International Transport Forum

Workshop Report

MEASURING INVESTMENT IN TRANSPORT INFRASTRUCTURE

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Objective of the Workshop

The International Transport Forum (ITF) convened a workshop in Paris on February 9 and 10, 2012, to discuss issues in measuring investment in transport infrastructure. The objective of the workshop was to serve as "…a platform for statisticians and stakeholders to discuss and better understand transport infrastructure investment and maintenance data…" by "bring[ing] together data providers and users to share their experience with the methodology, interpretation and limitations of transport investment data." The organizing concern was that, while transport investment data are an important component of sector planning and operations, there might be significant gaps in supplying the information needed or significant differences and ambiguities in the definition of common terms. Moreover, while there is general agreement on the criticality of transport in underpinning economic development, there is less confidence that either the adequacy of the sector's capacity, or its quality, can be determined from readily available datasets. Major investment decisions may potentially be made with incomplete or erroneous data. The stakes in getting better and more complete data are thus very high.

The one-and- a- half-day workshop supported vigorous discussion among experts from a number of disciplines across the modes of transport. The results of the discussions, along with a set of tentative suggestions for further work, are summarized below. This can serve as a recommendation for topics to be discussed at the ITF Forum on Funding Transportation in Leipzig in 2013.

Diversity of Needs and Concepts

By design, the Workshop included a wide range of professional disciplines, from transport economists to financial analysts to industry specialists. In many cases, different disciplines have slightly different understandings of, and concepts for, the same basic idea. Economists may think of investments as being the allocation of resources to obtain the means of production: financial analysts think of investment as the activity that acquires an asset that, in turn, is used to produce revenue by deploying either equity or debt; industry specialists think of investment as the acquisition of locomotives or track or trucks or airports, and focus on the specific outputs and costs of the equipment. Statisticians are the agent to bring it all together, focusing on proper collection and accurate classification of data by country, sector, industry and company without necessarily focusing on the particular nature or use of the asset;

Each of these audiences thinks of the data about investment, for example, as serving a different purpose or objective. Economists care about the overall economic contribution of an investment and the opportunity cost of using an investment in one way as opposed to alternative uses, with the objective of maximizing the composite value of resources invested. At this level of abstraction, both the value and the costs of the investment are seen from the viewpoint of society as a whole excluding transfer payments while using shadow costs for resources and including a number of social costs, such as emissions, that have no financial value. Financial analysts will look at the financial and commercial consequences of an asset acquired, but excluding the impact of transfer payments and social costs. Industry specialists will move directly to the particular

design and cost of an investment (asset) and focus on the cost, output and efficiency of the particular locomotive or truck involved. Again statisticians (or accountants, their corporate equivalent) generate and report the numbers in accord with the rules of the public or private reporting system within which they work.

As a result of these different perspectives, there is no single or agreed definition of the two key concepts of the Workshop: investment and maintenance. In addition, an "in-between" concept – "rehabilitation" or "upgrading," which may involve a mixture of both investment and maintenance – occupies a gray area and lacks an agreed meaning. The differences, discussed in more detail below, are partly due to the conceptual approach employed, but also are rooted in history and economic "stovepipes": the disciplines involved, and the different transport sectors, are to some degree inward-looking and have evolved in parallel, but not always in a coordinated or cooperative way. Distinct modal issues in transport have, for example, legitimately led to differing views of asset design, ownership and maintenance and to different demands on the statisticians and accountants who serve them. Once established, these definitions can become cast in concrete and are very hard to modify.

Demand versus Supply: When does a number become information?

Discussion in the Workshop tended to highlight an underlying issue: to what extent are the real users of transport data getting what they need and in the form and timing in which they need it (information), and to what extent are numbers being collected and reported that have little real use (just numbers)? Answering this question ultimately depends on a clear identification of users and uses of transport-related data, and in building the best available connections between and among them.

Data-**consuming** participants in the Workshop included government ministries, state-owned enterprises (SOEs), regulators, international development banks (World Bank and Asian Development Bank), investor and industry groups, private sector companies and academic researchers. This list is clearly only a sample of a much wider potential customer population: transport ministries and modal departments at many levels of government, private banking, and shippers and passengers could also have been added, among many others. The consumer group listed needs for transport information for a wide range of purposes, including policy formation, very high-level economic planning and analysis, budget management, investment and operational analysis and management at all levels, regulatory decision-making, enterprise management, and academic research, among many others. It would be fair to say that each of the consumers mentioned at least some problems with information available, either due to completeness, accuracy, timeliness, cost, or all four.

Public Private Partnership (PPP) proposals have become an increasingly important consumer of information about transport investment and operations. PPPs are a bridge between the public and private sectors and, as a result, probably have the largest range of data needs. The public side needs to know whether a proposal is economically justifiable, given its full range of economic, financial and social benefits and costs, and taking the allocation of risk and asset

ownership into account. The private partner will want to assess the risk allocation in the context of the expected financial and commercial outcome. Some data needs overlap, others do not.

