are not ready when the policy makers need them. The data, analysis, and format of results are often inappropriate for the decision makers' needs.

There is a lack of transparency in every phase of the data cycle, the agencies responsible for collection, analysis and evaluation have limited capacity and in most cases lack independence. Data validation is generally not performed, and the analysis not regularly carried out. Findings and recommendations are not generated based on data or evidence. If recommendations exist, they are not adequately disseminated, or ultimately not followed. A truly independent instance with the capability to validate the data quality, and then conduct a balanced and unbiased data analysis is rarely found.

Three vital measures have to be taken to overcome these challenges. First, add transparency to the entire data cycle generation, collection, analysis, evaluation, and impact in order to dramatically increase their use, and improve governance and accountability. Second, define a set of incentives for policy decision makers to use the findings and follow evidence-based recommendations. And third, identify

or establish an "independent" instance to validate, monitor, and analyze the data in order to generate findings and recommendations useful to evaluate transport sector policies. Typical challenges and alternative options for TSDMS to be successful as a tool for making evidence-based decisions are presented in Figure 13.

Figure 13. Challenges on utilization

CHALLENGES ON UTILIZATION	ALTERNATIVE OPTIONS TO ACHIEVE UTILIZATION
M&E systems forced by external agencies are not sustainable and last only as long as they are involved	TSDMS primarily led by internal demand and transport agencies in response to their own needs are more likely to success and become sustainable
Inadequate M&E design and inappropriate approaches	Establish TSDMS preferably on a single M&E within MOT and gradually include agencies by improving existing systems
Users cannot influence the TSDMS design nor the data it generates	Organize and seek inputs and participation from users, the private sector, and academia
Costly M&E systems and insufficient financial resources for collection	Conduct a realistic cost estimate to establish a TSDMS and prioritize funds to generate & collect data
Lack of good quality data and standardized transport indicators	Generate key indicators baseline with existing data and attempt standardization to allow cross-country comparison
Limited exchange of information among transport agencies & others	Agree on formal and clear exchange of information among all participating agencies and government levels
Insufficient monitoring & lack of evaluation of transport policies	Establish TSDMS as part of national planning & policy framework and apply the results chain concept
Limited credibility of agency responsible to conduct the evaluation	Sub-contract an independent evaluation agency and/or ensure there is no conflict of interest or partiality
Lack of incentives for policy decision makers to use evaluation findings	Add the political dimension to the M&E assessment and take into account the incentives for policy decision makers
Limited or lack of follow up evaluation findings or recommendations	Establish TSDMS emphasizing accountability & disseminating lessons learned

Key features that make an evaluation useful

· Impartial and independent
· Based on evidence and technically sound
· Transparent and conclusive
· Timely and cost-efficient

Examples of the use of data from a TSDMS are provided below.

Figure 14. Sample Uses of TSDMS

SAMPLE USES OF TSDMS	KEY TSDMS CLIENTS
Generate indicators that measure the contribution of the transport sector to the economy, or economic benefit for the population at large	Ministry of planning, national statistical office
Provide data on historical budgets & actual expenditures against actual allocations & needs across transport modes to prepare future budget allocations	Ministry of finance, funding sources & transport agencies
Generate key transport indicators to monitor & evaluate the performance of transport sector agencies	Transport agencies & authorities
Provide information to carry out in-depth transport sector studies to formulate pilot projects of large-scale programs	Transport agencies & international development cooperation
Use data sources to generate indicators and apply them to inform policy decisions and clearly illustrate the use and impact of the importance of proper data collection and reporting	
Periodically report on transport safety records on various modes	Media & transport users
Publish average road works costs for new construction, rehabilitation, periodic and routine maintenance by type of road	Construction industry, road agency & road fund

Frequently maintain, expand & improve the TSDMS

Establishing a TSDMS is a process that requires frequent revision and improvement, as there are always new challenges that may require the attention of policy makers. One frequent challenge is the fact that in most countries a truly independent entity with the capability to validate the data quality and conduct a balanced and unbiased data analysis does not exist. It is acceptable to start without an independent instance, but as the TSDMS expands and improves it is highly recommended to identify or establish an "independent" instance to validate, monitor, and analyze the data in order to generate findings and recommendations useful to evaluate transport policies. Among good practices are the following:

- In addition to monthly, and annual reporting, for both internal and external use, promote the implementation of the TSDMS among stakeholders

· Frequently identify potential risks on the sustainability of TSDMS

· Ensure financial resources are allocated to generate the primary data

· Respond to internal demand coming from transport users and agencies

· Gradually increase the scope with a larger number of outcomes to monitor

· Expand and improve only when resources will lead to quality data and evidence useful for transport policies

Initiate the process to implement a TSDMS

It is strongly advised that a progressive approach is adopted in the implementation of a TSDMS. It is often unrealistic to aim at implementing a fully integrated TSDMS from scratch. A more sustainable strategy is to start with only one mode or government level and select specific policies and corresponding *core set* of data and indicators. It may also be useful to implement a Pilot TSDMS involving only 2 or 3 key transport agencies, with others to follow at a later date once the initial phase is complete, or when the lead agency and M&E Unit in the MOT have become fully operational.

