

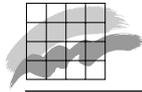
Ministry of Environment and Energy
National Environmental Research Institute

Indicators and performance measures for Transportation, Environment and Sustainability in North America

Report from a German Marshall Fund Fellowship 2000
individual study tour October 2000

Research Notes No. 148

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Henrik Gudmundsson
Department of Policy Analysis

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Abstract: A study trip to USA and Canada was undertaken in October 2000 with support from the German Marshall Fund. The purpose of the trip was to learn about performance planning and performance indicators in the area of transportation and environment. The report describe findings from the trip in the following areas: 1) How performance planning for transportation and environment is conducted in the US and Canada at federal, state and municipal level. 2) To what extent performance planning serve as an instrument to integrate environmental and sustainability goals in transportation policy. 3) Which specific indicators are used to measure the environmental sustainability of transportation systems and policies in the two North American countries.

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Summary

How do we know if our transportation systems are becoming more or less sustainable, and how do we know if our transportation policies are helping to achieve the goals they are meant to serve? Such questions have increased the demand for *indicators* to measure the performance of transportation systems and policies. The GMF Environmental Fellowship trip to the US and Canada reported here, had the aims to study:

- how performance planning requirements in the US and Canada are working in general, and with respect to transportation and environmental policy making
- to what extent performance planning serves as an instrument to integrate environmental and sustainability goals in transportation decision making
- which kind of indicators are used to measure the environmental performance and sustainability of transportation in the two North American countries.

The fellowship research trip was organized as a series of thirty one meetings with government agencies at federal, state/province and municipal levels; as well as with research organizations and independent experts, working with indicators and performance planning throughout the US and Canada.

The North American experiences generally suggest that indicators may be more useful and have more impact on policy if they are linked to performance based planning frameworks, where indicators are not just information, but targeted *signals*, that bureaucracies and decision makers are obliged to respond to in some way. By establishing *measurable targets* for *tangible outcomes*, providing *formalized links* to *decision making* situations, and securing follow-up by *independent auditing bodies*, indicator based planning may obtain some strength.

It also appears from the North American experience that formalized performance planning can support the *integration of environmental concern in transportation policies*, although the actual level of integration is dependent on a number of institutional and political factors external to performance planning. At this point in time the level of integration appears limited in the US (except in the case of air quality). It is more developed in Canada, where governmental performance planning mandate departmental strategies for sustainable development; an independent Commissioner of the Environment and Sustainable Development conducts rigorous reviews of the governments efforts, and extensive research in sustainability measures takes place. Still, even in Canada much work is left before a system of goals and indicators to fully measure the sustainability of transportation systems and policies could be defined, let alone implemented.

This study tour report is part of the current indicator research and development undertaken at the National Environmental Research Institute in Denmark. The experiences gained are compared with transport and environment indicators approaches in Europe. The results are input to the further development of Danish and European approaches, frameworks and indicators.

Dansk sammenfatning

Hvordan ved vi om vore transportsystemer bliver mere eller mindre bæredygtige, og hvordan ved vi om de transport policies der indføres hjælper til at opnå de mål de sigter imod? Sådanne spørgsmål har øget behovet for opstilling af indikatorer til at måle transportsystemernes – og transportpolitikkenes – præstationer eller deres 'performance'. Formålet med den studierejse til USA og Canada som afrapporteres her, var at studere:

- Hvordan lovgivningen om performance-planlægning i USA og Canada fungerer generelt og med særlig henblik på transport og miljøregulering
- I hvilket omfang performance-planlægning fungerer som instrument til at integrere miljø- og bæredygtighedsmål i transportbeslutninger
- Hvilke typer af indikatorer der benyttes til at måle den miljømæssige bæredygtighed af transport i de to nordamerikanske lande.

Studierejsen var organiseret som en række på 31 møder med regeringsinstanser på føderalt, delstatsligt og regionalt niveau, og med forskningsorganisationer og uafhængige eksperter, som arbejder med indikatorer og 'performans' planlægning forskellige steder i de to lande.

De Nordamerikanske erfaringer peger generelt på at indikatorer kan blive mere nyttige og have større effekt på beslutninger hvis de sammenkædes med et performance-baseret planlægningssystem, hvor indikatorer ikke bare er *informationer* men udgør *styringssignaler*, som administration og beslutningstagere er forpligtede til at pejle efter og reagere på. Det er gennem opstilling af kvantitative mål for faktiske resultater, gennem formaliseret kobling til beslutningssituationer og gennem granskning fra uafhængige organer som Rigsrevisionen (General Accounting/Auditor General), at indikatorbaseret planlægning kan opnå en vis styrke.

Det fremgår også af de Nordamerikanske erfaringer at formaliseret performance planlægning også kan understøtte sektorintegration af miljøhensyn i transportpolitikken, om end det faktiske niveau af integration i høj grad også afhænger af institutionelle og politiske faktorer udenfor selve performance planlægningen. Indtil videre synes sektorintegrationsgraden i USA at være begrænset (undtagen på luftkvalitetsområdet). Den er noget mere udviklet i Canada, hvor den statslige performance planlægning stiller krav om at ministerier skal udarbejde særlige bæredygtighedsstrategier; hvor en uafhængig kommissær for miljø og bæredygtig udvikling foretager kritisk revision af ministeriernes indsats, og hvor der foregår omfattende forskning i bæredygtighedsmål- og indikatorsystemer. Selv i Canada synes der dog at være lang vej igen førend et system af mål og indikatorer der kan måle bæredygtigheden af transportsystemer og politikker er udviklet og implementeret.

Den studierejse som afrapporteres her indgår i igangværende indikatorforskning og -udvikling ved Danmarks Miljøundersøgelser, finansieret af blandt andet Miljøstyrelsen og Transportrådet. Resultaterne skal sammenlignes med transport- og miljøindikatorer i Danmark og Europa, og skal også give input til videreudvikling af eksisterende miljørapporteringssystemer.

1 Performance indicators – what, why and how?

Transportation systems provide access, mobility and other benefits, while at the same time putting pressures on the human and natural environment. Making progress towards more sustainable transportation systems and mobility patterns, while at the same time increasing the economic prosperity and quality of life, are policy aims shared by countries on both sides of the Atlantic and elsewhere in the world.

But how do we know if our transportation systems are in fact becoming more or less sustainable, and how do we know if the transportation policies are helping to achieve the goals they are meant to serve? Such questions have increased the demand for *indicators* to measure the performance of transportation systems and policies.

Policy performance reporting mechanisms have recently been introduced in both North America and Europe, including also reporting for transportation and environmental issues. In Europe there is much focus on sustainability and indicators to measure the integration of environmental concerns into other policies. In the US planning indicators are developed at all levels of government and extensive, formalized government performance planning programs, with close links to federal decision making have been established. In Canada similar government performance procedures also include sustainable development reporting, thus combining elements from both US and European frameworks. It seems relevant to compare the different approaches and frameworks in terms of their usefulness as mechanisms to report on environmental performance and sustainability of transportation policies.

The main purpose of the German Marshall Fund (GMF) Environmental Fellowship research trip that is reported here, was to learn about performance measurement and planning for transportation and environment in US and Canada. I especially wanted to look into recently implemented performance legislation - namely the 1993 Government Performance and Results Act (GPRA) in the US, and the Amendments to the Auditor General Act in Canada, adopted in 1995 - and how this legislation is integrating the policy areas of transportation, environment and sustainability.

The main aims of the fellowship trip have thus been to study:

- how performance planning requirements in the US and Canada are working in general, and with respect to transportation and environmental policy making
- to what extent performance planning can and does serve as an instrument to integrate environmental and sustainability goals in transportation decision making

- which kind of more specific indicators are developed to measure the environmental performance and sustainability of transportation systems and policies in the two North American countries.

The trip was part of current indicator research and development undertaken at the National Environmental Research Institute in Denmark. The experiences gained on the trip to North America are to be compared with European transport and environment indicator approaches at national and EU level, and the results are to be used for inspiration in the further development of Danish and European approaches, frameworks and indicators.

2 Methodology and report structure

The fellowship research trip was organized as a series of more than thirty meetings with government institutions, research organizations and independent experts, working with indicators and performance planning throughout the US and Canada.

2.1 Research Issues

The meetings can be grouped according to two overall *research issues*:

The first research issue concerned understanding the policy performance planning regulation and procedures in the two countries.

To that effect I first met with officers responsible for indicators and performance measurement in a number of *federal departments with regulatory mandates* within transportation and/or environment, like the US DOT and US EPA, in Washington DC, and Transport Canada and Environment Canada in Ottawa. I also visited *performance planning coordinating bodies* in federal government (Office of Management and Budget in the US and the Treasury Board of Canada), as well as *independent auditing offices* with major responsibilities in the area (like the US General Accounting Office and the Canadian Auditor Generals Office).

To study how performance planning was applied at *state/provincial* and *municipal* levels of transport planning, I visited public agencies in California, US and in British Columbia, Canada, as well as metropolitan transport agencies in the San Francisco Bay Area, Toronto and Vancouver, BC. I also met with *independent political scientists and consultants* with extensive knowledge of performance management.

The second research issue concerned how sustainability issues are penetrating into transportation related performance planning frameworks.

To that effect I first looked closer into the actual goals and indicators used by the public agencies (as mentioned above). I also consulted indicators and frameworks proposed by independent experts and consultants in the area. In addition to the above agencies, the visits therefore also included *transportation indicator experts, sustainability indicator experts and sustainable transportation experts and researchers* in various public and private institutions throughout the two countries.

2.2 Research questions

A list of more operational *research questions* was pursued. The questions were not asked directly, but used to loosely guide the meetings and interpret the discussions. The main questions were:

- how are *environmental* issues reflected in *transportation* performance/indicator frameworks?

- how are *transportation* issues reflected in *environmental* performance/indicator frameworks?
- how is the concept of *sustainability* conceived, and to what extent does *sustainability indicators* impinge on performance planning?
- to what extent have *environmental policy targets* been defined as part of performance planning frameworks?
- have the necessary *data* to report on performance been identified?
- how are performance frameworks linked to *policy and decision making*, and what kind of *feed-backs* or *sanctions* are attached to those links?
- how are *inter-agency issues* (like 'sustainable transportation') dealt with in single-agency based performance planning?

It has not been possible to actually answer all of those questions in the current report from the trip. The questions however indicate how the research issues have been explored.

2.3 Report structure and qualifications

The remaining part of the report has the following sections

- Section 3 reports on selected findings at the US federal level
- Section 4 reports on the same for the Canadian federal level
- Section 5 reports findings at state/province and municipal level planning
- Section 6 provide additional viewpoints from visited experts
- Section 7 compares some aspects of transportation and environment indicator frameworks in the US/Canada with EU
- Section 8 has some concluding remarks
- Section 9 mention plans for dissemination of the results of the trips
- Section 10 include Acknowledgments

Appendix A are selected *references*. Appendix B has some useful *Internet links*.

Appendix C shows a *map of visited cities*; Appendix D is a *full list* of institutions visited.

The report is based on the meeting notes and tape recordings from thirty-one meetings plus written or electronic material kindly provided by the various organizations, or accessed over the Internet. Detailed notes from all the meetings are found in a background report (not published).

A few additional remarks are in order.

The trip was made while the Clinton administration was still in power in the US. The performance planning frameworks are not af-

ected by the change in administration, as the basic legislation is bipartisan (supported by both Democrats and Republicans). The specific goals and targets pursued by various government agencies may nevertheless undergo changes under the new administration. A general election was also held in Canada about the same time. The Chretien government was reinstated, but the process did delay some important policies. Most notably the second round of departmental Sustainable Development Strategies was not completed until early, 2001, meaning that only drafts have been cited in this report.

It should be noted that the report only focuses on selected examples and key preliminary findings from the trip. Additional information obtained during the trip and later will be incorporated in further research. The report reflects *work in progress*.

It should also be noted that the report reflects *my interpretations* of what I have heard and read. No parts of the report should be ascribed to any particular person interviewed or to any organization visited.

I remain solely responsible for all possible errors and misinterpretations.

3 The US federal level of performance planning

This section will first briefly introduce performance planning at the US federal level in general. Then follows a presentation of indicator frameworks used by the US Department of Transportation (DOT), the US environmental Protection Agency (EPA) and the US Interagency Working Group on Sustainable Development Indicators. Finally some main points are discussed, emphasizing also some (missing) links between the different frameworks.

3.1 A general framework for performance planning

All major institutions of the US federal administration are working with performance planning indicators. Several frameworks and approaches are in use, and a large amount of indicators are at play.

One of the most extensive frameworks is the performance planning process defined by the *Government Performance and Results Act (GPRA)* adopted as a US law in 1993, with bi-partisan support. This framework will be the main focus in this section, although some other frameworks will also be addressed.

The GPRA a.k.a. the *Results Act* requires that major Government departments and agencies define their goals, establish measurable indicators for those goals, and annually measure and report on performance in relation to the goals and indicators. 24 major departments and agencies – the so-called Chief Financial Officer (CFO) Act Agencies - fall under the GPRA planning requirements.

More specifically the GPRA requires agencies to provide 3 types of documents at regular intervals (OMB 2000):

- 1) 5 year strategic plans defining the vision, mission and goals of the agency (to be revised every third year)
- 2) An annual performance plan, setting up expected quantitative results planned for each strategic goal that year
- 3) An annual performance report, evaluating to what extent the performance goals were met

An important element in the performance planning process is the strong focus on results or *outcomes*.

Outcomes refer to the *actual end results* of an agency's effort in the 'real world', as opposed to *inputs* (resources used) or *outputs* (like the number of decisions made or regulations issued from the agency). Measures of outcomes could for instance be in terms of improved environmental quality, the level of congestion on the roads, or amounts of energy saved.

According to the GPRA, what counts are the actual results of government policies. The input to and output from agencies are necessary means in producing outcomes, but not the real goals themselves. The agencies are therefore strongly encouraged to define goals and performance measures in terms of *desired outcomes*, and not only input and output.

Some key terminology is shown in the box below.

Key Definitions quoted from Section 4 of the GPRA:

- ‘outcome measure’ means an assessment of the results of a program activity compared to its intended purpose;
- ‘output measure’ means the tabulation, calculation, or recording of activity or effort and can be expressed in a quantitative or qualitative manner;
- ‘performance goal’ means a target level of performance expressed as a tangible, measurable objective, against which actual achievement can be compared, including a goal expressed as a quantitative standard, value, or rate;
- ‘performance indicator’ means a particular value or characteristic used to measure output or outcome;
- ‘program activity’ means a specific activity or project as listed in the program and financing schedules of the annual budget of the United States Government...

Another very important feature of the GPRA is that annual performance plans are linked to the administration *budget*.

First of all the annual performance goals must be linked to the program activities that are described in the agencies annual budget requests that are sent to the US Congress. The budget requests have to be *justified* in terms of the stated performance goals and targets of the agency or department. This close budget link enhances the importance to the performance planning efforts and the chosen goals and indicators.

The Office of Management and Budget (OMB) under the Executive Office of the President provides guidance to all the departments and agencies in drawing up their strategic plans and annual performance plans and reports. The OMB also closely coordinates the agencies’ annual performance planning and budgeting process, before the requests are sent to Congress. This further strengthens the link between government budgeting and performance planning.