The data **producers** ranged from international agencies (U.N., E.U. agencies, International Transport Forum) to national statistical agencies such as the U.S. Bureau of Transportation Statistics (BTS) or the U.K. Office of Rail Regulation (ORR)) to international industry-focused agencies such as the International Road Federation (IRF). Some data consumers are also data producers, such as the World Bank, International Monetary Fund (IMF), or the International Transport Forum (ITF).

Examples of data production touched on world-level collections (World Bank, IMF, U.N.), multi-national but not world level (E.U. and ITF/OECD), international sectoral data (IRF), national sectoral data (BTS and Ministry of Roads and Highways of India), and hybrids such as TENtec that cover part of a sector (the TEN-T network spanning surface transport across the entire E.U.) but encompass a set of national systems.

The data producers seemed well aware of (at least some of) the gaps in data being collected and of problems with timeliness (for example, the U.S. BTS is only now tabulating some aspects of 2007data). These are problems at the broadest levels. For example, transport data in National Accounts are subsumed within even broader economic categories ("Economic Affairs") rendering them less useful for transport analysis.

By comparison, detailed data are often missing at narrower levels of specificity (numbers of types of trucks by carrying capacity, or total listing of airports by type in many countries). The problems appear both as cross-sectional gaps (some countries or types of data consistently missing) and in time series (some yearly data missing in an otherwise complete series). As a result, data consumers can be frustrated in conducting analysis of performance among countries and in economic or financial analysis within a single country or sector.

In concept, at least, the Workshop discussions suggest viewing the data production/consumption issue in market terms: there are producers and suppliers of information and there should be a connecting mechanism (a market) between them to ensure that demand and supply are balanced, in quality, quantity and costs. To the extent that this is not true, and the Workshop clearly established that it is certainly not true in many significant respects, then the question is: what is it in the structure of the institutions and the demand/supply clearing information that limits reaching a better balance between the data that users want and the data that the producers are supplying? In terms of the subtitle of this summary, how can we ensure that the information/numbers ratio is a high as possible and that conclusions are based on facts and not the reverse?

To be fair, the information problem has limits and in many cases is not terribly serious. Many decisions in the transport sector are fully supported by adequate data, and most decisions have at

least a reasonable basis in facts that are "fit for purpose."[1] Moreover, many investment and operating decisions are robust enough to survive gaps or even minor errors in supporting data. Instead, the question is whether the balance between data needs and supplies can be improved, either across the entire spectrum or in particular cases. Can the data "market" be made to function more efficiently?

Participants also raised the reverse issue: does increased or wider supply of data ever create new demands? If so, is there a reason to collect and report data "on spec" in the hope that is should eventually have a use? The answer is not entirely clear. There are certainly research needs that cannot be fully anticipated, and information of no apparent immediate value can sometimes be crucial in later applications. In addition, consistency in time series data can sometimes be valuable even though specific applications for the data change over time that otherwise slightly re-define the data.

Clear problems identified in the Workshop

Definitions. There is a lack of clear and agreed definitions for a number of critical terms, some of which formed the basis for this Workshop. For example, while "investment" might generally be understood to denote the long term allocation of resources to acquire a physical asset for productive purposes, "long term" might well mean 30 years in the context of a PPP concession, or could mean "anything over one year" in national accounts. An "asset" would certainly include highways or airports, but has often been applied to human capital as well. "Productive" would imply that the asset is used to yield some kind of tangible output – a ton-km or a passenger-km, for example; but, other outputs, such as access for the poor or handicapped, can be much more difficult to define and report.

From a different angle, the term "investment" can mean either a "stock" or a "flow" depending on the user. That is, the total value of an asset (original cost minus amortization or depreciation) can be an investment (stock), or the amount used in any year for asset acquisition can be called "investment" (flow). The first case yields a total value, the second the amount flowing in any one year (or period other than a year). Some datasets contain information based on both concepts while other datasets contain only one (usually flow): some contain neither. Public agency reports nearly always focus on flows whereas state owned enterprise (SOE) and corporate annual reports will usually contain a balance sheet (stocks) and an income statement (flows). Public agency accounting in particular raises the added question of the timing of a flow: does it occur when the funds are made available, when they are actually expended, or when the ownership of an asset actually is recorded or changes? In the U.S., for example, federal funds to acquire an asset may be budgeted in one year, appropriated in a later year, outlayed (expended) in an even later year, then finally recorded as completed in yet later years. In this case, economists, financial analysts and operational managers might reach a different conclusion as to when the asset has been actually "acquired" and when the shift to maintenance occurs.