The way forward to initiate the implementation of a TSDMS includes taking the following four steps: (i) build consensus; (ii) procure a consultant; (iii) sign Memoranda of Understanding with key stakeholders; and (iv) establish an Inter-Agency Steering Committee, or equivalent to oversee the implementation of the TSDMS.

Build consensus

The TSDMS should involve many stakeholders, and it is an absolute requirement to achieve buy-in from major stakeholders at this point.

The Ministry of Transport, or equivalent, should take the lead in this effort, as the TSDMS will be an important tool for planning, managing, monitoring and evaluating of the entire sector. Decision makers will be the first to benefit from a working TSDMS. Their support will be essential if it is deemed necessary to make changes in the organization of certain supervised agencies.

Figure 14. Timeline to implement an initial TSDMS

| Design (3 months) | Procurement (2-3 months) | Piloting (6 months) | Operation (continuous) |

1. Assess readiness
(institutional, technical, financial and human dimensions)

2. Prepare specification
Consistent with the available resources, and building consensus among agencies

3. Procure consultant

4. Implement a pilot system
Establish steering committee, sign MoU,, agree on data, develop procedures, implement IT systems in pilot agency/agencies

5. Operate the system
Monitor implementation; look to extend the system to other agencies and data; ensure continued direction & support

Bringing in the agencies is often a challenge. Particularly if a proposed restructuring of the data management process leads to rethinking some internal agency operations that could be perceived as a potential source of disruption.

Involving development partners is also essential. They should be made aware of proposed developments and implementation plans. An operational TSDMS will add value for many development partners by being able to manage and monitor indicators in a professional, consistent and coordinated manner. Development

partners may also already be funding M&E initiatives in some agencies, or have projects in the pipeline, which can accommodate additional tasks to contribute to the overall TSDMS.

Procure consultant

It is likely that most countries would procure a consulting firm to implement the TSDMS, given the specialized nature of the task, the introduction or upgrading of computer systems, and the likely requirement for training across different agencies. The main tasks of the Consultant could be to help establish an Inter-Agency Steering Committee, prepare Memoranda of Understanding between the agencies, fully define the indicators and data for the TSDMS, implement a pilot system in one or more transport sector agencies, and make recommendations for further expansion and operation of the system.

The process, and time, taken to procure a consultant will depend upon the procurement method and type of funding. These issues are not discussed here. However, it is recommended that the procurement is fast-tracked so as not to lose momentum from the interested agencies' initial commitment to actual implementation. If possible, the procurement phase should last no longer than 3 months.

The evaluation criteria of proposals for implementation must require that each Consultant should:

- Have experience in the implementation of statistical systems in general; experience with transport data and indicators; and in particular, experience with the software being proposed for the TSDMS.

- List any agencies in which the application has been implemented, and indicate whether there are offices in the Region or Country that may be able to provide on-going support after implementation.

- Provide a list of clients in different regions.

- Describe future potential support and maintenance services, including a sample Service Agreement.

- Demonstrate that the ICT system being proposed meets the technical and functional requirements.

It is important to avoid requesting the consultants to propose the software, as they are more likely to recommend the software they know, and should not be responsible for procuring the software as part of their contract. It is better that the consultants write the specifications of the software, which can then be procured through a competitive process. Consultants should not provide the software as part of their contract. It is best practice for an independent ICT specialist to define specifications of the software for bidding based on the scope and objectives of the TSDMS. However, sometimes the software can be imposed by the NSO or by the ministry in charge of statistics.

Sign a Memorandum of Understanding

Many agencies within the TSDMS are likely to be covered already by a high-level, legal mandate to provide information to the Ministry of Transport (MOT) or equivalent. A country's Statistics Act may also describe any legal requirements for data reporting.

However, even if such legal mandates exist, it is still considered useful to prepare a Memorandum of Understanding between the MOT and the line agencies. Such a memorandum should describe clearly the role of each agency, and the type and extent of inputs it will provide to the TSDMS.