Finally, after the end of a budget year, Departments send their performance reports to Congress. Congress may use the reports and compare them with targets in the performance plans, whether the goals were met, etc. Congress committees may for instance use the performance information when negotiating over which agencies or programs should be cut, and which ones should have additional funding in next year’s budget.

The US General Accounting Office (GAO) has an important role in performance planning. To increase the reliability of performance planning, GAO makes extensive, independent reviews of the departmental documents, and reports its findings on strengths and

weaknesses to Congress. The GAO uses the following of criteria to evaluate departmental performance plans (GAO 1998):

- 1) *Clarity*: To what extent does the agency's performance plan provide a clear picture of intended performance across the agency?
- 2) *Consistency/Specificity*: How well does the performance plan discuss the strategies and resources the agency will use to achieve its performance goals?
- 3) *Credibility*: To what extent does the agency's performance plan provide confidence that its performance information will be credible?

In this way a very extensive system to support, improve and control government performance planning has been established. Apart from the legislative requirements of the GPRA itself, there are other laws supporting this planning framework. The formalized procedures are also supported by an extensive network of government officials across agencies and branches of government, engaged in the exchange of ideas, viewpoints and comments to draft documents.

The US DOT and US EPA are among the CFO agencies required to plan according to the GPRA, and they have both produced all three types of planning documents required. Both have also had their performance plans reviewed extensively several times by the GAO. In the following some features of performance planning in the two agencies are described.

3.2 DOT's performance planning

DOT has been through a full round of GPRA planning and beyond.

The first strategic plan came out in 1997, and the second one was completed in 2000. Performance plans for 1999, 2000 and 2001 have been made, and the Performance report for fiscal 1999 has been completed. The 1999 Report and the 2001 Plan have been combined into one document to enable an easier linkage between performance planning and performance reporting.

DOT's strategic goals

DOT has defined 5 strategic goal areas. They have not been changes from the 1997 to revised 2000 Strategic Plan. The 5 goal areas cover Safety; Mobility; Economic Growth and Trade; Human and Natural Environment; and National Security.

For each goal a set of *strategic outcome goals* and a number of more specific *performance measures* are defined for use in the annual performance planning. There are currently 21 performance measures for Safety, 18 for Mobility, 7 for Economic growth, 11 for Human and Natural Environment, and 9 for National Security, 66 in all. (DOT 2000a).

To exemplify this the outcome goals and performance measures for *the environment* will be shown here.

The four *strategic outcome goals* for the environment are qualitative:

- Reduce the amount of transportation-related pollutants and greenhouse gases released
- Reduce the adverse effects of siting, construction and operation of transportation facilities
- Improve the sustainability and liveability of communities through investments in transportation facilities.
- Improve the natural environment and communities affected by DOT-owned facilities and equipment

The environmental *performance measures* are shown in the box below.

DOT's Environmental Performance Measures and targets	1999	1999 Target	Target met?
Emissions Tons (in millions) of mobile source emissions from on-road motor vehicles	N/A	64,9	(Yes)
Greenhouse Gas Emissions Metric Tons (in millions) of carbon equivalent emissions from transportation sources	N/A	N/A	N/A
Energy Transportation-related petroleum consumption (in quadrillion BTUs) per trillion dollars of Real Gross Domestic Product	N/A	N/A (2000=3.13)	N/A
Wetland protection and recovery Acres of wetlands replaced for every acre affected by Federal-aid Highway projects	2,3	1,5	Yes
Livable communities – transit service Percent urban population living within 1 mile of a transit stop with service of 15 minutes or less	11,24	11,56	No
Airport Noise Exposure Number of people (in thousands) in US exposed to significant aircraft Noise levels	680	680	Yes
Maritime Oil spills Gallons of oil spilled per Million Gallon Shipped by maritime sources	2,38	5,04	Yes
Fisheries Protection Compliance rate with Federal fisheries regulations	98	95	Yes
Toxic material 1) Tons of hazardous liquid materials spilled per million Ton miles shipped... 2) Gallons of hazardous liquid materials spilled (non-pipeline) per serious transportation incident...	0,0223 2743	0,0171 2046	No No
Hazardous Waste Percent DOT facilities categorized as No Further Remedial Action Planned under Superfund Act	90	80	Yes
Environmental justice Environmental justice cases that remain unresolved over one year	13	12	No

Targets and performance results for environmental performance measures in DOT's 1999 Performance Report/ 2001 Performance Plan. /US DOT 2000a N/A = Not available. No target defined for Greenhouse Gasses

For each measure one or two specific indicators have been set up, with *quantitative targets* (re)defined in the annual performance plans. Greenhouse gasses is an exception, where definition of targets have been obstructed by Congress.

As can be seen, the performance measures cover a broad range of environmental impacts, as well as several transportation modes. Several of the selected impacts refer to statutory mandates that the DOT (and/or other agencies) are required to address by (other) Laws or Presidential Orders.

Consultation, cooperation and evaluation

There has been a process of consulting and stakeholder outreach in developing the strategic plans of DOT in both the first and the second Round of strategic planning. This involvement has also involved other agencies like the US Environmental Protection Agency for the goals related to human and natural environment.

The same level of involvement is not taking place for the annual performance plans where the quantitative annual targets are defined. Annual target setting is an internal procedure in the Executive Branch, because of the close link to the budget requests. For the same reason the Office of Management and Budget is strongly involved in that part of the process.

There is ongoing communication between DOT, OMB and GAO about technical issues in DOT's performance planning to improve reporting and insure mutual understanding of problems and challenges in the process.

'DOT has generally been praised for their strategic planning and performance reporting compared with some other departments. While its first Strategic Plan was criticized by the GAO for some unclear goals and missing links between goals, strategies and resources, the later performance reports have received better reviews. GAO has given DOT's 2000 report the highest grade in 'Clarity of goals' and 'Specificity of strategy', and a higher middle grade in 'Information Credibility'.

However, according to the GAO the DOT still does not consistently link the strategic outcomes to the performance goals and does not consistently explain coordination strategies with outside organizations (GAO 1999).

Data quality

The GAO has also pointed out weaknesses in the data and methodologies underlying the performance reports. Examples include inconsistent methods to measure airport security performance and incompatible methods to assess the quality of road surfaces. Another recognized example in the environmental field is insufficient data to measure the goal of compensating wetland losses.

As one response to data quality issues, DOT's Bureau of Transportation Statistics has consulted with each operating administration in DOT on the data used for the performance measures used in the DOT 2001 Performance Plan and 1999 Report. One result of this work is the "Compendium of Source and Accuracy Statements". Each of the DOT's performance measures has been linked to a statement for the data used to compute the measure (a few statements have yet to be completed at this point).

Links to decisions

There are direct links between performance *plans* and decisions in terms of budget requests. DOT's latest performance plan includes budget sheets showing the actual and requested budgets for programs in a way that can be directly linked to each of the 5 strategic

goals. In this way budgeting is structured along the strategic planning goals.

The program budget requests are not linked to individual *performance measures*, however, so it is not directly possible to assess the goal achievement contribution from each budget element. As mentioned above the GAO has criticized DOT for not making links more clear, but it is considered a general (analytical) problem to link specific programs with actual outcomes.

There are apparently weaker links between performance *results* and decisions. Looking at the actual result reported in DOT's 1999 performance report shows that most of the performance goals for the 5 strategic goals were in fact met during that year. However, for the strategic goal of *environment* only 5 performance goals have been met; 4 have not, and for one (annual air emissions) the data are not yet available, but the 1999 goals was already met in 1998. Success or failure to accomplish the various goals has had no immediate or directly definable impact on DOT's budgets.

The GPRA does not specify any corrective action in case of poor performance, and the GAO does not have formal sanctions stronger than making a 'recommendation', which is not an instrument that has been used in this area. The actual use of the performance reporting information is a political matter for the Executive Branch (including the OMB) and Congress.

It is not clear how the Executive Branch (EB) makes use of the performance result information. According to some sources it is for instance difficult for the EB and DOT to use the performance planning process itself to control transportation policy making as this is strongly influenced by other more specific legislation and other decisions in Congress. Congress appears until now to have made limited use of performance results in their transportation related decision making, according to the GAO. This is partly due to the fact that GPRA is still in an early phase of implementation. It may also be due to some disconnect in Congress between performance reviewing committees and decision making (e.g. appropriations) committees.

Some other important indicator activities at DOT

1) The Bureau of Transportation Statistics has recently begun to issue monthly Transportation Indicators report (DOT 2000b). The report covers more than 70 different trends including 5 sections with indicators relating to the 5 strategic goals of DOT's strategic Plan. The indicators does not exactly match the performance measures in s performance reports in all cases, partly because of data limitations and partly because they are system indicators and not policy performance indicators. At this point 4 to 5 of the 10 environmental performance measures of the DOT performance plans are covered in the Monthly report. The Transportation Indicators initiative serves mostly a public information purpose and is not initiated within the performance planning process.

2) The Federal Highway Administration and the Federal Transit Administration provide the so-called Conditions and Performance bi-

annual report. This is a very large and comprehensive report on the state of the highway and transit systems in the US. The report also measures the systems outputs in terms of traffic, congestion, transit ridership etc. This report is closely linked to the budget process, being explicitly requested by Congress committees dealing with transportation appropriations. The report provides detailed analysis of the budget needs to maintain or enhance service levels and conditions in the highway and the transit systems respectively. It is more narrow and detailed than the GPRA planning approach, and seemingly closer linked to decision making.

The two examples show that there are areas outside the GPRA process where DOT uses indicators. The latter example could suggest that some performance indicators in other legislation might even take precedence over GPRA planning information.

3.3 US EPA: Strategic goals and Transportation indicators

The US Environmental Protection Agency is also one of the CFO agencies that are obliged by the GPRA performance planning requirements to set up strategic and performance plans. The EPA has worked with environmental indicators and frameworks for many years. This work provides substantial inputs to the GPRA planning process.

In its year 2000 Strategic Plan EPA has defined 10 overall environmental goals as shown in the box below.

Under each strategic goal are 3-4 Objectives (34 in all). Objectives are quantitative and supposed to be measurable. Below the Objectives are again quantitative Sub-objectives, (101 in all). In the Annual Performance Plan the strategic sub-objectives are broken further down into Annual Performance Goals (APG's) (270), which are to be measured with a set of 689 (!) Performance Measures (PM's).

Ten Strategic goals in EPA's Strategic Plan 2000 (draft)
<ol style="list-style-type: none"> 1. Clean Air 2. Clean and safe water 3. Safe food 4. Preventing pollution and reducing risk in communities, homes, workplaces and ecosystems: 5. Better waste management, restoration of contaminated waste sites, and emergency environmental protection. 6. Reduction of global and cross border risks 7. Quality of Environmental Information [revised wording] 8. Sound science, improved understanding, innovation to address environmental problems 9. A credible deterrent to pollution/enforcement of the Law 10. Effective management

The very broad range of goals and indicators reflects the diversity of the natural environment and the complexity of environmental problems and policies. The strategic goals and objectives etc. are mostly defined in terms of environmental media or endpoints, reflecting

EPA's regulatory mandates in those areas. A *sector based* approach (e.g. with specific goals and measures for transportation impacts) is not used in EPA's strategic or performance planning.

Indicator typology and data requirements

To address the GPRA's call for *outcome* oriented indicators the EPA has established an elaborate hierarchy of indicators with six levels:

6. Ultimate impacts (on Health, Ecology and Welfare)
5. Exposure or burden uptake
4. Ambient conditions
3. Discharges/emissions
2. Actions/responses by regulated parties
1. EPA or other Governments regulation activities

The highest level (6) represent the most genuinely outcome-oriented endpoints, whereas the lowest level is pure 'outputs'.

Each office in the EPA organization involved in performance planning has been urged to find measures and indicators for their activities at the higher level (more outcome-oriented measures). However, recent analysis done by EPA's CFO has revealed that the majority of the performance measures used are still based on the lower end data (output rather than outcome oriented). The best 'outcome score' in EPA's most recent Performance Plan is received for indicators on the *air quality* goal. This is mostly due to air quality monitoring mandated by the Clean Air Act, which 'automatically' produces outcome information that is useful for performance planning. The same is not (as) true for other media (like for instance water).

The GAO has persistently criticized the limited use of outcome indicators by EPA.

According to the EPA this may require more extensive environmental monitoring systems and efforts than the ones currently available. Without legislative mandates and accompanying funding for monitoring it is difficult to establish a strongly outcome oriented planning. The data required - and the knowledge of causal chains from policy to outcome - are in many cases simply not available at this point.

This can also be seen as a barrier for adopting Sustainability oriented approach to environmental planning.

Transportation indicators at the EPA

Outside the GPRA planning process the EPA has done extensive work to define specific indicators for transportation and environment. This work is reported in "Indicators of the Environmental Impacts of Transportation" from 1996 and the 1999 updated Second Edition (US EPA 1999). The reports attempt to provide a comprehensive overview of the full range of environmental impacts from transportation systems. It also provides indicators with actual data for a broad range of impacts.

The indicators included transportation impacts in the following areas:

- impacts on air, water, climate, natural habitats, and other endpoints (9 impacts)
- impacts from all transportation system modes (road, rail, air, sea)
- impacts from the major system elements (vehicles, infrastructure, partly fuels)
- impacts from several stages of the lifecycle of each element (including production, construction, use/maintenance and disposal)

In total 166 indicators are reported and several other issues described in more qualitative terms. The indicators include both indicators of activities, outputs, and outcomes. Ideally outcome indicators are needed. In practice most of the indicators are output oriented (in terms of emissions, extraction, intrusion, etc.)

The box below illustrate the broad range of indicators included. The box only has selected examples from the report. The selection emphasises some of the more unusual types of indicators, while more conventional ones are omitted. The indicators are grouped under the nine types of environmental impact considered in the report.

The transportation indicators project have mostly been an exercise to explore data options and knowledge gaps and not a part of strategic planning. The transportation indicator set is therefore not as a whole fed into the GPRA performance planning process at EPA (or DOT or other agencies). The EPA has not at this point established procedures to track the entire transportation indicator sets continuously. Several of the data sources are however tracked and used for various reporting and planning purposes.

Examples of Transportation and environment indicators (selected from US EPA 1999)

3.3.1.1 Criteria air pollutants

- Change in Criteria Pollutant Emissions compared to Vehicle Travel, 1940-1997
- Criteria Pollutant Emissions from Transportation Vehicle and Equipment Manufacturing (car, rail, aircraft, etc.)
- Criteria Pollutant Emissions from Airport Service Vehicles
- VOC Emissions from Solvent Utilization in Surface Coating for Autos & Light Trucks
- VOC Emissions from Service Stations, 1940-1997

3.3.1.2 Toxic pollutants

- Mobile Source Contribution to Hazardous Air Pollution Inventories (HAPs = causing serious human health effects or ecosystem damage)
- Toxic Chemicals Released from Ship- and Boat Building & Repairing Facilities,

3.3.1.3 Greenhouse gases

- Share of CO₂ Emissions from Transportation
- Full Fuel Cycle CO₂ -equivalent Emissions for Light-duty Motor Vehicles (grams per mile)

3.3.1.4 Chlorofluorocarbons and stratospheric ozone depletion

- Estimated U.S. Emissions of CFC-12 and HFC-134a (all sources not only transportation)

3.3.1.5 Habitat and land use

- Land Area Occupied by Roadways
- Disposal/Use of Material Dredged by U.S. Army Corps of Engineers
- Wetland Losses and Creation Associated with the Federal Aid Highway Program
- Number of Animal Collisions with Motor Vehicles reported

3.3.1.6 Water quality

- Highway Salt Sales, 1970-1997
- Number of Fuel Spills and Total Volume of Fuel Discharged Annually,
- Fuel Tank Leakage: Corrective Action Measures Reports for the U.S.