[1] The experienced transport specialist will add that all too many transport policy decisions are made in apparent defiance of the data and facts, but that is not a problem that this Workshop attempted to address, at least in the formal presentations.

Similarly, "maintenance" commonly means the types of repairs and replacements that are needed to keep an investment asset in good working condition: changing the oil, replacing burned-out lights on a runway and removing weeds would all be understood to be maintenance. This kind of maintenance is treated as part of the annual cost of deploying an investment asset. At the same time, it is clear that maintenance practices can affect the life of an asset, thus creating an interaction between investment cost and lifetime in investment analysis.

However, some items do not fit so neatly into the either/or category of investment versus maintenance. If 60 kg/meter rail is replaced with 65 kg/meter rail, some part of the costs is usually regarded as maintenance, whereas another part is regarded as "upgrading" and treated as an investment. A similar issue might arise when a waterway is dredged from 10 meters navigable depth to 15 meters: one part of the dredging is simply maintenance of the existing functionality while another adds to the productivity of the waterway.

To some extent these differences are specific to the differing types of assets and asset lives of the transport modes involved. Railway freight wagons typically have 30 to 50 year lives whereas autos have 10 year lives (or less) and truck trailers roughly the same. Depending on traffic levels, railway maintenance cycles may typically be 5 years whereas highways may be one year or less. As a result, what is considered maintenance on a railway could well be classed as investment at an airport or on a highway (or by a highway operator).

The definitional issue appears to be further complicated by different national ownership patterns and the way that countries account for public versus private investment and maintenance. Most E.U. railways are owned and controlled by governments and typically manage (and report) investment data according to public accounting requirements. It is quite common for these railways to provide little or no public information about investments or maintenance and, despite Commission requirements that their infrastructure be adequately maintained year-on-year, these railways (or their infrastructure manager) do not report the data required to ensure that such maintenance is actually performed.

By contrast, the requirements of rail regulators or of financial reports to shareholders (or both) have produced a different situation in the U.S. and the U.K. In both countries, at least in the rail sector, the basic data needed to measure both investment (stock and flow) and maintenance (and upgrading) are collected and reported in accordance with relatively clear and consistent standards. Moreover, because regulators operate in a public (and political) environment where changes (especially price change) are contentious, regulators are concerned with reporting over time and usually attempt to maintain consistent time series data definitions of information as well as accurate data in any given year.

Regulatory asset base (RAB) data can sometimes differ from the apparently similar information provided in the annual reports of a private corporation. Regulators demand detailed data about the numbers, ages, conditions and values of assets because this determines the allowable income of the company after cost coverage: shareholders rarely need asset information at this level of detail. In order to assure equity and comparability among regulated enterprises, regulators may impose an accounting approach that the individual companies do not follow in their reports to

shareholders. At the same time, tax requirements and the threat of shareholder litigation act to ensure that accounting reports of assets in total will be accurate and defensible. There is a difference in incentives, however, in that a regulated enterprise will want to maximize its RAB in order to maximize earnings whereas an unregulated firm may want to reduce its reported asset base in order to increase its reported return on investment.

There is also a continuum between the periodic (usually annual) asset reporting of transport corporations and the essentially continuous approach of Perpetual Inventory Management (PIM). In the first approach, recorded asset values, and the effect of rehabilitation and maintenance, are changed only in discrete steps; if the steps are long enough, especially toward the end of a measurement period, the last reported value of the assets may depart from actual. By contrast, the PIM approach should, in principle, always contain an up-to-date account of asset values.

An added complication across all countries is the fact that accounting standards can be different due to historical practices for management and reporting. Generally Accepted Accounting Principles (GAAP) and International Financial Reporting Standards (IFRS) are both internally consistent reporting systems that form the basis for data collection and reporting in a number of countries, but they are not identical overall, and can vary somewhat in different countries; the differences influence the data employed. In addition tax policies influence data collection and reporting. Given that "maintenance" is usually classified as an expense against revenue, whereas "investment" is not, and that asset depreciation or amortization is also an expense, differing tax regimes have had a significant influence on the definition of these terms and on the way in which data are collected and reported. In general, where the "investors" and operators are publicly owned, enterprises face a different set of incentives with regard to maintenance and depreciation/amortization (they are generally content to take a longer-term view) as opposed to corporations that prefer to minimize or defer maintenance where possible and to accelerate depreciation where permitted. To the extent that annual charges against asset value, such as amortization or depreciation, are taken as a proxy for necessary maintenance, these differing regimes will yield different apparent results even though the underlying managerial practices might be similar.