It is recommended that a Memorandum of Understanding be developed between the MOT and each agency covering at least the following:

- Purpose of the agreement, including reference to any existing legal mandate
- Areas of cooperation between the parties
- Role and function of any steering committee
- Role and involvement of each party
- High-level description of data to be provided
- Reporting procedures
- Financing of the activities
- Privacy issues

It is recommended that the detailed data and indicators are *not* included in the MOU, since these may change over time. The MOU should be kept as generic as possible, only highlighting the broad data categories to be provided by each agen-

cy. Alternatively, the data and indicators could be added as an annex to the MOU so that they can be easily updated.

Establish an inter-agency steering committee

The establishment of an Inter-Agency Steering Committee is vital for the successful implementation of the TSDMS.

The inter-agency steering committee should include high-level representation from all line agencies. The National Statistics Office (NSO) should have active involvement, since the NSO has experience of design and implementation of national statistical systems. Many NSOs have their own agency coordinating offices, with dedicated staff, which are able to assist other government agencies with data collection, funding, training, standards and procedures, practical advice on implementation, etc. The NSO may also be aware of other current or pipeline initiatives (including donor involvement), which may be useful to establish linkages.

It is also crucial that the transport data and indicators under the TSDMS are incorporated into the National Statistical System.An early and close involvement with the NSO is one way of ensuring this. Opportunities for inclusion of transport-related questions in on-going household surveys conducted by the NSO should also be explored.

The Inter-Agency Steering Committee should also be a forum in which discussions can be held between the agencies to help formalize the structure and operation of the TSDMS. Particular areas for cooperation will be in defining any inter-agency agreements on data sharing, and on the detailed definitions of the data.

Even though it was suggested that the focus should initially be on 2 or 3 agencies, it will also be important for other agencies to be involved at an early stage so that they are kept involved with planning for future TSDMS expansion, particularly as to how it relates to their agency.

The Steering Committee should continue to operate even after initial implementation. It will continue to identify the need for additional indicators and data, bring other agencies into the system, increase stakeholder awareness, etc. The Steering Committee should also be a forum to discuss any issues on data collection programs and quality of data from the line agencies. In general, it should drive, re-

view, and monitor the on-going operation of the system. The frequency of meetings of such a committee would depend on each country. It is likely, however, that the committee will meet more frequently during the initial implementation phase and/or during major periods of expansion of the system, and prior to the production of the National Transport Plan or other major transport initiatives. Even with a proper-functioning TSDMS, annual or even semi-annual meetings would be useful to review objectives and progress.

Conclusion

The fundamental motivation underpinning both policy note and guidelines is to place the concept of transport sector data management at the heart of sound policy development, and to emphasize the urgency for decision makers to recognize the importance of data when formulating and improving transport policies. In today's world centered around information technology that offers a wealth of opportunities to collect data, the transport sector in Sub-Saharan Africa can neither justify continuing operating nor improve—without a sustainable transport sector data management system.

The quality of the input data of the TSDMS and the reliability of the indicators generated will largely define the effectiveness of transport policies. Adequate and reliable data are necessary, not only for understanding the extent to which various interventions are contributing to the achievement of objectives set by transport sector ministries, agencies and other stakeholders; but also, for assessing how the transport sector contributes to the overall national and international development goals like the MDGs and successor SDGs.

A TSDMS is undoubtedly a very effective tool for improved policy decision making; but worthless, without genuine commitment from high level government officials to properly design, implement, and consistently apply it. A good TSDMS forms the basis for evidence-based policy decisions, planning, monitoring and evaluation of performance and impacts of transport policies and investments. It is therefore, of the utmost importance that policy makers adhere to the SSATP proposed principles of sustainability, transparency, and accountability to obtain the much-needed support from transport stakeholders.

The Policy Note suggests creating or strengthening a single M&E Unit in the Ministry of Transport (or equivalent) to lead the TSDMS in a way consistent with the given legal and institutional framework. It also advocates for increased investment in building the necessary technical, institutional, and financial capacity as a long-term undertaking of the African countries.

The Guidelines provide advice on how to assess the existing monitoring and evaluation systems, and detail the process to design and establish an appropriate

TSDMS. They also capture valuable lessons learned and propose alternative ways to overcome commonly found challenges in Sub-Saharan Africa. SSATP has been actively advocating for the proper design and implementation of TSDMS and is committed to continue supporting the efforts of African countries to promote the development of transport sector policies based on evidence.

In an environment where the exchange of information is rapidly increasing and transport modes generate vast amounts of real-time data, a TSDMS is the mean to respond to the growing demand from transport users for improved access to reliable transport data. It is therefore imperative that transport professionals capture this data, package it, and present it in a way, which links the evidence so generated with the policy decisions in order to demonstrate that the latter ultimately benefit the general public.