3.3.1.7 Hazardous materials incidents

- Number of Hazardous Materials Incidents

3.3.1.8 Noise

- Percent of U.S. Population Exposed to Different Levels of Transportation Noise
- Length of Noise Barriers Constructed (miles) and Cost
- Population Exposed to 65 DNL at 30 Busiest Airports (various years)

3.3.1.9 Solid waste

- Number of Motor Vehicles Scrapped Annually
- Disposition of Scrap Tires
- Lead Acid Batteries in Municipal Solid Waste Streams
- Estimated Annual Garbage Generation by U.S. Maritime Sectors

3.4 The Interagency Working Group on Sustainable Development Indicators

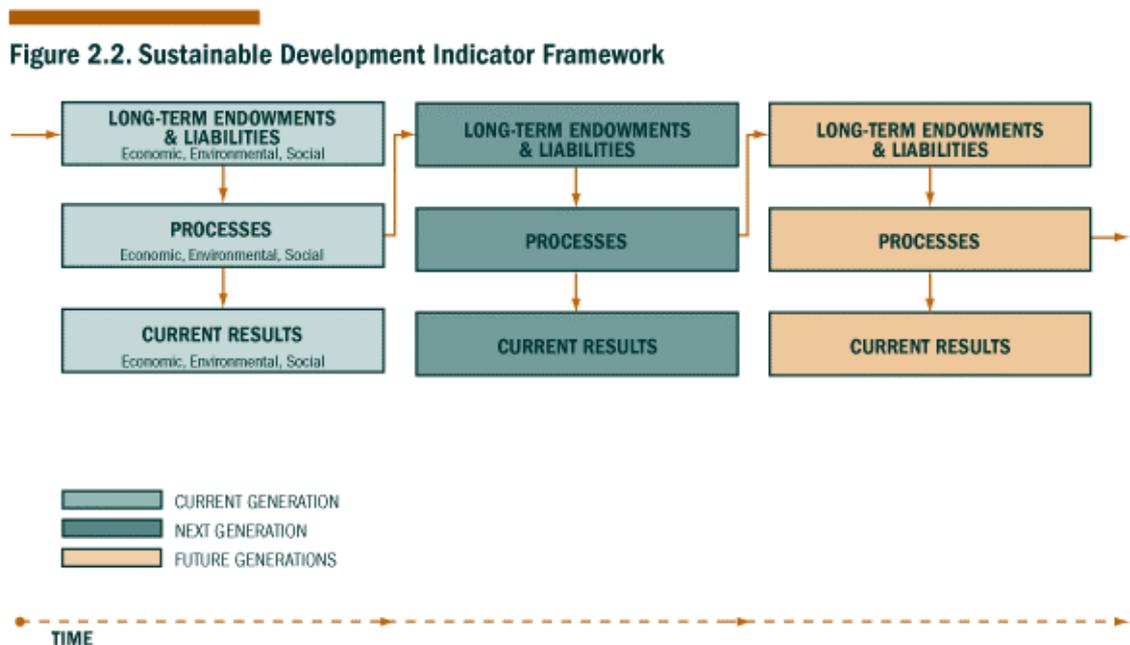
The Interagency Working Group (IAWG) has members from a number of federal agencies. The group has been working informally with indicators of sustainable development since 1994. In 1996 the group was officially assigned to follow up a recommendation from the Presidents Council of Sustainable Development (PCSD) to establish national and indicators of sustainable development. After the PCSD is terminated the group has been hosted under the Council of Environmental Quality.

In December 1998 the group issued its first draft report “Sustainable Development in the United States: An Experimental Set of Indicators. A Progress Report Prepared by the U.S. Interagency Working Group on Sustainable Development Indicators” (IAWG ISD 1998).

Major elements in the report are:

- A proposed framework for measuring progress towards sustainable development
- A set of 40 specific indicators for the US within that framework
- Time series data and graphs for each indicator

The conceptual framework has 2 dimensions (as shown in the figure below): The one dimension divide indicators into *economic, environmental* and *social* issues. The other dimension divide indicators into the categories of *endowments, processes* and *current results*.



Endowments can be seen as representing inter-generational concerns. *Current results* are relevant for the current generation. *Processes* affect both and the linkages among them. The framework is thus closely

related to the concept of sustainable development as proposed by the Brundtland report and other international bodies.

Since the draft report was issued in 1998 it has been out for comments from a wide range of stakeholders inside and outside the US government. A revised and final version of the indicator set is planned for the end of year 2000. If and how the indicator set will then be used further on will be up to the new administration.

Assessment of trends

An assessment of the trends for each indicator is included in the report. For 17 indicators the trends are deemed as favorable for Sustainable Development, for 13 indicators the opposite is the case, and for 10 indicators no clear interpretations emerge. The report does not attempt an aggregate assessment of whether development in the US has been sustainable on the whole.

Transportation

The original indicator set has no indicators on transportation. This has been criticized from various sides, because of the importance of transportation for the economy as well as the environment. A transportation indicator (or rather a set of three indicators) will therefore be included in the revised, final report. The new transportation indicator includes vehicle ownership, fuel consumption and travel per capita. The transportation indicator is placed in the framework under 'Economic indicators' and under 'Current Results'.

There have been some discussions about how to deal with transportation in a SD indicator framework. The links between transportation and sustainability are not obvious or direct. There is limited consensus in the US on the interpretation of growing transport indicators: Is it good or bad? Some would see it as a sign of increasing opportunities, while others might see it as an indicator of environmental damage. Transportation is not a final demand but a derived one, and therefore transportation activities may not actually be defined as a "Current Result".

Impact on governmental performance planning

The work of the SDI IAWG is not final before the revised report is sent out towards the end of 2000. There has been limited use of the proposed framework by other governmental bodies yet, although a few agencies already use parts of the frameworks, and many of the indicator data are commonly used for other purposes.

The potential linkage between the SDI reporting framework and agency based strategic planning and performance measurement has not been explored very much. Both DOT and EPA are involved in the IAWG, but the current involvement does not include the offices responsible for performance planning in those agencies. In general the SDI indicator framework has not penetrated deeply into US Government strategic or performance planning at this point.

3.5 Summary and discussion of the US federal level

The GPRA process represents an impressive piece of coordinated performance planning at the federal level.

Within this framework departments of US Government define policy goals and performance indicators for a large number of areas. Extensive procedures are in place to monitor and report the results, and others serve to enhance the reliability of the information. Performance results are fed into the process of budget request and negotiations.

The actual use of the result information is not formalized, and may have been limited up to this point. However, there is some evidence of increasing use of performance information in Congress (Knezo & McMurty 1998). Many believe that performance information will gradually become more important for decision making.

Transportation and environment issues have been combined in performance measurement and planning, although not as any requirement of the GPRA itself. In this sense it can be a vehicle for policy integration, although not a dedicated one.

The GPRA process is structured along existing departmental and agency lines, with less emphasis on interagency, crosscutting and government wide policy issues. Crosscutting performance goals for the whole administration have not been defined. Transportation and environment has not at this point been singled out as a particular area for interagency coordination in the US Government GPRA planning process.

In the following some of the main points are summarized for the particular area of transport and environment, emphasizing also some possible challenges for a more integrated approach.

It appears that DOT is leading the efforts to integrate transportation and environment issues in performance planning. Protecting the human and natural environment has been defined as one of DOT's 5 strategic goals, and specific targets to reduce a broad range of environmental impacts have been set up by DOT and its subsidiary agencies. Through the GPRA reporting requirements lack of progress in environmental performance in some areas have been revealed, prompting a need for explanations and policy responses. Transportation policy makers (and in particular the DOT) can thereby be held accountable for some level of environmental performance.

There appears to be some limitations to the level of integration at this point, however. DOT's environmental performance measures are mostly linked to a limited number of regulatory mandates. The performance reporting does not seem to convey a comprehensive picture of the environmental impacts of the US transportation system as whole (compared for instance with EPA's work with indicators of transportation's impact on the environment). Moreover, it appears if DOT's environmental programs refer to the particular strategic envi-

ronmental goal, and not DOT's four other strategic goals, where programs could also affect environmental outcomes. In that respect, integration of environmental concerns in broader transportation policies still seems limited.

The EPA has specific mandates in air quality policies, providing important environmental information for transportation performance as well. However the EPA does not seem to address transportation as a strategic planning issue as such. EPA's strategic performance goals are mostly related to environmental media and its own legislative mandates. Outside formalized GPRA planning the EPA has done extensive work to document a very wide range of environmental impacts of transportation, and have proposed indicators for several of those. The broader range of transportation indicators is not at this point monitored regularly as part of performance planning.

The concept of 'sustainability' appears to have made only limited impression on transportation related performance planning frameworks at this point (of course depending on how sustainability is defined). The strategic plans of DOT and EPA does not adopt a 'sustainable development' indicators reporting framework, like the one defined by the Interagency Working Group or other similar concepts.

Reporting performance in terms of 'sustainability' would typically require measurement of actual outcomes at a system level (economic, environmental, etc.), and linking those to policy programs and outputs. The GPRA process does encourage a strong focus on outcomes and has led agencies to extensively review the usefulness of their data sources to report on outcomes. This review process has revealed substantial difficulties in actually moving from output to outcome indicator reporting, not only due to particular data gaps but also to fundamental problems in the analytical understanding of linkages between regulatory efforts and actual conditions in the regulated systems. In this way the GPRA process also helps to reveal that planning for sustainability could be a demanding task.

The GPRA process links performance goals to decision making in terms of budget requests and subsequent political negotiations. This provides further opportunities to integrate environmental performance with transportation decision making. Those opportunities appear to be restrained by several factors. First there are no direct legal requirements to link agency performance results to budget allocations. Secondly, widespread inaccuracies or inconsistencies in performance information apparently make it risky to use it in a 'strong' or 'punitive' fashion. Thirdly there seems to be disconnects in the political process, where GPRA transportation performance information at this point appears to receive limited attention from the most relevant policy committees in the US Congress (e.g. budget appropriations for transportation projects).

The chance of further environmental integration within the GPRA framework therefore appears to depend on a number of factors. Among the major factors could be the governments adoption of further mandated environmental policy goals (like e.g. ratification of the Kyoto target), the continuous provision of relevant and reliable data,

the structure of political negotiations over funding in Congress, the strength of external pressures, and the level of (voluntary or forced) interagency coordination.

All in all there appears to be some opportunities as well as barriers for further integration of transportation and environment in performance measurement and planning. To what extent the barriers can be overcome within the existing performance planning framework is not immediately evident, but could be explored in further research.

4 Federal performance and sustainable development planning in Canada

Like in the US section above this section will first briefly introduce government performance planning in Canada, with special emphasis on the unique Sustainable Development reporting and auditing procedures. The next section will go into sustainable development strategic planning in Transport Canada, the federal Canadian transportation department; this is followed by brief sections on related indicators work at two other federal agencies (Environment Canada and Natural Resources Canada). To illustrate a interesting experimental approach, I describe the Sustainable Transportation Performance Indicators project undertaken by consultants for several Canadian federal departments. Finally some main points are summarized and discussed.

4.1 The general frameworks - performance and sustainability

Procedures for comprehensive government performance reporting linked to the budget process have also been established at the federal level in Canada, even though the procedures are not mandated in a Law in the same way as the GPRA in the US.

All federal departments are required to table Estimates (budget proposals) each year (That *is* a legal requirement). In the estimates each department must provide performance information, including a report on Plans and Priorities (RPP) for the next three years. In a separate document tabled half a year before (in the fall), the departments report on their performance in the previous fiscal year, the so-called Departmental Performance Report (DPR). The primary objective of the DPR is to convey to Parliament and Canadians the benefit citizens receive from the resources and authorities provided to departments. The performance assessment refers to commitments made in the DPR's and other government policies.

The split of performance planning and reporting into two reports (RPP's and DPR's) is a recently introduced procedure agreed in Parliament, and not defined by Law. The aim of the split is to give Parliament better opportunities to actually make use of the performance information. Before the split plans and results were reported together, which gave parliamentarians very few options to respond to the performance information, other than in fact voting no to the entire budget meaning an overturn of the government. In Canada, the entire federal budget is voted on en bloc, as opposed to the US where Congress Committees have major influence over federal spending, and the budget voting is not en bloc. The impact on Parliament's usage of performance information from the altered procedure has yet to be seen.

The coordinating body for performance planning at the federal level is the Treasury Board. The Treasury Board a committee of cabinet, responsible for managing the governments finances, personnel and administration. The Treasury Board Secretariat (TBS) assists the Board.

The Canadian Counterpart to the US GAO is the Auditor General's Office (AG). The AG conduct independent audits and examinations that aim to provide objective information, advice and assurance to Parliament and promote government accountability. The AG reviews the departments Performance reports including the DPR's, and also report on the general state of performance reporting on a government-wide basis.

Sustainable Development Strategies and Reporting

In 1995 the Canadian Government changed the Auditor General Act, requiring federal departments to prepare sustainable development strategies every 3rd year, with the first strategies due in 1997, and the second round in December 2000 (postponed to early 2001 due to elections). 24 Departments have the requirement to set up SD strategies. The departments are also required to report on their progress in implementing the SD strategies annually, as part of the ordinary DPR, as described above. There is no similar requirement like this in the US.

According to general guidelines from the governments Treasury Board the purpose of reporting on the Sustainable Development Strategies (SDS) as part of the DPR is to apprise parliamentarians of progress made against commitments since the SD Strategy was submitted. Departments should report the following:

- key goals, objectives, long-term targets;
- performance indicators or performance results measurement strategy;
- targets for the reporting period;
- progress to date; and
- corrective action, if any.

The amended Auditor General Act also established a new institution, The Commissioner of the Environment and Sustainable Development. The Commissioner's office is a part of the AG's office, but does its own reporting to Parliament. The Commissioner has the role of overseeing the government's efforts to protect the environment and foster sustainable development.

Among the specific responsibilities of the Commissioner are to monitor departmental sustainable development strategies and to carry out audits and studies of environmental and sustainable development issues. In reviewing the departmental SD strategies, the Commissioner generally asks questions such as:

- are there measurable goals?
- how is it decided which targets and actions to use?
- how are consultations done?
- are the roles clearly defined?

- is there credible information?
- how about consistency, coherence, timing etc.?

In the first generation of departmental SD strategies from 1997 the Commissioner found a number of critical problems in the strategies. Major problems pointed out were that there were few clear targets, and that strategies in general were not designed as instruments for change. In short the Commissioner pointed to an *implementation gap* and a need for the departments to *move up the learning curve*, as far as strategies for SD were concerned.

The work of the Commissioner is guided by general interpretations of Sustainable Development laid down in the governments Guide to Green Government from 1995. However, the guide does not give a specific definition or common framework for SD strategies that each department has to follow. Rather the Commissioner can ask if the departments spell out *their* definitions, and if they work to fulfill them. To assist the departments in this process the Commissioner issues an 'expectations' document, based on the findings of the Commissioner of the earlier strategies and reports.