Differing public and corporate practices with respect to leasing and outsourcing can also have an effect on the way assets are owned, used and reported. Depending on how leasing is employed, a significant asset may or may not show on the accounts of an enterprise but may instead show on the accounts of the lessor entity. A leased asset can act to increase the apparent operating costs of an enterprise while reducing its apparent asset base. Similarly, when public policies discourage use of the private sector for support activities, the asset (and employment) base of an SOE will appear larger than when "outsourcing" is encouraged. From the viewpoint of the overall economy, the problem is "netted out," but it could be important when looking at the productivity of a particular sector or enterprise. Of course, if the leasing or outsourcing is international, a national sectoral asset base could be distorted, though this effect is unlikely to be large enough to be significant on the scale of the overall national economy.

Commonly needed supporting data. Another issue emerging from the Workshop is the fact that many transport-related databases leave out information that is frequently needed for

completion of transport analyses. For example, economic or financial analysis of time-series data almost always entails some form of correction for price changes (inflation), but the relevant price deflators are rarely available directly: other sources must be consulted, and these sources may be hard to find and not directly applicable to transport or to a specific mode of transport. International cross-sectional comparisons frequently involve currency conversions and Purchasing Power Parity (PPP) adjustments, and these are also rarely a direct part of transport databases. Safety is another good example: some databases (ITF or the U.S. BTS) contain some information about transport safety and accidents, while others focus primarily on costs and activity.

Perhaps this can be better broadened to cover the lack of **linkages** of transport data to related measures of transport impact. For example, most transport databases do not directly provide information about energy consumption, emissions (CO_2 and pollution) and other social impact data, nor do they provide information as to how to find such information that is consistent with the definitions and assumptions in the original database. As a result, data users trying to evaluate a transport investment in the context of its broader impacts must either have a broader than normal familiarity with all sources of data, or proceed piecemeal by consulting a number of unconnected sources.

Known and significant gaps. Another issue arising from the discussions is the fact that even datasets with agreed definitions and content often have major gaps, both cross-sectional and time series. These gaps can be due to existing or prior political systems and concepts. The former socialist economies in Central and Eastern Europe (CEE) were managed in accord with economic concepts that were quite different from the concepts that these countries are now attempting to implement. This means both that time-series data before the transition are questionable and that, even now, some of the older definitions probably are still in play.

A similar problem in data availability has been the impact of national rivalries, particularly in the earlier years of the E.U. Countries historically did not collect and (especially) report data that they saw as threatening to their national interests or national champions and, given the inertia of national institutions, gaps once created are hard to fill even if the original motivation has faded (somewhat). Many countries have funded their transport modes in quite different ways as a result of the influence of political constituencies, which has led to "stovepipe" funding and management: data has been structured to serve the needs of those within the stovepipe, and data that might reduce the strength of the boundaries is often suppressed.

A particular problem within SOEs is resistance to bureaucratic accountability. It was observed at the Workshop that investment and maintenance decisions cannot be expected to be better than the information on which they are based. A concomitant of this fact is that he or she who controls information, or lack thereof, can shape or limit the investment and maintenance decisions that are made and, perhaps more important, can control the degree of accountability that policy makers can exercise. Explicitly, there are circumstances in which one or more parties actively do not want to produce or report data that decision-makers might otherwise need. Overcoming this barrier is often only possible with the involvement of the highest level policy officials of a country.

A private sector parallel is the issue of control over "commercially sensitive" information. Most private sector companies (unless forced to do otherwise by regulators) will publish only the minimum information demanded by shareholders, although they are likely to have copious and accurate information available internally for management purposes. Thus, economies in which a major part of the transport sector is in private hands (usually trucking, but often airlines and waterway operators as well) may face major gaps in information about the investment and operation of the most important parts of the sector. For example, in the U.S., trucking accounts for about 72 percent of transport value added, about 31 percent of tonne-km, and national and state investment in highways accounts for 66 percent of total transport infrastructure investment, but information about trucking traffic flows by type of carriage (especially in-house), commodity and route is relatively limited. At the same time, information about private sector railroad investment, maintenance and operations along with traffic flows is much more accurate and detailed than for users of the highways.[2] Nor does the issue of commercial confidentiality apply only the private sector: many SOEs suppress publication of information about their investment and operations on the grounds that they must compete with private providers who would derive commercial advantage from information about the public operator – even though the investment and planning of the SOE is, in principle at least, wholly the responsibility of public officials.

An important gap: incomplete or missing output data.

As discussed earlier, the point of investment and maintenance is ultimately the production of a good or service – in the case of transport, the movement of people and goods from one place to another. There is thus little point in focusing on measuring inputs (investment, maintenance and operating costs) without being able at the same time to measure and evaluate outputs and to relate the outputs to the inputs functionally.

