Sustainability in Transportation - Making it count

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Application	Leading question
Describe	What is going on?
Forecast	Where are we heading?
Review	How are we doing?
Diagnose	How did we get here?
Decide	What should we do?
Account	Who is responsible?
Learn	How do we do better?
Communicate	How do we tell others?

Table 1: Overview of Selected Indicator Applications

Describe—What is going on? This is the most basic application of indicators and is usually applied when a new, perhaps much debated issue emerges on the agenda. The main purpose of using indicators here is to help establish some idea about the magnitude and evolution of the problem being considered. Suitable indicators will provide overviews of key historical trends, or evidence of how a situation (e.g., accessibility for physically disabled citizens) varies across a geographical space. A search for leading indicators to help refine knowledge from descriptions toward possible actions may be one obvious extension of this application.

Forecast—Where are we going? An important aspect of sustainability and transportation planning is a focus on the future. Apart from preparing for future problems of congestion and pollution, the attachment of indicators to forecasts may also be useful in the evaluation of alternative policy scenarios. De Ceuster et al. (2006) illustrate the effectiveness of this approach for the Mid-Term Review of the European Union's Transport Policy in 2005. While it was not feasible to evaluate the current policy accomplishments due to data limitations, the use of models allowed the development of forecasts, which demonstrated a need to revise current policy priorities. A limitation is that it is usually only possible to create a limited set of forecast indicators, such as transport volumes and greenhouse gas emissions.

Review—How are we doing? Moving deeper into the core functions of indicators, it will often be desirable or even necessary to perform an assessment of the present or predicted future situation in order to prepare a course of action. Such an assessment is normative with regard to objectives, standards, benchmarks, or simply determining which direction of change is desirable; hence, some form of normative indicators is needed. Examples of questions addressed by the review application include: Will objectives be met? Is progress occurring? Does the program work? Or, are we becoming sustainable, in one sense or another? The Texas Department of Transportation for example uses a measure called "average pavement condition score" as one component in the review of a goal to preserve the value of its transportation assets (Ramani et al. 2011).

Diagnose—How did we get here? Policy making often proceeds in an incremental fashion, and is governed by the "art of the possible" or follows the intuition of policy entrepreneurs. Sometimes such policies are successful, but they may also utterly fail. Very often a need arises for evidence of "what works" or why something did not work. Analyses tracing correspondence between leading and lagging indicators, or between causes and effects, can be helpful. Such diagnostic efforts can help to unpack the factors behind a (possibly undesirable) present situation and also create a more solid basis for interventions to avoid it. An example is a decomposition analysis of CO₂ emissions from passenger cars in Greece and Denmark, which found that changes in vehicle ownership, fuel mix, engine capacity, and annual mileage all contributed to the increase in emissions in the two countries (Papagiannaki and Diakoulaki 2009). If the diagnosis can be linked to actionable policy variables—such as fuel type—it may be particularly helpful.

Decide—What should we do? Decision-making is formally the responsibility of elected officials or executives who act on their best judgment of a situation. However, it has been a common trend in transportation policies in most developed countries to apply technical decision support (DS) tools and procedures to parts of the process (Hayashi and Morisugi 2000). Costbenefit analyses of infrastructure projects rely on a limited set of normative socioeconomic indicators, such as Net Present Value (NPV), where the final decision might be based on the project with the highest NPV. Indicators also play important roles in other decision support applications such as multi-criteria analysis, environmental impact assessment (EIA), and performance budgeting. The methodological challenges involved in selecting indicator variables and aggregating them to the appropriate degree differ greatly among various settings. For example, a cost-benefit analysis provides a more unambiguous basis for a decision about which construction project to choose if the compared projects share many similar features (Quinet 2011). In any project, small or large, the scrutiny of the indicators and their credibility tends to increase significantly when actual decisions draw near.

Account—Who is responsible? Over the last decade or so, performance management regimes have been adopted by or imposed on many national and local transportation agencies around the world. These have placed indicators in a central position as tools to operationalize strategic goals, monitor performance, and report results. An example is the Swedish Road Administration that was tasked with implementing cost-effective safety measures on the road network that would reduce the number of road fatalities by at least 20% compared to 2006. The results of the program were later to be used in political negotiations or decisions on the allocation of future resources (Küchen and Nordman 2008). A key purpose of performance management with indicators is to allow "principals" to hold "agents" accountable for results; this applies to taxpayers with regard to elected officials as well as agency executives with regard to staff. The choice of indicators in a performance management regime can be perceived to have distorting effects on results if, for example, the performance indicators are not "SMART" or if the set of available indicators is unbalanced.

Learn—How can we do better? Arguably a key aim of any performance management effort or indicator application is to build capacity to learn and improve. Improvements occur when results and experience are used to implement changes in the practices, procedures, or structures of the organization in a way that exploits experiences and enhances the capacity to perform in accordance with principles, goals, and capacities in the future—i.e., it is a learning process. Another way to foster learning was experienced in the region of Gothenburg Sweden, where a network of civil servants was able to promote multi-sector and multilevel collaboration and enhance the capacity for sustainable urban development (Polk 2010). An element in the strategy was a consensus formed around a specific definition of sustainability with associated indicators. However, a complex multi-actor network can also pose a challenge for consensus building and shared learning. The use of indicators to support continuous improvement is a long-term endeavor that is in no way guaranteed to succeed. In some studies, this "learning" approach is contrasted with the "accountability" approach as an alternative way to seek improvement in performance.

Communicate—How do we tell others? Communication is an essential and cross-cutting component in working with indicators, as it applies to and reinforces any (and all) of the other applications. The selection of variables to measure can communicate a strong focus on certain areas or a dedication to certain issues. The reporting indicator values is therefore essential for descriptions, assessment, diagnostics, accountability, and learning. The audience for the communication of indicators can vary from technical experts, to decision makers, to the general public and the press. The forms and media used to report the indicators should vary accordingly. There are a multitude of potential ways to communicate indicators.

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