The Commissioner does not any sanctions if the departments do not meet the expectations. The only instrument is to express critique to the department, and report the critique to Parliament and the public.

A new three-year project to define a set of SD indicators for Canada at the national level has recently been initiated with government funding. The project is led by the National Round Table on the Environment and the Economy in collaboration with Statistics Canada, involving several groups of stakeholders inside and outside of the federal government. The project will not be finalized before 2003, and the possible links between the coming national SD indicators and departmental level SD indicator reporting is not a key priority for the project and have not been explored at this point.

4.2 Transport Canada's Sustainable Development Strategy

Transport Canada (TC) is one of the departments that are required to produce a SD strategy. The first strategy was tabled in 1997 and currently TC is preparing the first updated and revised version, due by the end of year 2000/early 2001.

The SD strategy (in both versions) is structured around a set of *Challenges* with a number of departmental *commitments* for each challenge. The table below illustrates the Challenges defined in the first strategy, as well as rephrased Challenges for the new one (wording to be confirmed when the strategy has been adopted, HG). The contents are not vastly different. The changes reflect needs for clearer goals and better distinction between the various 'spheres of influence' of TC (see below).

1997 Challenges	2000 Draft Challenges
<ol style="list-style-type: none"> 1. Minimize the risk of environmental damage from transportation accidents; 2. Promote greening of operations in the transportation sector; 3. Reduce air emissions from transportation sources; 4. Promote education and awareness on sustainable transportation; 5. Assess the department's direct budgetary transfers for their environmental impact; 6. Refine sustainable transportation indicators; 7. Understand the environmental costs of transportation; 8. Develop and promote the application of cleaner transportation systems and technologies. 	<ol style="list-style-type: none"> 1. Improving education and awareness of sustainable transportation 2. Developing tools for better decisions 3. Promoting adoption of sustainable transportation technology 4. Improving environmental management for Transport Canada operations and lands 5. Reducing air emissions 6. Reducing pollution of water 7. Promoting efficient transportation

The 1997 strategy identified 8 challenges and 42 specific commitments. Some of the challenges address external outcomes, like reducing air emissions or reducing risks from transportation. Others focus on behavioral changes or internal processes, like promoting the greening of operations or assessing budget transfers.

Indicators were defined for some of the challenges and commitments, but for most of them there were no operational performance indicators. Typically commitments are in verbal terms like Commitment 1.2: "Ensure that all ongoing safety management activities include environmental considerations".

An internal management review done in April 2000 by TC's own Corporate Audit and Advisory Service found that most challenges and commitments have in fact been worded in such a way as to preclude meaningful measurement (e.g. Challenge 7 - "Understand the environmental costs of transportation"). This review echoes more general criticism about lack of clear targets from the Commissioner for the Environment and Sustainable Development, as mentioned in the previous section.

According to the same management review, TC has nevertheless made progress on most of the 42 commitments, and 19 of them have been completed.

Current revision process

The current revision of the strategy has been extensive. The revision has included several phases with input from external stakeholders all over Canada, as well as input from contractors. The consolidation and rephrasing of the challenges is one outcome of this process.

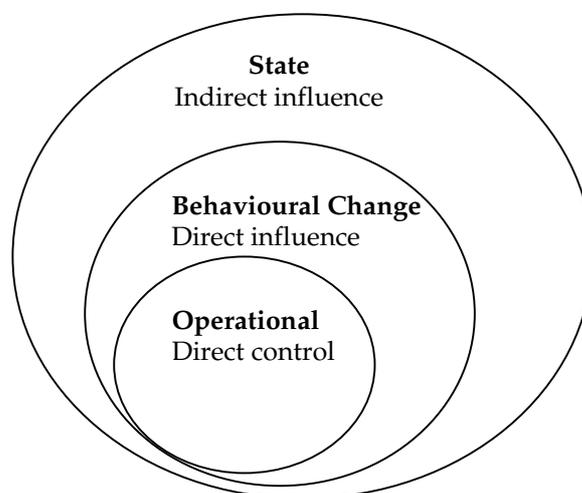
Another outcome is a new reporting framework with performance indicators to monitor progress on challenges and commitments. The new reporting frameworks have been developed in collaboration between TC branches of Environmental Affairs and Program Evaluations.

The new framework has three levels of indicators, reflecting different so-called 'spheres of influence' of TC:

- 1) *State level* indicators, describing the state of the transportation systems in terms of sustainability. This level can be seen as addressing the overall vision of the department's work: to obtain a sustainable system. The state of the system is however not within the direct control of the department. TC only has *indirect influence*.
- 2) *Behavioral* indicators describing the behavior or activities of the actors and stakeholders whose actions matter for the state of the system (e.g. transport operators, decision-makers, the public). This is equivalent to the 'mission' level of TC's work. Here TC has *direct influence*.
- 3) *Operational* indicators, describing indicators for operations and actions of Transport Canada itself. This is equivalent to a 'mandate' level of work., where TC have clear responsibilities. TC has *direct control* over this level.

The idea is illustrated in the figure shown below (Redrawn from: Transport Canada Sustainable Development Strategy Performance Measures Project Report, Program evaluation Branch, Policy Group, Transport Canada. April 2000. Copyright Steve Montague, Performance Management Network, Inc. 2000).

All the levels are seen as important to measure and report, but the responsibilities for TC on each level should not be mixed up.



The framework has been discussed and developed through a series of workshops, mostly with internal stakeholders in TC's various departments. The final list of actual commitments and indicators to be filled into the framework was not accessible at the time of writing this report.

The strategy will mostly focus on indicators for the operational and behavioral levels, as the State level are to be further developed in an ongoing research project (the STPI project reported below).

TC has chosen to focus mostly on the *environmental* aspects of SD, because this is the area where there is the greatest need to show progress.

It is considered important –at least for the time being - to maintain separate SD strategies within the overall performance-planning framework of TC. The SD strategy does involve other departments in TC the Environmental Branch, and increased integration of environmental concerns in the other department’s work is seen as crucial. However there will most likely still be a need for a separate sustainable development unit to secure momentum of the SD strategy for some time to come.

4.3 Transportation indicators at Natural Resources Canada

Natural Resources Canada (NR Can) is a federal government department specializing in energy, minerals and metals, forests and earth sciences.

One area of responsibility for NR Can is the federal government’s programs for *energy efficiency in transportation*. There are several sets and levels of indicators in different publications, where NR Can reports on progress for those policies.

The most detailed level of performance indicators currently seems to appear in NR Cans Business Planning. For each Program output (initiative of the federal government) the Business plan has a Performance Information Table, with Indicator, Target and Actual results for both Outputs (actions) and Outcomes (results) for the whole range of specific program initiatives. The information tables also describe the background for the initiative, the budget requirements, and next steps based on the performance information.

Two examples of performance indicators and targets are shown in the Table below. The examples are from a draft revised version, and should therefore be confirmed with NR Can before any citation (see NR Can 2000 for the current Business Plan).

<i>Output</i>	<i>Indicator</i>	<i>Target</i>
Agreement with Vehicle Manufacturers on Motor Vehicle Fuel Efficiency	Number of manufacturers submitting complete and timely fuel consumption data	Obtain 100% submissic and timely submission data
<i>Outcome</i>	<i>Indicator</i>	<i>Target</i>
Compliance by vehicle manufacturers with CAFAC Standard for new light vehicles	Company Average Fuel Consumption (CFAC) for passenger cars	8.6 litres/100 km

In NR Cans reporting system there is an emerging distinction between *output*, *intermediate* and *final outcome* indicators. The final outcome indicators are for instance the actual fuel efficiency of the new vehicle fleet (as above). *Intermediate* outcomes refer to behavior or actions, e.g. how many car manufacturers have put energy efficiency

labels on the vehicles. *Output* indicators are the activities of NR Can itself.

This reporting framework appears to be very similar to the one adopted by Transport Canada for its Sustainable Development Strategy and general performance reporting (the previous section).

4.4 Transportation indicators at Environment Canada

Environment Canada (EC) has been working with indicators since 1991. An overall reporting framework has been defined. Currently EC reports indicators in the Series of National Environmental Indicators (bulletins), with 4 main themes as shown in the box below. For each there are a number of *indicators*, which again have a number of *data series*.

Ecological Life-Support Systems

- Stratospheric Ozone Depletion
- Climate Change
- Toxic Contaminants in the Environment: Persistent Organochlorines
- Acid Rain

Human Health & Well-Being

- Urban Air Quality 1999
- Urban Water: Municipal Water Use & Wastewater Treatment

Natural Resources Sustainability

- Sustaining Canada's Forests: Timber Harvesting
- Sustaining Canada's Forests: Forest Biodiversity
- Sustaining Marine Resources: Pacific Herring fish Stocks
- Environmental Sustainability: Canada's Agricultural Soils

Pervasive Influencing Factors

- Canadian Passenger Transportation
- Energy Consumption

Transportation is included under the theme of 'Pervasive Influencing Factors'. The indicator for 'Passenger transportation in Canada' has the following data series:

- How Canadians Travel (modal split)
- Fossil fuel use by automobile
- Fuel efficiency of new automobiles
- Urban transit and automobile use

The bulletins on each indicator use a stress-condition-response (+activity) framework, originally developed by Statistics Canada. The transportation indicators bulletin was last updated in 1998.

The environmental indicators have not been directly linked to departmental performance measurement (RPP/DPR) or to Sustainable Development strategies of EC or other departments. At the moment

the indicators are used in an ad hoc way, in combination with other environmental information, to support performance planning.

EC considers it to be difficult to attribute environmental outcomes to particular government programs. One should therefore distinguish between (science related) environmental indicators, which provide a picture of trends and final outcomes and (policy related) performance measures, which are directly linked to specific policy initiatives.

4.5 The Sustainable Transportation Performance Indicators project

The purpose of the Sustainable Transportation Indicators Project (STPI) is to develop a set of indicators that can be used to monitor the progress of Canadian transport systems towards (or away from) sustainability. In this final section on Canadian efforts the STPI project will be described in a little more detail.

The project is conducted by the Center for Sustainable Transportation, in collaboration with the IBI Group consultants. The clients are several departments of the Canadian federal government, including Transport Canada and Environment Canada.

The project proceeds in 3 phases:

The first phase included a review of 13 Canadian and international sources of sustainable transportation related indicator sets. The 160 indicators in those sets were evaluated and rated for their relevance for measuring progress towards sustainable transportation, and a preliminary list of candidate indicators for further work was identified. Phase 1 was completed with a report in June 2000.

The second phase of the project is conducted in the second half of 2000. The aim is to enable the selection of 2 or 3 indicator sets with a limited number of indicators (expected 3-5 and 10-12 indicators) from the long list of 'candidate' indicators. Major elements in this phase include a questionnaire survey of experts and a workshop for stakeholders and potential users of the STPI's.

The third phase will aim to complete the actual sets of indicators during 2001, if funding is provided.

The innovative approach of the STPI project is to base the selection and construction of sustainable transportation indicators (STPI's) on an explicit *definition* of sustainable transportation. According to the definition (Gilbert & Tangauy 2000) a sustainable transportation system is one that:

- Allows the basic access needs of individuals to be met safely and in a manner consistent with human and ecosystem health, and within equity within and between generations.
- Is affordable, operates efficiently, offers choice of transport mode, and supports a vibrant economy
- Limits emissions and waste within the planet's ability to absorb them, minimizes consumption of non-renewable resources, limits

consumption of renewable resources to the sustainable yield level, reuses and recycles its components, and minimizes the use of land and the production of noise.

The definition has been decomposed into (now) 18 elements within three dimensions or 'domains'. Each element represents some key concern of sustainable transportation. Each concern should therefore somehow be reflected in the indicators if they are to show progress towards a sustainable transportation system, as defined. The elements are shown in the Table below.

Environmental domain	Societal domain	Economic domain
1. Limiting emissions	7. Meeting access needs of individuals	14. Affordable
2. Limiting waste	8. Meeting access needs of society	15. Efficient operation
3. Minimizing consumption of non-renewable resources	9. Access needs are met consistent with ecosystem health	16. Choice of transport mode
(0). Limiting consumption of renewable resources to the sustainable yield level	10. Access needs are met consistent with human health	17. Support for a vibrant economy
4. Reusing and recycling of components	11. Access needs are met safely	
5. Minimizing land use	12. Access needs are met with equity within this generation	
6. Minimizing noise	13. Access needs are met with equity across generations	

Note: (0) means that the element has been added later

The idea with using the approach based on a definition is to build on a logical and comprehensive framework from which indicators can be identified. The elements of the definition are used to search for and group candidate indicators from various sources, and point to areas where new indicators have to be defined.

All 160+ indicators in the 13 reports have been reviewed for their relevance as indicators for the 18 elements of the definition. The quality of the indicator was rated on a scale from A to C, based on certain criteria.

'A' means that an indicator provides a strong quantified indication of progress for one or more element(s) of the definition of 'sustainable transportation'. For example, for the first definition element (limiting emissions) this could be measure of how far current transportation emissions are from a level that will respect the absorption capacity of the atmosphere or ecosystems.

'B' means that the indicator provides a quantified assessment of relevance to some element(s) of the definition, without being able to indicate the degree of progress. Again, for emissions this could be a

quantitative figure for the transportation emissions (in tons) without a specified target.

'C' means that the indicator is only loosely related to any element(s). For emissions this could be an estimate of total (not transport) emissions.

The main result of the analysis is that only 4 of the 160 indicators currently in use or proposed in the 13 sources receives an 'A' grade for any element in the definition.

The four indicators with grade 'A' were found to be:

- Number of fatalities and injuries per year in transport
- Average portion of household expenditures devoted to transportation
- Portion of transportation-related costs paid by public funding
- Affordability of public transit service by lower income residents

For some elements in the definition few or no relevant indicators were found among the 160 candidate indicators in the literature. Issues with limited indicator coverage are e.g. 'Noise minimization'; 'Meeting access need consistent with ecosystem and human health and safety'; 'Meeting access needs consistent with equity within generations'; 'Support for a vibrant economy'; Waste limitation'; 'Reuse and recycling' and 'Access needs met with equity across generations'.

In other words the STPI project has revealed that indicators are available, but their relevance for measuring progress towards sustainable transportation is often limited. This is mostly because indicators are found to be lacking a degree of quantifiability that would enable assessment of the rate of progress.

To compensate for this lack of relevant *existing* indicators, the project has proposed 11 additional indicators as possible candidates to measure progress towards 'sustainable transportation'. The proposed new indicators are in the form of composite indices, because the concerns of 'sustainable transportation' typically are too complex to be captured with only one variable. Many of the indices suggest to relate some current pressure from transportation (like emissions or resource use) to a certain natural tolerance limit for that pressure. The particular values or limits have not been defined.

The candidate indices are shown in the box below.

The indices as well as the best indicators from the literature review are to be further discussed, and a limited number selected in the next phases of the project.