Outputs are, however, measured in a number of dimensions, only some of which are easily collected and reported. The first dimension – **quantity** – has been the starting point of most transport databases. Freight outputs in tonnes originated, tonne-km transported and freight revenue generated are accepted measures. Even at this physical level, though, there are imbalances between modes, with information about railways and air typically more detailed than for roads because railways and airports/operators are sufficiently limited to permit a full description of assets whereas roads are often of necessity reported on a sampled basis. A notable part of the ITF database is annual physical output of the transport systems by mode and by

[2] Prior to the deregulation of airlines, trucking, water and rail in the U.S. that occurred between 1978 and 1981, the Civil Aeronautics Board (CAB) and the Interstate Commerce Commission (ICC) required that carriers provide annual income statements, balance sheets, physical assets and operating statistics in a format specified by the commissions. After deregulation, although the U.S. Government retains safety oversight of all modes, and requires reporting of data relevant to safety, only the large railroads (Class I) continue to report in the prior detailed formats. In addition, all companies with shares sold on stock exchanges must provide financial reporting as prescribed by the U.S. Securities and Exchange Commission (SEC) but, as discussed, this is rarely as detailed as economic regulatory reporting. It should also be emphasized that only the U.S. railroads own, maintain and operate their infrastructure. All other modes own and operate only their equipment while public agencies own, maintain and operate the infrastructure.

country. Moreover, relating physical outputs to specific commodities, origins, destinations and routes has been much harder, though some programs (TENtec) are attempting to construct such databases in support of the E.U.-wide transport systems.

Another aspect of output **quantity** measurement – matching costs to revenues – has been much less available, and yet this is the real basis of calculation of net benefits of investment and maintenance. Some efficiency proxies (annual tonne-km/truck, tonne-km/employee, etc) can aid in establishing this relationship, but they typically do not involve monetary relationships, and are only partial measures of the effectiveness of the use of resources. In some regulatory cases – the U.S. Surface Transportation Board (STB) and the U.K. Office of the Rail Regulator (ORR), some forms of transport outputs can be related to their costs, but these are the exception.[3] By comparison, most SOE railways have chosen to avoid linking costs to outputs. There are very few if any reliable datasets linking trucking or water (or airline) reports of outputs with the costs specific to those outputs.

In many if not all of the private transport providers, the cost/output/revenue data actually do exist because it is almost impossible to manage effectively without it; but, private enterprises are rarely required to provide the data to the public. Public SOEs are not as strongly financially driven so may not even have the information in the first place; even when they do, they resist providing it in order to reduce accountability or to protect commercially "sensitive" material.

The second dimension of output measurement is **quality**. Quality of service measures are complex, and can include on-time reports, cleanliness, customer complaints, and loss and damage, among many others. Quality measures can be specific to each mode and to the types of service provided by the mode in a particular country (rail commuter versus intercity passengers versus high-speed rail, for example). Both the U.S. Federal Railroad Administration and the ORR have wrestled with the issues involved in designing and implementing quality measurement regimes for rail passenger transport. Despite the complexity of the measurements, the level of quality of service is an inherent assumption in decisions about where and how much to invest in transport and it is directly related to maintenance decisions as well. In the case of public support provided to franchises, quality serves as a part of the compensation calculation. As a result, the productivity of a given investment and priority decisions across modes can hardly be assessed without at least some connection to quality of outputs as well as sheer quantity and cost.

As discussed above, economists and environmentalists will add that transport outputs have social impacts as well and some will argue that these **indirect** effects can be as important as the transport quantity and quality considerations. Investments that produce efficient transport but with increased emissions may well not be wise decisions overall; and, environmental decisions, such as limitation of greenhouse gas emissions, that target transport rather than finding the most efficient reductions within the overall economy (coal-fired power plants, for example) may well actually reduce the efficiency of the total economy.

[3] See, for example, the U.S. STB's Costed Waybill Sample, that provides data, including commodity, tons, ton-miles, revenue, and estimated cost for U.S. Class I railroad shipments.

To the extent possible, then, transport datasets should be constructed so as to show both quality and indirect effects, or should at least make the reference to **all** output impacts as effective as possible. If this can be improved, one of the concerns of the Workshop – that the overall linkages between transport investment and economic development are hard to quantify – can be alleviated.

Bridging the gap between macro and micro.

The formal program of the Workshop focused on a limited number of **input** measures, specifically measurement of investment and maintenance. The program defined these concepts initially from the viewpoint of macroeconomics rather than, for example, the viewpoint of a regulator or an operator.

Although there are clearly significant gaps in the data (and definitions) that economists would like to have for their work on transport, the presentations and the discussions immediately broadened the focus to definition of the concepts from a financial and operational point of view, and included outputs (tonnes, tonne-km, passengers, passenger-km, etc.). Clearly the broader approach of the economist needs to be supplemented with data specifically suited to financial analysis and operational management.

Significantly, for some micro-economic purposes, such as regulation of rail (and perhaps some airport) infrastructure in the U.K. and the U.S., accurate and sufficient data do exist because the regulator has a clear objective to ensure adequate investment and efficient operation including maintenance, and has the authority to require that the data be produced and verified. It seems likely that public airport authorities (Frankfurt or Schiphol) and seaport authorities (Rotterdam) also have the same congruity of objectives and authority. In these cases, the data needed to evaluate investment, asset condition, maintenance and (at least direct) outputs are produced as a matter of necessity (though they are not always reported publicly). Private sector railroads in the U.S. and Canada furnish a similar example of how adequate data are a necessary result of clear objectives (profits, though clearly not minimal social impact) and appropriate managerial authority and requirements.

This raises the issue of the role of the interaction between the institutional framework (authority and objectives) and the data required to serve particular institutional needs. Clear and defined purposes tend to produce accurate and sufficient data (whatever it might be); undefined objectives or limited authority tend to yield the reverse. One of the underlying data design and collection problems identified by the Workshop may well be that the "market" for transport investment, maintenance and output reporting is imperfect, especially where some of the institutions involved face the wrong, or incomplete, incentives to generate information for their own, internal uses. If so, some of the "gaps" are actually in a sense purposeful and will be especially difficult to fill.

This also raises the question of whether the "regulatory" approach, which has historically been limited to national or sub-national regulators seeking to enhance the competition or public health and safety performance of regulated enterprises, could be applied to a broader set of activities

where better management and data reporting is desired. A similar question can be posed about SOEs with a hard budget constrains (if that is actually possible). For example, the E.U. Commission has imposed restructuring requirements on the Community's railways in which infrastructure must be separated (at least in an accounting sense) from operations and in which the reports of the various rail operators must be separated in order to prevent public support from being used to support commercial competition. In addition, Commission Directives require that the railway infrastructure provider maintain the infrastructure under its control in appropriate condition and impose access charges for all operators that equal or exceed marginal cost while not exceeding full financial costs, and that the access charges are not discriminatory or unduly burdensome to the flow of traffic.

It is difficult to see how such requirements could be implemented or supervised (regulated) without simultaneously generating data that would fulfill the objectives of this Workshop for information on investment and maintenance of the railway infrastructure. The same information will need to be developed, for example, by the French national railway infrastructure provider (RFF) in its program to improve the management and reporting for the national rail network. The data gathering activities of the TENtec data program may fulfill a similar function for at least the parts of the highways and other modes that have been determined to be of E.U.-wide significance, but may leave out the question of what needs to be known about the overall national transport networks in each country.

Defining what we need to know.

The Workshop revealed terminological problems with critical data and the existence of gaps in both cross sectional and time series data dealing with output quantity, quality and indirect impacts. The discussion also highlighted possibilities to enhance the immediate usefulness of transport data by linking it clearly with frequently needed economic and social impact data. At the same time, the complexity of the data needed and the number of existing formats is daunting. Some participants expressed a sense of frustration that this is not a new problem and questioned whether much progress is really possible.

Certainly the initial answer is that, however difficult and slow progress might be, data needs will never be met until they can be more clearly defined. Posed as a question, is it possible to make a listing of what information would be desirable to have and to use the list in future discussions on collection and reporting of transport investment and maintenance data?

This is a provocative question for which the answer in any complete sense is almost certainly "no," for reasons familiar to participants that have been discussed above. Nevertheless it appears that progress toward better information (if not a solution to the full problem) would be aided by an attempt to make such a listing. Based on the discussion at the Workshop, Table 1 has been developed as a very preliminary discussion topic. Table 1 is an initial listing by country, by mode and by year, of the data needs discussed above in a format that might be standardized.

Table 1 is not at all meant to be either correct or complete at this point. Instead, it is meant to pose a challenge to those would like better data for their purposes and to ask a series of questions:

- Which terms require a better definition?
- Is anything superfluous or impossible to collect?
- What is missing?
- What kinds of analysis could these data support and in what format?
- Is there a reasonable balance between a perfect dataset on the one hand and the possibility of supplier willingness on the other hand?

The Challenge.

Assuming that some version of Table 1 could be designed for each country, year and mode, the question remains whether there is a reasonable expectation that the data could be provided. Collection and reporting of all kinds of data must compete with all other resource demands – and transport data often loses the competition for resources (and sometimes rightly)

Actual collection of original data is very costly and is often resisted if the purpose is unclear, if it is not in the interest of the supplier to cooperate, or if essential confidentiality may be compromised. A strong case has to be made that the collection is worth the cost – a barrier that is usually too high when curiosity is the primary motive for collection, and there is a clear need to increase the appreciation of how data will be used and why they are needed. Therefore, in any realistic approach, the emphasis must be on finding ("mining"), collecting and/or linking in a systematic way what already exists or is produced for more direct purposes by others who can provide it at no (or minimal) cost. The challenge is thus, after having refined the requirements, to identify and classify what already exists in datasets collected by data producers such as IMF, the World Bank, regional development banks (IADB, ADB, AfDB), OECD (ITF among others), U.N. agencies, Eurostat, the U.S. BTS, International Union of Railways (UIC), Association of American Railroads (AAR), Railway Association of Canada (RAC), IRF, various national statistical agencies, and annual reports of transport enterprises, among many others.