Additional candidate indices to measure progress towards 'sustainable transportation'

- Index of specified transport emissions in relation to defined absorption capacity
- Index of specified transport wastes in relation to defined absorption capacity
- Index describing the rates of use of non-renewable materials in relation to the rates of growth of production of renewable replacements
- Index of the degree of reuse and recycling in relation to the amounts of potential waste from production and use
- Index of the amount of land used for all transport purposes in relation to the total urbanized land area.
- Index of transport noise in relation to established critical levels for health impacts
- Index of the extent to which lack of transport constrains the meeting of defined everyday needs
- Index of the extent to which lack of transport constrains the meeting of the collective needs of society.
- Index of the prevalence of transport-related diseases in humans
- Index of the extent to which transport contributes to social polarization
- Index of the actual or perceived quality of the transport system in relation to an accepted benchmark

4.6 Summary and discussion of the Canadian federal level

Canada for some years now has had governmental performance planning along the same lines as in the US, even though the requirements are not mandated in a Law like the GPRA.

All departments provide systematic reports on the goals and performance, several of which are specified further in internal business strategies or similar documents. Canadian performance planning is also linked to the federal budget process, but the steering effect of that linkage is considered weaker than in the US, partly because of the more limited opportunities for the Canadian parliament to influence the governments budget. Despite the focus on outcome and results it could seem like the major function of governmental performance planning in Canada at this point is to provide a structure for reporting on activities in a way that is useful for the administration's own internal planning efforts.

A special feature of the Canadian approach is the requirements for department based planning for sustainable development, - the SD strategies and the SD reporting as part of overall performance reporting. The formalized SD planning requirements obviously means that sustainability is a much more integrated concern in federal Canadian policy making, as compared with the US. The existence of the Commissioner makes this concern and the planning efforts substantially more credible. Through the SD strategy and reporting process government agencies has had to learn a level of 'sustainability' language and methodology, which would probably not otherwise be adopted.

It is remarkable that there is no common, interagency framework for SD strategies and reporting. Each department basically has to report what it does to help sustainable development, according to its own

interpretation of SD and its own understanding of its responsibilities in that respect. Apparently it has not been a priority for the Canadian government to establish a common framework for SD reporting, and no government-wide targets have been defined. The Commissioner does not have the mandate to establish such frameworks or targets, because of its character as an auditing (not policy making) institution.

However, it should also be noted, that some coordination does take place. Apart from Expectations and Criteria documents provided by the Commissioner and the Auditor General, the governments Treasury Board also provide frameworks for reporting on a number of common government-wide, horizontal issues. This has also included efforts to coordinate SD planning on an inter-agency level, although it has not taken the shape of a unified SD planning framework at this point.

Transportation and environment reporting

Several federal agencies are involved in reporting on transportation and environment issues. Among the most comprehensive efforts are the work done by Transport Canada. As part of its 1997 sustainable development strategy a set of challenges and commitments were defined. Also a structure for reporting progress on a wide range of transportation and environmental issues was set up, even though that structure has been criticized for having too few measurable indicators.

Like in the US there are efforts to accommodate the demand for more outcome oriented performance planning. One response to this is TC's differentiated system of indicator levels, where monitoring commitments/outputs are to be supplemented with more indicators for behavioral responses and the state of the transportation system. Similar ideas are pursued in the reporting of other departments such as Natural Resources and Environment Canada. This differentiated approach resembles somewhat the *6-level indicator typology* adopted in the strategic planning at the US EPA. While the EPA typology seems more elaborate, the 'layered' Canadian approach seems more accommodating towards also emphasizing lower level indicators that can indicate a level of policy and management integration (This may be my over-interpretation, HG).

The STPI project

A system level approach to measuring transportation and environment performance is pursued in the experimental STPI project aiming to develop indicators for *sustainable transportation*. The project has made a rather extensive review and it has produced a systematic assessment of a large amount of indicators currently in use, based on criteria derived from an explicit definition of sustainable transportation. This systematic approach distinguishes this project from most other work in the area. The analysis reveals that there are in fact very few indicators today that are really useful to monitor progress towards (most aspects of) sustainable transportation, if rigorously defined.

The 'definition' approach therefore seems to be a useful tool for assessing indicators and finding the gaps, as indicated above.

However, it is not really clear what has led the Centre of Sustainable Transportation to adopt that particular definition in the first place. It is not specified what the role each element of the definition plays in relation to achieving overall sustainability (or which part the transportation sector as a whole plays in achieving such a goal). Some of the elements in the definition seem to relate more to transportation system quality in a much broader sense, in other words, what a 'good' transportation policy should try to obtain. This may weaken the definition approach as a rigorous tool to select sustainable transportation indicators.

An interesting output from the project is the list of possible indices, many of which relate some current pressure from transportation to a natural tolerance target. The proposed indices are mostly of a speculative kind, however, as the targets and the data requirements to monitor them have not yet been explored. It will be very interesting if the remaining phases of the project will be able to sort out whether any of the proposed indices can in fact be defined and measured, and if the indices will be sufficiently transparent for the potential user groups.

5 Performance planning at state and municipal level

Efforts to define and use indicators and performance measures are not limited to the federal level. Also governments at state (USA), and province (Canada) level, as well as municipal level are involved in performance indicator assisted planning and policy making in the area of transportation and the environment.

A few states, provinces and municipalities have even developed performance measurement frameworks that in some respects appears more elaborate or ambitious than the federal ones. Some sources quote examples such as the province of Alberta's governmental performance planning and reporting; the environmental monitoring in the Mid-Atlantic Region of the US (EPA region 3), and the sustainability indicators of the City of Seattle. In general, however the frameworks for performance based planning at state and municipal levels appear less formalized and less extensive than the federal Ones and the diversity in approach (in terms of frameworks, procedures, and specific indicators) is large.

This section will not explore deeply into the wealth of state and local performance planning. It will only highlight a few interesting examples of planning frameworks and practical indicator usage as encountered during the fellowship trip. The examples are based on meetings with state/provincial and municipal officers as well as with researchers and consultants in Oakland and Sacramento, California; Boston, Massachusetts; Washington D.C, and in Victoria and Vancouver, BC.

5.1 Performance based transportation planning in US states

In the US a growing proportion of transportation decisions are 'devoluted' to the state and local levels, including the expenditure of substantial federal transportation funds. Along with that process, a *performance-based* transportation planning approach is increasingly being adopted by state and local agencies. A recent report on performance based transportation planning provides an overview of this. The report is authored by consultants at Cambridge Systematics and has recently published in the form of a Guidebook in performance based planning by the National Cooperative Highway Research Program (NCHRP 2000).

According to the Guidebook and other sources, the increased use of performance based planning is closely linked to the two major pieces of federal transportation legislation adopted in the nineties, namely the Intermodal Surface Transportation Efficiency Act of 1991 (ISTEA) and its successor, the Transportation Equity Act for the 21st Century (TEA-21) from 1998.

The new legislation strongly emphasizes an *intermodal* approach, with certain requirements for intermodal (as opposed to mode by mode) transportation planning at state level. This concurs with a stronger focus on a planning for the needs (of people and municipalities), rather than planning for individual modes or transportation systems. More flexibility in the state and local use of federal transportation funds across modes also lessens the central control over *how* the money are spent, while at the same time increase the focus on *what* is achieved, in terms of actual outcomes. In other words planning should center on which transportation needs are served and what goals are met. *Performance measures and targets* can contribute to make such needs and goals operational. However, the increased devolution to state and local levels have not at this point been accompanied by any federally mandated performance targets for State transportation planning (apart from certain requirements to conform with environmental planning procedures, as described later).

According to the Guidebook, performance based planning can be used for a number of different purposes at local level, including State and regional transportation planning; Transportation Improvement Programs (TIPs), investment and corridor studies, strategic and business planning, and transportation system performance audits. In other words performance measures can be used for monitoring (backwards) as well as planning (forwards) and to link various types of decision making. Some general terminology is shown in the box below.

Definitions of key terminology in performance based transportation planning (NCHRP 2000)

“A *goal* is a general statement of a desired state or ideal function of a transportation system, for example “promote economic development” or “improve the safety of the state highway system”

“An *objective* is a concrete step toward achieving a goal, stated in measurable terms. For example: “Reduce the number of alcohol-related traffic fatalities” or “reduce the number of at-grade railroad crossings”

“Objectives may have specific *performance standards* which set out in clear, numerical terms a desired or required degree of achievement. For example: “Provide transit service in all urban areas/corridors with more than nnn population” or “Travel time in urban areas/corridors should not deteriorate below 1994 levels”

According to the Guidebook many transportation agencies have already established various *goals* and *objectives* within some areas of transportation planning concern. However many have not (yet) established any *performance standards* for their goals.

The most commonly used measures are grouped under the following 8 areas:

1. Accessibility
2. Mobility
3. Economic Development
4. Quality of Life

5. Environmental and Resource Conservation
6. Safety
7. Operational Efficiency
8. System Condition and Performance

For each of the goals there are very many different performance indicators in actual use. Several hundred examples of performance measures in use are listed in the report.

It is interesting that there appears to be no uniform measures for key goals like *accessibility* and *mobility* (1 and 2 in the list above), but a long range of more or less indirect measures. In general what can be seen is a broadening in the range of measures applied. For instance when traditional highway based Level-of Service indicators of mobility is supplemented with measures related to other modes. Or when a number of different measures are put together in indices instead of using a single indicator.

Environmental measures are found in the above list in groups 4 (Quality of life) and 5 (Environmental and resource conservation). Examples are indicators for land use, air quality, noise, salting, fuel use, recycling, and customer satisfaction with environmental decision making. However, many agencies use the same few environmental measures, most of them focused on *air pollution*. This can either be in terms of tons of *transportation emissions*, or *population living in areas classified as non-attainment of air quality standards*. The background for this is explored a little more in the next section.

5.2 Air quality and transportation planning performance

In the US there is a close link between transportation planning and air quality planning at the state and local level. The links have tightened with ISTEA and TEA-21.

In general transportation planning and projects must be in compliance with air quality planning requirements of the Clean Air Act Amendments of 1990 (CAAA). According to the CAAA states that have areas where the national air quality standards (NAAQS) are exceeded must make State Implementation Plans (SIP's) for how they will meet air quality standards within certain time limits. Regional Implementation Plans must be established to specify how the targets are to be attained for each particular metropolitan area in non-compliance with the NAAQS. This will typically involve also measures to reduce mobile source emissions.

Turning to transportation planning, the TEA-21 and other legislation define a number of transportation planning requirements for states and Metropolitan Planning Organizations (MPO's), designated for all urban areas with more than 50,000 inhabitants. Every MPO must produce a 20-year Regional Transportation Plan (RTP) and a 3-5 year Transportation Improvement Program (TIP), both based on realistic assumptions about the funding requirements to implement the plans. The TIP must conform to the RTP. Every specific *project* to be imple-

mented must be included in an approved TIP (similar procedures apply at state level combining the regional plans).

To coordinate transportation and air quality planning a RTP and a TIP has to be in compliance with (meet the targets of) the State Implementation Plan (SIP). Federal funding for transportation projects cannot be obtained in non-attainment areas if an approved SIP is not in place, or if a TIP would make it more difficult to reach the specific air quality targets of the SIP (for instance if the plan will generate motor vehicle emissions exceeding the so-called emission budget defined in the SIP). The TIP forms a basis for the federal DOT's determination if there is compliance at the planning level. There are additional, even more detailed conformity requirements at the level of the individual *projects*.

The TIP/SIP compliance requirement procedures are seen by many as the most advanced example of how environmental performance requirements are integrated in transportation planning in the US. The procedures are far more rigorous than for other environmental planning issues, as there are actual sanctions for not meeting conformity requirements, most directly in terms of the restrictions on federal funding. Non-compliance basically means 'No' to any transportation project requiring federal funding or approval.

5.3 Performance based transportation planning in California

Caltrans is the Transportation authority of the Government of California. Its traditional role has been to build and maintain the California State highways. Now Caltrans has broader tasks, involving also transit and intermodal transportation planning.

In California much of transportation decision making have been transferred to the regional/local level. This is mainly the result of recent legislation (SB45). 75% of the state's Transportation Improvement Program (TIP) funding is now controlled at local level. There are 44 regional transportation-planning agencies in the state.

There is not (yet) any formal requirement at California State level for either state or local agencies to define performance goals and indicators for transportation planning.

Recently adopted legislation (the AB 2140) *encourages* the use of performance measures for regional transportation planning in the large metropolitan areas, but is permissive. More stringent legislation failed to pass at this point.

Caltrans is currently working on a multi-year project to develop intermodal, system level performance measures and indicators, to be used at state and regional level planning in California. Such a system is considered useful with or without mandates. The project has 3 phases: 1) design phase 2) testing phase 3) implementation phase.

The approach is outcome oriented. Initially *nine outcomes* were identified. For each outcome a number of performance indicators have

been suggested. The nine outcomes with definitions and proposed performance indicators are shown in the Table below.

The outcomes correspond broadly to the groups identified by the NHCHP guidebook (previous section) although there are some noteworthy differences, for instance that *sustainability* has been singled out as an outcome goal (more on this below).

The first three outcomes (mobility/accessibility, reliability and safety) have been tested in the first year. Right now three other indicators have entered the testing phase, one of them being environmental quality.

DESIRED OUTCOMES	DEFINITION	CANDIDATE MEASURES/INDICATORS
Mobility/Accessibility	Reaching desired destinations with relative ease within a reasonable time, at a reasonable cost with reasonable choices.	<ul style="list-style-type: none"> • Travel Time • Delay • Access to Desired locations • Access to the System
Reliability	Providing reasonable and dependable levels of service by mode.	<ul style="list-style-type: none"> • Variability of Travel Time
Cost-Effectiveness	Maximizing the current and future benefits from public and private transportation investments.	<ul style="list-style-type: none"> • Benefit / Cost Ratio • Outcome Benefit per unit of cost
Sustainability	Preserving the transportation system while meeting the needs of the present without compromising the ability of future generations to meet their own needs.	<ul style="list-style-type: none"> • Household Transportation costs
Environmental Quality	Helping to maintain and enhance the quality of the natural and human environment	<ul style="list-style-type: none"> • National and State Standards
Safety and Security	Minimizing the risk of death, injury, or property loss.	<ul style="list-style-type: none"> • Accident and Crime Rate
Equity	Distributing benefits and burdens fairly	<ul style="list-style-type: none"> • Benefits per Income Group
Customer Satisfaction	Providing transportation choices that are safe, convenient, affordable, comfortable, and that meet customer needs.	<ul style="list-style-type: none"> • Customer Survey
Economic Well-being	Contributing to California's economic growth.	<ul style="list-style-type: none"> • Final Demand (Value of Transportation to the Economy)

Initial Outcome indicators Caltrans' performance indicator project (Kashkooli 2000)

For *environmental quality*, air pollution (in terms of areas meeting air quality standards) has been chosen as performance indicators at this point. A number of other issues have also been considered, including issues such as noise, stormwater run-off, use of pesticides, etc. Some issues are related to federal or statewide environmental regulations, like air quality. Others are more regional or local, or even related to aspects of Native American culture. Caltrans thinks it important to consider all major impacts. However, regional transportation commissions may want to want to emphasize different issues based on local priorities. No uniform set of environmental indicators would apply everywhere.

Sustainability is included as one of the 9 outcomes. The terms of reference for the project have defined this outcome as “Preserving the transportation system while meeting the needs of the present without compromising the ability of future generations to meet their own needs”.