There may be opportunities to prioritize by purpose. For example, a very limited number of railways actually constitute the vast majority of world rail activity. While national issues require national data by country, some **world** trends (railway CO_2 emissions for freight and passenger transport, for example) might be adequately defined by the activity in a limited sample of countries (U.S., Canada, Russia, India and China, and perhaps the E.U.15 and E.U.10).

More important is the fact that a large number of databases are becoming accessible by the worldwide web and are downloadable in formats that facilitate analysis. Even a decade ago, collection of international data often involved searching through hard copies available only in major libraries or in some cases electronic data in forms that had to be printed (PDF or scanned images) that were extremely laborious to process. As data become available more easily and in spreadsheet or equivalent formats, it will be increasingly possible either to collect data directly or to provide links to the data and make it readily accessible to those whose expertise is in the use,

not the collection, of the data. The example of the "data bridging" used in TENtec may be very relevant, as is the apparent two-way nature of the bridge, since both the producer and collector of the data acquire a common interest in the accuracy and comprehensiveness of the data.

Potential and tentative recommendations for future work.

The Workshop was expected to provide appropriate recommendations for further work on data collection and improvement. Although it is clear that a program for expansion and improvement of data for transport is needed, but will be a never-ending topic, there are a number of ways in which ITF could support a useful effort. Some candidates are listed below, with the hope that the list will be improved by comments from the participants:

- ITF can support discussions by selected expert panels to broaden and refine user needs for transport data and to improve the definition of terms. Something resembling an improved Table 1 could serve as the basis for initial discussions. The panels should include private sector producers and users, since much of the data needed are already produced by them and their understanding and cooperation will be valuable.
- ITF can help sponsor conferences and task forces to refine definitions of data needed across modes and at all levels. A second task would be a focused effort to locate as many as possible of the various existing databases along with an inventory of the data available (and in what format) from these databases. In some cases this might also lead to dialog with data producers to see if datasets can be modified to change the level of detail provided and to fill significant gaps. Several examples were cited of "implicit meta data" that should be available. For example, data on vehicle registration, which is compiled for licensing purposes, should be relatively easy to use in generating estimates of vehicle fleets by type, age and value. A third task could be to attempt to re-design datasets slightly in order to supply information at the appropriate level of detail for user needs: for example, transport should have a separate category even within broad economic activity data to meet future needs for estimating the resources needed and benefits generated by greenhouse gas control programs. Such an effort could also include design of satellite accounts within the National Accounting efforts that could provide transport data in more suitable detail. A fourth task might simply be to expand the reach of the professional community to other levels of the transport, finance and statistics community to increase understanding of the value of good transport data.
- A major effort could be justified to provide much improved working links between "direct" transport data (inputs and outputs) and social impact data such as shadow prices, deflators, emissions (including CO_2 as well as pollution and noise), health, safety and congestion, among others to be defined. As discussed, most of the information already exists, but in disparate and uncoordinated databases, so the effort involved is focused on location and linkage, not original production.
- In conjunction, the ITF databases could be expanded to form more of a "one-stop shop" that either includes required data directly, or indicates the linkages needed to provide such data. In this effort, the effort should be to provide information in downloadable and processable formats consistent with major spreadsheet or other analysis software.

- A focused effort to estimate and disseminate the value of transport data might be worthwhile, and effort that ITF can support. Data production is always seen as a cost, while the benefits of data use are often not fully appreciated. One particularly important example might be the need to communicate to the public at large the very high returns from various forms of congestion pricing. Given the high cost and community resistance to adding transport capacity, better measurement of the benefits of congestion pricing, and communication of those benefits, might well be critical to effective management of future transport infrastructure.

BUT, recommendations need to be tempered with realistic priorities along with a focus on "good enough." Resources for additions to databases are always going to be limited and subject to competition from other areas in the economy. In addition, commonality or at least harmonization of terminology across all modes is may be desirable, but is probably not a fully achievable objective: rather, consistency within a mode and over time would be a better objective.

Practical Steps Forward.

A specific, near-term step that the ITF may wish to take in preparation for the May 2013 ITF Summit in Leipzig would be the formation of a Task Force to initiate work on the issues outlined above. This Task Force should consist of selected experts, probably selected from the Workshop attendees, but possibly expanded depending on areas of interest that may not have received enough attention at the Workshop (viewpoint and expertise of private transport operators, for example). The aim of the Task Force would be to survey the definitional issues and data gaps and develop a draft "best practices" manual for what would eventually become a manual for data collection and reporting.

As discussed above, the Task Force could be asked to take an initial approach toward:

- Making an inventory of existing sources of data along with definitions and coverage;
- At the same time, identifying critical data gaps and highlighting the importance and usefulness of filling the gaps;
- Setting suggested priorities for filling the gaps;
- Developing suggested improvements in data definitions where appropriate and preparing a report to relevant agencies now collecting the data;
- Developing a proposed methodology for moving forward in improving the data available for measuring assets and their value in addition to the investment and maintenance of transport assets.

The draft manual of best practices should be available in time for discussion at the May 2013 Summit in Leipzig.

Given the cost of changes in extant data sets and the institutional inertia that exists, any progress will have to be made in small, finite steps and, in any case it will be slow. With that acknowledged, and based on the work of the Task Force, the ITF could plan for a careful

expansion of its reporting – one step at a time and based on an agreed balance between priority and availability. Directions of expansion could be: adding more countries in line with ITF membership; expanding data to include measures of assets and investment stocks; carefully selected measures of output quality (if they exist and can be defined); linkages to broader economic datasets such as price indices, PPP adjustments, GDP, demographic datasets; or, direct inclusion of, or linkages to, transport energy and emissions datasets, among many potential choices. Some of these data already exist at IMF, World Bank or Eurostat sources. Interestingly, none of the participants suggested that ITF's time-series should be extended further back in time, so there is at least one dimension of expansion that can be ruled out.

Table 1

Potential Transport Datasheet*

Country		Year		Mode	Road*

General Economic data:

Currency:	Euros
Currency value (1 Euro=1.00)	1.000
Price Index (2000 = 100)	
PPP adjustment (2000 US$=1.00)	

Stock and Flow Data on Physical Assets:

Infrastructure	Km at start of year	Km added this year	Km at year end	Estimated value at start of year	Estimated investment this year	Estimated maintenance costs this year	Dep'n or Amort. This year	Estimated value at end of year
Major international highways								
Major national highways								
Regional roads								
Local roads								

Vehicle fleet	Numbers at start of year	Added or retired this year	Numbers at year end	Estimated value at start of year	Estimated investment this year	Estimated maintenance costs this year	Dep'n or Amort. This year	Estimated value at end of year
Heavy trucks, For-hire								
Heavy Trucks, in-house								
Heavy Trucks, Public								
Light Trucks, for hire								
Light Trucks, in-house								
Autos, public								
Autos, private								
Buses, for hire intercity								
Buses, private use								
Motorcycles								

	For Hire						Not For Hire					
Freight Output Data	Tonnes originated	Tonne-Km	Revenue	CO2 emissions (tonnes)	Fatalities	Accident costs	Tonnes originated	Tonne-Km	Revenue	CO2 emissions (tonnes)	Fatalities	Accident costs
Heavy trucks												
Light trucks												

	For Hire						Not For Hire					
Passenger Output Data	Passengers originated	Passenger-Km	Revenue	CO2 emissions (tonnes)	Fatalities	Accident costs	Passengers originated	Passenger-Km	Revenue	CO2 emissions (tonnes)	Fatalities	Accident costs
Passenger Autos												
Buses												
Motorcycles												

* Note: This datasheet has been prepared for Road transport. There would be an equivalent sheet for each mode, though definitions would differ slightly.

Summary Listing of Presentations.

Opening Session
Timo Välilä, "Data Needs and Existing gaps in Economic Research"

Measuring infrastructure investment and maintenance
- Peter van de Ven, "National Accounts and Transport Investments"
- Helmut Morsi, "An Introduction to the European Commission's TENtec Information System"
- Frédéric Boccara, "Measuring Transport Infrastructure Investment and Maintenance"
- Patricia Hu, Measuring Transportation Investment: Challenges and Opportunities"
- Arvind Kumar and T.P. Sankar, "Magnitude and Measurement of Investment in Transport Infrastructure"

Combining data from public and private entities
- Cristian Gonzalez, "The importance of data to public and private assessments of transport projects"
- Paul McMahon, "Regulatory asset bases"
- Rafael Echevarne, The relationship between private and public investment – the airports approach"
- Krister Sandberg, "A country perspective for compiling investment data from different sources – Sweden"

Harmonization of international data collections
- Mario Barreto, "International Workshop on Measuring Investment in Transport Infrastructure"
- G. Amerini, "Data from the Eurostat/UNECE Common Questionaire"
- L. Freysson, "What COFOG statistics can provide"

Matching needs and identifying gaps
- John Dulac, "Transport Investment Projections for Asia and the Pacific"
- Andreas Kopp, "Can We Better Evaluate Assets?"
- Makeda Jahanshahi, "Data Needs for Efficient Rail Network investment Assessment"

Summary discussion and concluding remarks
Lou Thompson, "Measuring Investment in Transport Infrastructure: 'Information = numbers with a purpose'"