Sustainability is thus seen from a transportation system perspective: to focus on the sustainability (or maintenance) of the transportation system itself. Measuring the outcome has been conceived purely in economic terms. *Environmental* sustainability was not included, apparently because this broader issue was not considered applicable within the limited focus of transportation planning.

The candidate sustainability performance measure was an indicator of *household transportation costs*, possibly linked to the costs of maintaining the transportation system. However, preliminary analysis has revealed that it is difficult to measure and forecast all of the costs, and link them together. The sustainability outcome is therefore currently being revisited. At this point it has been decided to take the indicator of the sustainability bracket and change it into a separate measure of ‘system preservation’, which will then be a separate outcome (so there will be 10 outcomes). The contents of the sustainability outcome will be reconsidered. There will be a process with focus group discussion in the regions to come up with ideas for sustainability outcome indicators.

Caltrans is in the process of informing the regional administrations about the use of performance measures and ‘marketing’ the proposed framework. As mentioned the regions may define their own measures, but hopefully they can fit somewhere under the ‘umbrella’ defined by the 9 (now 10) outcomes. Regions are encouraged to use the framework ‘as a *tool* for decision making - rather than as a *rule* for decision making’ (Caltrans officer).

Caltrans is also trying to build the linkage between external performance planning (customer perspective) and internal business planning. Not by interfering with the way regional agencies define their internal efficiency, but by making them aware that there are linkages - business planning can affect system performance. An example could be incidence response time. Faster responses would in fact also affect mobility and reliability. Other examples could be measures of maintenance of road signs and maintenance of road surface, both have impact on safety, apart from their relevance for internal business planning.

Data and data collection are crucial for performance planning. Performance planning is prompting agencies to revisit the sources of information already there. Funding of data collection may however become a key issue, as data collection has also been decentralized and made more flexible in the TEA-21 process.

5.4 Performance based planning in the Bay Area

The Metropolitan Transportation Commission is the transportation planning, coordinating and financing agency for the nine-county San

Francisco Bay Area in California. MTC plans for all modes of transport. MTC does not control land use planning.

MTC has explored various types of performance based planning over the years. A comprehensive and integrated system to monitor the performance of the transportation systems in the Bay Area has not been established at this point. There are limited data available for intermodal performance monitoring. For instance MTC has done a study to explore monitoring of door to door travel time (accessibility). It was concluded that the data were not available at this point (or only for selected corridors and modes). Geographical Information Systems may make this possible in the future. There are no methods are currently available to continuously monitor system performance in terms like travel time or reliability on an intermodal basis.

The MTC makes use of certain performance indicators for its *long range planning* and forecasting efforts. One example is the recent environmental assessment of the 2020 Regional Transportation Plan (RTP) from 1998. The impact of the plan was compared with the situation today and a situation in 2020 without the plan. A very broad range of environmental impacts were assessed, including: Air quality, Noise, Energy, Climate Change, Population and Housing, Seismic effects, Water quality, Biological resources, Visual resources and Cultural resources.

The impacts are specified in terms of criteria derived mostly from the California Environmental Impact Quality Act. The criteria are used to assess if impacts are significant and would require mitigation. The criteria have in general not been formalized in terms of performance targets. *Air quality* criteria are the main exception. The formal status of the federal air quality standards criteria means that a conformity analysis has already been done as a part of the RTP itself, and not 'only' in the accompanying impact analysis. The overall expected environmental impacts of the plan are shown to be small compared with general growth trends in the region. The plan is in compliance with air quality criteria.

An even more recent planning project is the evaluation of the so-called Bay Area Transportation Blueprint for the 21st century. The Blueprint was done to identify possible transportation measures *beyond* the economic constraints of the official RTP. The assessment is less detailed than the impact study of plan itself. Among the performance measures used for the study were Number of new transit riders attracted.

Costs per new transit rider (a cost-effectiveness measure), Travel Time Savings, Air Quality (emission per day), and Fuel Consumption.

The analysis of various policy packages showed that also with more extensive measures the predicted changes will be small for most of the overall indicators including travel patterns (VMT and modal split), air quality and fuel consumption.

The main interest of the study has been the *cost-effectiveness* indicator, where variations are much larger. The study for instance revealed

that in many cases bus improvements are more effective in terms of costs per new rider than rail investments. Also revealed was that policies like *transportation pricing* and *land use changes* may be at least as cost-effective as more traditional investments. The study has therefore revitalized discussions over a recently decided major rail investment project (a BART extension). It has also been a contributing factor to a recent decision to establish a new express bus network.

This example shows that performance based planning (in this case: indicators of cost-effectiveness) can influence decision-making. According to MTC officers this also emphasizes the need to be careful about the choice of indicators and the quality of the underlying data and methodology.

5.5 Environmental Accounting at British Columbia Ministry of Transportation

Provincial Governments in Canada have similar or even greater responsibilities for transportation decisions than US States. They also work with performance planning for transportation and the environment, although perhaps not as much yet.

In British Columbia, performance based transportation planning is not as developed as in California. Integration of sustainability concerns in transportation planning is in its infancy. The strategic plan of the Ministry has a set of goals and performance indicators including an indicator of Greenhouse gas emissions. In the 2000 plan there were a few indicators, in the next year's plan there will be several more. Work on defining performance indicators is on its way. Actual targets have not been defined at this point.

An interesting assessment approach has been adopted for *project level* assessments called the Multiple Accounting Framework. The framework includes a number of environmental cost factors, including monetized costs for air pollution, watershed effects, noise and community severance. The cost estimates are based on replacement costs, and include also cumulative effects of several impacts as well as environmental monitoring costs. The estimates build on detailed environmental data collection and modeling for the particular project area under consideration. Thereby accounting for the environmental costs is now in fact considered as more advanced than accounting for e.g. the economic development effects of transportation projects.

Examples show that the accounting analysis can lead to concrete changes in a project or even abandoning a project site altogether. A particular bridge construction project was dropped mainly because of projected environmental *monitoring* costs at the site would be prohibitive. The methodology is only used at project level, not (yet) at program or strategic level.

5.6 Performance planning at Translink, Vancouver

In Vancouver Translink has been established as a new transportation planning agency with jurisdiction over most of the transportation systems in the Greater Vancouver area. Translink does not control land use planning. Translink collaborates with the Greater Vancouver Regional District (GVRD) about regional planning. GVRD has adopted the so-called Livable Region strategy for the period up to 2021. This is also the basis for Transportation planning.

Performance based planning is in an early stage. Consultants have been asked to come up with proposals for performance indicators and a report has been produced. At this point many data are simply not there to establish sophisticated performance indicators.

There are two areas with clear targets and good data: Modal split and Air quality.

The Livable Region plan has set a target of 17% of modal split for transit in 20 years from now. It is currently around 11%. Translink has defined an intermediate target of 12,5% in order to make a closer link to decision making and actions. There are already well-established methodologies and data available for monitoring this target.

There is an Air quality goal to reduce the number of days with low quality air. Goals have been achieved, but mainly because the industrial sources have moved away from the city. There is no particular target for transport related emissions. Translink provide the necessary data for transport and emissions forecasts as part of the regional Air Care program. The focus is on ozone precursors and particulate matter (PM-10). The data in this area are considered to quite good.

Among the other important planning issues are protecting water quality (related salmon fishing) and controlling urban development patterns. Transport related targets and indicators are less developed in those areas.

5.7 Environmental indicators in British Columbia

The BC Ministry of Environment, Lands and Parks works with environmental indicator both at a *system indicator* and a *performance measures* level. The two types of work are closely integrated.

The *system level indicators* are included in the Ministry's bi-annual State of the Environment Report called 'Environmental Trends in British Columbia. The indicators cover a broad range of environmental impacts (there are 15 key indicators in 13 areas) Indicators at sector level (like transportation) have not been established.

Performance measures are included in the Ministry's annual Business Plan. There are 4 overall Objectives in the Business Plan

1. Natural Diversity
2. Healthy and Safe Land, Water and Air
3. Sustainable Social, Economic and Recreational Benefits
4. Responsive and Adaptive Organization

For each objective there are a number of goals and below that a series of quantitative performance measures and targets, 75 in all. For each goal the business plan describes the connection between a set of *Ministry Activities*, the *Performance Measure* used to monitor it, the quantitative *Target* defined, and the *Department* to hold accountable for them. Most targets are now being defined in a collaborative bottom-up process involving regional offices of the Ministry, with careful consideration of available information and also cost assessments. This should help make the targets realistic.

The Business plan also establishes links between each of the performance targets and the relevant corresponding indicators in the State of the Environment report. In this way performance reporting is justified in terms of environmental outcomes, and accountability for the outcomes are linked back to the organizations activities. However, the Ministry does also note that no organization can obviously be held accountable for the state of the environment as a whole.

5.8 Summing up and discussion of state and local level planning

Performance planning at state/province and city level is an evolving process. Some indicators have been monitored and used for planning by many agencies for several years; for instance transportation indicators like modal split and highway level of service, and environmental indicators such as air emissions and air quality.

More comprehensive efforts to develop system level indicators for intermodal transportation planning and link them to planning and decision making responsibilities of state and municipal agencies has only recently been set in motion. The organizations visited during this trip did not yet have such monitoring systems in place yet, even though considerable efforts to that effect are being made.

Major obstacles appear to be methodological problems and extensive data requirements. The increased availability of powerful Geographical Information Systems will most likely help overcome some of the problems. For some new issues such as sustainability there also appears to be more fundamental conceptual problems, and widely differing approaches.

The existence of environmental monitoring and planning systems enable some level of integration of environmental concerns in decision making and management. However environmental, transporta-

tion and land use planning/management appears to be relatively disintegrated in actual practice.

Clearly the level of transportation/environment integration is strongest for air quality, especially in the US. The integration includes *system indicator* aspects (monitoring and forecasting) as well as *decision-making* aspects (e.g. conformity requirements).

This situation is however not so much due to performance based planning efforts in themselves, but to legal requirements in federal Laws for transportation and air quality planning, which have provided not only mandates but also a pressure to fund data gathering etc.

It remains to be seen whether state and municipal performance based planning will be developed to a level where other concerns can be dealt with at the same level of methodological care and concern as air quality.

6 Additional viewpoints from experts

In this section some interesting additional viewpoints from a number of sustainability and performance indicator experts visited during the trip of will be summarized. Please note that the summaries represent this authors interpretation.

Tony Hodge is a researcher and private consultant. For several years he has been working with the concept of sustainable development and how to make it operational for planning, policy and decision making. At the moment he is involved in sustainability analysis of several economic sectors, among them are the mining industry and pipelines. Social sustainability is another current work area.

TH conceives sustainability in terms of a value base with *parallel care and respect* for the ecosystems and the people within them. *Sustainability* is about the persistence of certain characteristics of both people and ecosystems over very long time. *Development* is to expand and realize potentials people and ecosystems. *Sustainable development* is related to *actions* leading to development that meets the needs of the present, without compromising the ability of future generations to meet their own needs. (Hodge 2000).

TH's currently uses an analytical framework called the Results Triangle for Assessing Progress Toward Sustainability. The triangle has the three basic elements identified above, namely 1) human well being; 2) ecosystem well-being and 3) a "success" measure of the actions taken. It is important to include the success element (the third corner of the triangle), because progress towards sustainable development has to be measured in terms of activities or actions taken.

It is interesting to try to relate sustainability concepts to government performance planning. Sustainability reporting is currently emerging from a number of different reporting frameworks, especially when environmental and other framework like health reporting and/or economic reporting are coming together.

In general there can be too much focus on indicators. Some people will not necessarily focus on the numbers, but rather on the stories about what is going on. *Storytelling* is important to make changes. Indicators does not capture everything, they may sometimes have more of a support role. Judgement and communication skills are important functions that may not be provided by indicators or indicator experts.

Jeb Brugmann is former Secretary General of the Toronto based International Council for Local Environmental Initiatives (ICLEI). One of his work areas has been City level environmental indicators.

According to JB, many cities are interested in sustainability indicators for comparison among cities. However, city managers has generally not been very interested in using indicators to improve the management of their own city in a systematic way. Much indicator work is

not related to management decisions at all. If local indicators are to have an impact they must be linked to 1) a regulatory regime and 2) flows of funding.

The best example of this may be the US air quality requirements.

The much-cited local sustainability indicators in Seattle have not really explored those linkages very much. Municipalities should build better management systems to monitor policies, and local sustainability indicators should be used to hold decision-makers accountable for implementation of policies.

Sue Zielinski is the Director of the Moving the Economy' initiative. It is a collaborative effort between the City of Toronto, Human Resources Development Canada, and *Transportation Options* (an NGO).

The initiative supports innovation and investments in new more sustainable transportation products and services. The idea is to help develop sustainable transportation as an economic sector. The aim is to promote win-win solutions by helping to form networks and clusters among private and public partners in the area.

This innovative approach suggests a need for another kind of indicators, namely *indicators of the positive effects of sustainable transportation*. Sustainable transportation indicators should not only show environmental damage such as emissions (as many, including some federal departments seems to assume). It should also be possible to monitor progress in a positive way.

Positive indicators could for instance include measures of the economic benefits derived from ST initiatives in terms of investments, jobs created, innovations, money saved, etc. It could also include monitoring the effects of implemented policy measure to change travel patterns such as public transit innovations, bicycle initiatives, pedestrianization efforts, etc.

Another idea could be to define *personal* indicators, whereby individuals or families can monitor the impact from their daily or lifetime travel choices (in terms of cost savings, emission savings, etc.). Personal indicators could make the link between daily life and general abstract sustainability concerns more transparent.

Indicators should support actions, because, as Ms Zielinski points out: "Policies that are implemented are a 100% more effective".

Todd Litman is the Director of the Victoria Transport Policy Institute (VTPI); an independent transport policy consultant. Sustainable Transportation is among the key work areas for the Institute. Indicators of Sustainable Transportation are one sub-topic.

According to TL transport decisions have often been narrowly focused only on the quality of vehicle movement. The impacts of transportation decisions are obviously much broader, and improving the vehicle flow may even have negative effects on the environment, safety, equity etc. To reduce the risk of conflicting trends or policies,

indicators of sustainable transportation impacts should therefore include environmental, social and economic indicators.

Mobility (movement of people) would be a more relevant service indicator than vehicle flows, because vehicles in themselves are only means to move people, and other modes may sometimes serve this function just as well or better. *Accessibility* is an even more relevant indicator, because access is really the service in demand, not mobility or transport in itself.

To support sustainable transportation decision making an index (or indices) of positive services and negative impacts should be defined. TL has proposed a set of possible indicators to be included, shown in the box below.

VTPI's list of suggested Sustainable Transportation Indicators (Litman 1999)

- Average portion of household expenditures devoted to transportation (direct and indirect)
- Average amount of residents' time devoted to non-recreational travel.
- Per capita automobile use (annual miles or kilometers of travel).
- Ability of non-drivers to reach employment centers and services.
- Per capita land area paved for roads and parking facilities.
- Quality of pedestrian and bicycle environment.
- Quality of public transit service, including number of service hours, service frequency, average speed relative to automobile traffic speeds, safety, comfort etc.
- Average number of major services (grocery, library, school, playing fields, etc.) within walking distance of residents, or average walking distance between residences and public services such as schools and retail centers.
- Land use mix (proximity of residential, commercial and employment land uses).
- Quality of delivery services (such as by food stores).
- Quality of mobility services for residents with special mobility needs.
- Affordability of public transit service by lower income residents (fares as a portion of lowest quintile income).
- Portion of residents with transit service within ½ kilometer.
- Motor vehicle accident fatalities and accidents.
- Per capita transportation energy consumption.
- Per capita transportation pollution.
- Medical costs attributed to transportation (including care for injuries and pollution-related diseases).
- Portion of transportation related costs paid by public funding.
- Residents' participation in transportation and land use decision-making.

It is important that indicators not only provide information about the *state of the transportation systems themselves*. As evident from the list information should also include e.g. underlying land use changes; the proximity of various services; the external effects of transportation, and information about public participation in transportation related decision-making.

Indicators should be accompanied by conditional policies, like: 'If this goal is not achieved, then that policy will come into force'. This would enable more reliable and long-term decisions.

There are examples of widespread indicators that are of limited value. Indicators like Modal Split and Average Vehicle Occupancy (AVO) does not tell very much about either service provided or impact from transportation. Efficiency indicators can also be misleading: Due to the rebound effect improved efficiency may not translate into reduction of overall impacts from transportation.

"Positive" indicators of sustainable transportation (as suggested by the Moving the Economy initiative of the City of Toronto) could be interesting. However positive indicators should not conceal the fact that current transportation trends are not sustainable. It is important to highlight negative trends that are a threat to sustainability.

Antti Talvitie is a Senior Transport Specialist with the World Bank. Mr. Talvitie has been the coordinator of an ECMT project about performance measures in road administrations in a number of developed (OECD) countries. The project is completed. A first report came out in 1997, and the final report is on its way.

One key message from Mr. Talvitie is that performance planning should not always be taken too seriously. It would be an illusion to think that events can be planned and controlled by performance measurement systems. Performance planning should be applied in a non-accusative way if it is to work. The people involved know if things do not work well, and they often have ideas why it happened.

The most important thing is to make people talk about what they want to do, what they did, and what went wrong, in anything. *Story-telling* may be used as a learning and planning instrument.

If performance based planning and decision-making can be used as a communication framework it can be useful. It can increase transparency of decisions. But: "Don't focus on outcomes, focus on process".

6.1 Summing up and discussion

The remarks from the experts mostly speak for themselves. However one common theme also highlights remarks from other experts as well as conclusions from other sections of this report: The need to link indicators to decisions making frameworks. Many experts seem to agree that indicators with no links to actions, decisions, and implementation will have limited impact and may even be a waste of time.

How the link should be made and what kind of decisions they should influence can be answered in many ways depending on the context.

Several experts have also noted, however, that performance planning should not be seen as powerful instruments to make changes in itself. It has to be supplemented by - or be a part of - broader communica-

tion processes, or even stories, linking system conditions via understanding to action.

7 Comparing North American with a European Union approach

It is not straightforward to compare transportation and environment performance planning directly between North America and Europe, due to the diversity of approaches on both sides of the Atlantic, not least in Europe. Some countries have performance planning procedures in the transportation and environment area, that resemble the procedures established in the US and Canada, e.g. the Netherlands (Van der Loop & Mulder 2000), while most do not. In Denmark there are or instance no similar procedures, but transport and environment reporting is included e.g. in State of the Environment Reports (NERI 1997) and annual Environmental indicator reports (ME DK 2000). Obviously the diversity is even greater at the local level.

In the following some parallels will be drawn between some of the federal level performance and indicator reports in the US and Canada and a European Union (EU) level report, namely the so-called *Transport and Environment Reporting Mechanism* (TERM 2000). The TERM is made in collaboration between a group of EU institutions, including The European Environment Agency (EEA), the EUROSTAT and the European Commission, with EEA as the lead agency. The first TERM report was issued in year 2000, and TERM is intended for annual publication in the coming years.

For comparative reasons a few features of the TERM report will first be highlighted in the following section.

7.1 TERM

In the European Union it has been recognized that environmental problems must be addressed through a broad range of policy instruments. According to the Amsterdam Treaty and the 5th Environmental Action Program of the EU, environmental concerns must therefore be *integrated into other (sector) policies* in order to move towards sustainable development. Also transportation policy must be reoriented to accommodate environmental goals.

In 1998 the European Council (a top-level policy body in EU with the European Prime Ministers) urged the EU Commission and EU member states to develop strategies for integration of transport and environment strategies. As part of this process the Joint Council of Transport and Environment Ministers invited the EEA and the EU Commission to set up the indicators- based TERM report.

The aim of the TERM reports is to monitor:

- the degree of environmental integration in the EU transport sector,
- progress towards transport systems that are more compatible with sustainable development, and
- the effectiveness of the adopted policy measures.

The TERM will also serve as a common basis for comparing the performance of member countries (benchmarking).

TERM 2000 is a pilot product in EU environmental policy reporting. At this point the data and indicator coverage is incomplete. The format and the contents of the TERM is expected to change, as a response to comments from EU policy makers and member states, and improved data analysis and collection.

The TERM report is structured around 31 *indicators*, placed within 7 *indicator groups* that reflect 7 *policy questions*. The policy questions have been derived from key EU policy documents to address policy areas where environmental integration is called for.

The indicators have also been selected to reflect the 5 elements in the so-called DPSIR reporting framework. DPSIR is an extension of the OECD Pressure-State-Response environmental framework, where DPSIR stands for Drivers, Pressures, State, Impact and Response. The use of the DPSIR framework serves to highlight links between causes, effects and policy reactions to environmental problems.

7.2 Comparing overall approaches

Below the 7 policy questions of TERM are placed in a Table with similar structuring elements in the Transport Canada's Sustainable Development Strategy (TC's '7 Challenges') and US DOT's Strategic Plan ('5 Strategic Outcome Goals' for the *environment*).

The 7 TERM questions has been used as the Table 'key', while an attempt has been made to place the two other reports where they best match the TERM questions

A direct comparison cannot be made as the purpose and format of the reporting frameworks are different (e.g. an environmental *indicator* report versus two transportation *departmental performance* documents).

Anyway some similarities and differences could be noted. First of all there is much overlap between the 'policy questions' defined by the EU and the 'challenges' identified by Transport Canada in particular. Among the shared concerns are the environmental performance of the transportation system, the systems' efficiency, and the environmental quality the vehicle fleet and other technologies.

EU 2000 Transport and Environment Reporting Mechanism	Transport Canada 2000 Sustainable Development Strategy (draft)	US DOT 1997 Strategic goal – Human and Natural Environment
“7 Policy questions”	“7 Challenges”	“5 Strategic Outcome Goals”
Is the environmental performance of the transport sector improving?	Reducing Pollution of Land and Water Reducing Air Emissions	Reduce the amount of transportation-related pollutants and greenhouse gases released Reduce the adverse effects of siting, construction and operation of transportation facilities
Are we getting better at managing transport demand and at improving the modal split?		
Are spatial and transport planning becoming better coordinated so as to match transport demand to the needs of access?		Improve the sustainability and livability of communities through investments in transportation facilities.
Are we optimizing the use of existing transport infrastructure capacity and moving towards a better-balanced intermodal transport system?	Promoting a More Efficient Transportation System	
Are we moving towards a fairer and more efficient pricing system, which ensures that external costs are recovered?		
How rapidly are improved technologies being implemented and how efficiently are vehicles being used?	Promoting Improved Technology for Sustainable Transportation	
How effectively are environmental management and monitoring tools being used to support policy and decision-making?	Improving Environmental Management in the Transportation Sector Developing Tools for Better Decisions Improving Education and Awareness of Sustainable Transportation	Improve the natural environment and communities affected by DOT-owned facilities and equipment

A noteworthy *difference* is that the EU approach appears to cover a broader range of ‘surrounding’ policy issues, including also transport demand, land-use/accessibility control and pricing policies.

On the other hand TC’s (and to some extent US DOT’s) approach seems more focused on management challenges and internal responsibilities, reflecting the departmental performance context of those documents.

Part of the explanation for the differences are that several issues included in the EU report (such as indicators of demand, systems efficiency and safety) are not seen as part of the environmental goal (DOT), or the SD strategy (TC), but appears in other sections of departmental reporting. This obviously reflects the European emphasis put on integrating environmental concerns with (other) sector policy issues.

Another main difference already noted above is the closer link to departmental responsibilities and commitments in the US/Canadian performance reporting (e.g. US and Canadian goals for reducing negative impacts through instruments such as decision making tools, management of own facilities and environmental management systems). This is less due to regional policy variations than to the difference between performance reporting and general 'system' indicators.

However the EU TERM report *does* also include policy management issues (question 7), but those issues are seen more from an outside evaluation perspective, rather than an inside management perspective. This suggests a possibly converging policy development: The North American departmental performance reporting approach seems to be reaching 'outwards' for more results (=outcome) oriented performance goals; whereas the European indicator reporting is reaching 'inwards' for policy related 'response' (=output) indicators. Bridging the gap between policy making and system development indicators (from both sides) may be a necessary move to increase accountability. However, as noted in both the US and Canada examples, this bridge may not be easy to build.

7.3 Comparing indicator frameworks

In the following some more detailed features are compared across an extended set of transportation and environment indicator frameworks. The following abbreviations are used of the reports in the tables and text below:

- ME DK 2000 is the annual report on Selected Environmental Indicators issued by the *Danish Ministry of Environment and Energy* (not mentioned earlier)
- TERM 2000 is the *EU* annual Transport and Environment indicators report (described in the above)
- US DOT 2000a is DOT's 1999 Performance Report/2001 Performance Plan
- US DOT 2000b is DOT's new monthly report *Transportation Indicators*
- US EPA 1999 is EPA's report on Indicators of the Environmental Impacts of Transportation
- TC 1997 is the *Sustainable Development Strategy* of Transport Canada (1997)
- EC 1998 is the Environmental Bulletin from *Environment Canada* (1998)
- STPI 2000 is the report from the first phase of the Sustainable Transportation Performance Indicators project (Gilbert & Tanguay 2000). It is bracketed in the table because it is not an official

publication but preliminary suggestions in an ongoing research project.

The two Tables below provide an overview of the comparisons.

The *first Table* illustrates the types of *environmental themes* covered by a number of indicator reports. *The second one* emphasizes a number of other issues, as described in the following.

'Indicators' here mainly refer to *information illustrated with quantitative variables*. Qualitative information is not counted as indicators here.

It should be noted that the comparisons are *preliminary* and based on very limited information. The quality or comparability of data has for instance NOT been assessed.

Environmental Themes

	ME DK 2000	TERM 2000	US DOT 2000 a	US DOT 2000 b	US EPA 1999	TC 1997	EC 1998	(STPI 2000)
Energy								
Air/Climate								
Land/ Nature								
Water/Sea								
Noise								
Accidents/risk								
Hazardous mat.								
Waste/recycling								
Material input								
Cultural resour.								
Visual impact								

Other Features

	ME DK 2000	TERM 2000	US DOT 2000 a	US DOT 2000b	US EPA 1999	TC 1997	EC 1998	(STPI 2000)
Report Scope	E	T&E	T	T	T&E	T&E	T&E	(T&E)
No. of indicators	14	31	11	4	166	42	4	(81)
Period	Annual	Annual	Annual	Month	No	Annual	No	-
System/LC	No	No	No	No	Yes	No	No	(No)
Modes	All	All	Motor	Motor	Motor	Motor	Motor	(Motor)
Driving Forces	Yes	Yes	Yes	Yes	No	No	Yes	(No)
Response	No	Yes	Yes	No	No	Yes	No	(No)
Targets	Few	None	Many	None	None	Few	None	(Yes)
Efficiency	Yes	Yes	Yes	Yes	Yes	Yes	Yes	(Yes)
Benchmarking	No	Yes	No	No	No	No	No	(No)
Stakeholders	tech	tech/pub	tech/pub	tech	tech	tech/pub	tech	tech/pub
Decision link	No	Weak	Medium	No	Weak	Medium	No	-

Notes: The 6 reports towards the right in bold face are North American. See reference list for details and see text for qualifications.

Environmental themes (upper Table)

It is striking that the two major US documents (US DOT 2000a and US EPA's 'Environmental impacts of transportation' indicators report) have indicators for the broadest range of environmental themes of the reports. They both include indicators of energy use, air emissions, noise, waste, and accidents/risks, nature/landscape impact, etc. (it should be noted that EPA does not include traffic accidents but focus on environmental risk factors).

The European TERM, TC 1997 (and the experimental Canadian STPI) are also broad in environmental scope, although less so than those two US ones. Some of the others reports (the Danish ME DK, EC 1998 and UD DOT 2000b) typically only have indicators on *emissions* and/or *energy* use.

The differences can largely be ascribed to the different purpose and focus of the reports. An 'environmental indicator' is clearly not the same thing in every context.

- The research oriented EPA report explicitly aims to cover as large a picture as possible, regardless of the environmental or policy relevance of each particular indicator. Most of the other reports serve more focused policy purposes, where indicators are carefully selected for relevance. It should also be noted that the full list of EPA indicators is not tracked continuously.
- The US DOT Performance report (US DOT 2000a) owes its range of performance indicators partly to a broad spectrum of legislative mandates (for e.g. Wetlands protection and Hazardous waste), some of which are typically not considered transportation policy related in Europe (like Fisheries protection or Oil spills). Also, there are only one or two indicator per impact. The EPA report has scores of indicators for some impacts, and is therefore far more *extensive* than the DOT one despite a similar *range* of impact types
- The more limited range included in the environmental indicator publications (like the Danish ME DK 2000 and EC 1998) can be explained by the fact that transportation is not the particular focus of those reports. Other environmental themes are covered in other sections of those reports. The reverse is the case for US DOT 2000b (transportation indicators report).

Apart from this, the differences also *could* suggest more awareness in the US of the range of environmental impacts that may be ascribed to transportation systems.

Other Issues (lower Table):

Report scope

The scope refers to if the reporting framework is transportation, environment or transportation & environment focused. Four reports all specifically address *transportation & environment* together (the EU TERM as well US EPA, and the Canadian TC and STPI). In contrast, both US DOT reports have *environmental* issues as part of general *transportation* reporting, while EC's Indicator Bulletins and the Danish indicator report and has some *transportation* indicators as a part of *environmental* reporting.

No. of indicators

The number of indicators is somewhat difficult to compare across the various reporting scopes. The numbers in the Table here refer only to *transportation & environment* related indicators. For the Danish ME DK (and EC's) report the number thus only refers to indicators mentioned in the *transportation* section (or bulletin). Conversely the 11 indicators included under US DOT (2000a) incorporate only the ones for the strategic *environmental* goal (not the full set of 66 indicators for all 5 goals). For TC's SD strategy all 42 commitments are counted as transportation & environment indicators (which in fact they not quite are – see section 4.2). The same goes for the entire set of 166 indicators reported by the EPA (which should be fair enough). The latter obviously has by far the largest set, although the earlier remark about that report should be recalled (no continuous monitoring of the comprehensive indicator set).

Period

Refers to the publication frequency. Most reports are annual. The US DOT (2000b) report on transportation indicators has an ambitious monthly reporting schedule. A few are not periodicals.

System/LC

Only the US EPA 1999 adopts a comprehensive System/Life Cycle approach, with all transportation system elements included and several stages of the life cycle of those from production, to use, to disposal. The other reports apply a more limited perspective, mainly focusing on indicators for the immediate impacts of traffic (e.g. emissions and noise and waste outputs), and a few other impacts. Again the earlier remark about the EPA report should be recalled.

Modes

Most reports have some indicators for all motorized modes. The US EPA report has the most extensive and systematic coverage for each of the modes (Road, Rail, Air, Sea). Only the Danish and European report also have information on bicycle use trends (in Denmark referring to a policy target for bicycle share of modal split). It is not quite correct that 'All' modes are included, as there are no data e.g. on walking.

Driving Force indicators

Driving Forces are the underlying socio-economic and spatial changes driving the environmental pressures of transportation. Most reports have some information about economic or transportation trends, although not necessarily as part of environmental reporting as such. Only US EPA 1999 and TC 1997 do *not* include this kind of indicators. For TC this kind of information is reported elsewhere. For EPA that is explained by the fact that transportation (or 'Activity') data are considered of limited value to measure the environmental outcomes. In contrast, the EU TERM approach does not see transportation trends as poor surrogates for environmental outcome indicators, but as important underlying trends in their own right.

Response indicators

Response indicators refer to the policy outputs adopted as a response to the environmental impact caused by transportation. Indicators of response can be important for accountability and policy performance assessment. As can be seen the departmental performance reporting frameworks all have some response information, whereas the system indicators reports does not. The Canadian TC's revised SD strategy adopts a *layered reporting framework*, where outcome and output indicators both have a place. The European TERM report is somewhat unique in its attempt to include several response indicators in a non-departmental reporting framework.

Targets

Targets are important to measure progress and increase accountability. It should be noted however that the use of targets does not guarantee a more 'stringent' approach, as targets may be lenient. The most clearly target based approach is the performance planning of the US DOT (2000a). The TC 1997 has many commitments but few actual targets. The revised SD strategy will reportedly have several more measurable targets. The European TERM does not have actual quantitative targets, because special transportation policy targets have not been defined at EU level at this point. However TERM has the 7 qualitative policy objectives and does also refer to some general environmental targets of relevance for transportation.

Efficiency

Efficiency has several meanings. According to some environmental strategies, policies should aim to increase the benefits derived from transportation while minimizing the physical inputs required (=Eco-efficiency). All of the reports does have some kind of efficiency indicators showing for instance the trend in transportation emissions or energy use, in relation to trends in overall transport demand or traffic levels, or average fuel efficiency of motor vehicles. Few have any efficiency indicators outside the area of fuel use and emissions.

Benchmarking

Benchmarks can serve to compare performance and inspire to adopt practices from front runners. Only the TERM report has benchmarks in the shape of comparative performance information across EU member states for a number of indicators. This feature is somewhat unique compared to the North American reports. It is not very sur-

prising that this information is included in TERM as the EU consists of individual member states that are used to compare and compete with on another on numerous issues. For a European it is more surprising that no similar indicators seem to be included in some of the US or Canada reports, where there should be ample opportunity to benchmark States, Provinces or Metropolitan Areas against one another. This may be less relevant in agency performance plans and reports, but it could in principle be a part of system indicator reports like the ones presented by US EPA 1999, US DOT 2000b and Environment Canada (EC 1998). The general answer suggested to me during the trip was that comparisons/benchmarks can be politically controversial, and therefore not used by agencies without clear policy mandates to do it.

The following issues are related to the *design and use* of indicator frameworks and not to the particular types of indicators.

Stakeholders

Involvement of stakeholders in defining goals and indicators may increase the likelihood that relevant issues are monitored. Technical involvement of outside experts is often necessary to secure data sources or quality. Public involvement can make it more likely that someone will show an interest in the reported results. It appears that most of the reporting frameworks are based on some kind of stakeholder involvement, at least of a technical kind. The US DOT has more stakeholder involvement in defining strategic goals than the annual targets. Transport Canada revised SD strategy seems to adopt very extensive procedures for involvement of both technical experts and potential users (as does the STPI project). However, it is has not been possible to explore the extent or impact of involvement in designing and revising all the different indicator systems described here. The information in the Table should be seen as very tentative.

Decision link

'Decision link' refers to if reporting is fed into a decision making context. The link may be relatively strong if there is a legislative mandate to report into a key public decision making situation like a budget or appropriations process. The link may be weak if the information is not provided to decision-makers, or there is no established procedure for their response to the information.

As noted before the US GPRA performance plans and reports and the Canadian counterparts does have formalized decision links, where the US links appears to be the strongest of the two, due to stronger legislative mandates and a more open ended political budget process. However, the actual strength of those links may still be limited, because the actual response is not directly formalized (for instance in terms of designated 'rewards' for good performance or otherwise). The European TERM has been set up to report findings to key decision-makers at political level in the EU and member states, and therefore has a decision link. It may be called a 'weak' link however, because at this point there are no provisions for exactly how the information should be used. It is not related to any budget decisions.

To expand a bit more on the important issue of linking performance reporting and decision making, an analytical hierarchy of 'decision links' will be outlined below, and tentatively applied to the European versus the North American reporting frameworks. In the hierarchy 3 levels of indicator framework usage is defined. Within each level two sub-levels of decision impact is stipulated:

A. Information level

1. Information about policy related issues are communicated to decision makers and the public
2. Information structures are changed and focused

B. Decision link level

3. Performance planning information is linked to particular decision making situations
4. Particular decisions are made contingent upon certain performance outcomes (formalised reward/punishment; 'performance budgeting' etc.)

C. Policy making level

5. Systematic use of performance goals and outcomes for major policy decisions (including program m and policy development; budget allocations, etc.)
6. Institutional structures are changed to facilitate policy performance in relation to outcomes.

According to the preliminary analysis above the exemplified 'European' approaches to reporting would be at different levels than some of the 'North American' ones.

The EU TERM and the Danish indicator report would belong to Level 'A', the Information level. The reports provide structured information to policy makers and the public in order to focus attention on a number of selected key issues.

The performance oriented reports by US DOT and Transport Canada that are at Level 'B' where links to decision making is a key issue. Performance information has to be tailored to certain decision-making situations, even though the actual use of the information by decision-makers is not defined in advance. Therefore level 'B4' has not been entered.

At the more speculative level 'C' the links to policy making are enhanced or even reversed. Major decisions would be based on systematic performance information, at the possible expense of more 'random' political decisions or 'habitual' administrative rules. At the most ambitious level (C6), the existing institutional structures would be transformed to reflect the main policy goals and reporting needs, rather than historically inherited institutional structures, such as existing government departments and parliamentary committees.

This postulated 'hierarchy' should in no way suggest that 'higher levels' would be more attractive than lower ones. A problem with the 'C' level could for instance be increased risks of technocratic control at the expense of democratic, political processes and informal com-

munication. Moreover, reporting/decision links are in reality much more complex than this simplified structure suggests.

Nevertheless a structure of this kind could be a possible 'model' to describe different approaches as part of further research.

7.4 Summing up comparisons

Some features of the preliminary comparisons can be highlighted:

- The US EPA transportation indicator report has the broadest and most extensive coverage of environmental impacts from transportation systems
- The US DOT performance plan has the most extensive use of targets and the clearest decision links
- The TC's Sustainable Development strategy appears to have the most extensive link between environmental issues and internal management procedures
- The STPI has the most ambitious approach to incorporate sustainable development concerns in a reporting framework (although only at a preliminary stage)

The European TERM approach does not stand out on any of those particular issues. However it seems to bridge several of them in its efforts to integrate environmental concerns in transportation policy making. This feature plus the use of benchmarks may be what distinguishes it mostly from any of the US and Canadian reports. TERM is not directly linked to budgets or decisions at this point.

8 Concluding remarks

As can be seen from the above there are both similarities and differences between frameworks and indicators used to report on transportation and environment in Europe and North America. However the aim of this report has not been to present conclusions from comparative research, but rather to report on possibly interesting findings about performance reporting frameworks and indicators used in the US and Canada.

Some of the most interesting findings are summarized in the following, returning to the 3 main aims of the fellowship described in the introduction:

General frameworks of performance reporting

The US and Canada have established much more formalized government performance reporting procedures than what is common in Denmark, in most European countries, and certainly at the level of the European Union. Ambitious ideas to link government performance to actual outcomes have been introduced and implemented in the two countries and some of the resulting challenges for information management and policy making have been revealed and confronted. Along with formal requirements, government agencies have increasingly become engaged in extensive performance oriented dialogue and learning processes with internal as well as external stakeholders.

The procedures are still under development but they are no longer in an initial phase. Extensive material to learn from approaches, challenges and experiences is available, and should be very useful for Europeans.

Frameworks appear more structured and formalized at the federal than at the state/province and local levels, but that is not necessarily equivalent with 'better' or more useful. There is a two-way relationship between performance at the federal and state/province levels: National monitoring and national results are highly dependent on local actions. Meanwhile responsibilities are transferred to lower levels and increased flexibility is introduced in some areas. The North American experiences in cooperation between the various levels could also be very interesting for the further development of European policy integration.

In any case the experience from US and Canada suggests that indicators can become more useful and have more impact if they are linked to some kind of performance based planning frameworks where indicators are not just information but *management signals* that bureaucracies and decision makers are obliged to respond to in some way.

It is through the provision of *measurable targets for tangible outcomes* and *the formalized links to certain decision making situations* that indicator based planning could have some potential 'teeth'. In the same

mouthful it should be added that biting may not always be the best way to use them. Communication and learning appears to be just as important elements in well functioned performance-planning frameworks.

It is also evident that the institutional frameworks within which performance based planning takes place are very important:

- Departmental structures provide vehicles for systematic planning efforts, but may also serve as barriers to address interagency issues or where there are conflicts.
- Similar or additional disconnects at the political level may mean that signals are not read at the right time or place, or may drown in a sea of other signals.
- Other legislation has substantial influence on the contents, the processes as well as the outcomes of performance planning. Performance planning is not so much a decision making tool in itself, rather it may support and help to integrate other decisions.
- Independent auditing organizations can provide considerable added quality of, and also direction to, performance planning if they are provided with clear mandates and the necessary resources.
- Institutional support and funding for continuous monitoring and data quality assurance is crucial. Without reliable information about the state of the systems (be they transportation or environmental systems), good outcome oriented performance management is not possible.

What the actual consequences of the output performance based planning adopted in North America will be is difficult to say at this point. The results – in terms of e.g. enhanced monitoring systems; more integrated decisions; higher cost-effectiveness; institutional changes; reorientation of budgets; increased customer satisfaction or more trust in government – could be issues for further study.

Integration of environmental and sustainability concerns

Performance planning procedures in North America serves as a framework for some integration of environmental concerns in transportation policy.

In the *US*, this integration appears not so much to be due to requirements of performance legislation itself. Rather it is the result of a historically emerged situation, where some environmental impacts of transportation have been clearly recognized, considerable information has been provided, certain policy mandates already exist, and external pressures makes some level of integration inevitable. Performance planning is then *one* operational channel through which environmental integration efforts can flow.

Air quality obviously stands out as the most 'integrated' impact. Air quality targets and timeframes are defined in environmental legislation (CAAA), and the requirement for transportation planning and investments to comply with those targets are defined in transportation legislation (ISTEA/TEA-21 etc.). The links to decisions are direct, although of a somewhat 'negative' kind: non-compliance means non-

funding. While this framework is impressive, and has a much stronger integration effect than any of the formalized performance planning procedures, it seems that air quality requirements have affected transportation *planning* much more than it has the actual transportation policy *decisions*.

Performance planning in the US has not been affected very much by concepts or indicators of *sustainable development*. This may be due to the limited impact of sustainability thinking and planning in the US in general and perhaps also to the administration's limited efforts to establish 'holistic', interagency strategic performance planning goals and frameworks. More integration may be achieved if customized frameworks such as the one developed by the Interagency Working Group of Sustainable Development Indicators are applied to strategic and performance planning, and if sustainability were to become a subject for closer interagency coordination.

What level of environmental integration will result as performance planning marches on, and what priorities environmental concerns and goals will enjoy in the actual decision making, may only to a limited extent be a function of performance planning procedures themselves as they look today.

This situation could change, however, if performance-planning procedures were reformed along lines adopted in Canada.

In *Canada* the integration of environmental concerns in transportation policy are to a larger extent due to formal requirements of performance planning procedures themselves. This is especially due to the requirements to set up departmental Sustainable Development Strategies, and to report progress of those strategies as part of general departmental performance reporting.

This process is taken quite seriously, not least due to the existence of the independent Commissioner for the Environment and Sustainable Development, with a highly professional auditing approach. Departments establish offices, allocate time and money and hold extensive hearings to develop their Sustainable Development strategies and set up methods and indicators for performance reporting. Intelligent frameworks are invented, and research is initiated to fill in frameworks with actual information. This by itself witnesses a high level of policy integration.

However, it has not been possible to pursue to what extent SD planning have actually had any real impact on major transportation decisions at this point. It seems that several scenarios can be imagined. One possible scenario could be that SD planning and reporting will develop in relative isolation from the core businesses and transportation policies, in other words that limited integration will occur in practice, despite elaborate frameworks. Another scenario could be that SD strategies will gradually encompass the design and evaluation of most transportation related policies, not only inside, but also outside TC, across agencies and federal/provincial levels.

How policy making in this area will progress could also be an interesting issue for further research.

Specific indicators

A broad range of particular indicators are used in transportation, environment and sustainability measurement and planning in the US and Canada. Several other indicators are *in demand*, but not yet operational due to limitations in data, methodologies, funding or conceptual understanding. Indicators that truly *integrate* among transportation environment and sustainability are sparse.

I will not mention all the potentially interesting indicators encountered during the trip, but I will summarize some examples in terms of *system level indicators* and *government performance measures*. *System level indicators* can describe the state of transportation systems, in terms of the service they provide and in terms of their impact on the environment and sustainability. *Government performance measures* link government goals and actions to the driving forces, state, and impact of those systems.

Everywhere there is a recognized need for better transportation system service indicators, in terms of the *mobility* they deliver and the *accessibility* they support. Traditional indicators of traffic volumes, road congestion, and highway level of service etc. are useful but not sufficient to measure of service in this context and therefore has to be supplemented. *Door-to-door travel times* for specific O-D pairs or types of destination functions as explored e.g. in California and elsewhere would certainly be relevant. The data requirements are an obstacle but GIS systems may help overcoming some barriers.

Other interesting examples of service indicators are for instance:

- Percent of urban population living within ¼ mile of a transit stop with service frequency of 15 minutes or less (US DOT Performance plan)
- Ability of non-drivers to reach employment centres and services (suggested by Todd Litman)
- Average number of major services within walking distance of residents, or average walking distance between residences and public services such as schools and retail centres. (suggested by Todd Litman)

Environmental indicators for transportation exist for a range of issues. Most indicators are in terms of environment pressures or stress rather than environmental impact (or end outcome). This is because it is often difficult to trace end impact back to transportation causes, or because transportation only has some share of the responsibility. There are rather good air pollution indicators for both pressure and impact/outcome (in terms of number of people living in areas of non-attainment areas), due to the Clean Air Act and similar legislation in Canada.

The most extensive range of environmental indicators for transportation is presented in the US EPA 1999 report, some of which are shown in section 3.3. of this report. More issues and indicators can be added from other sources including the Canadian and the state and local reports.

The Table below has a list of environmental indicators mined from several of those reports. It is *not* a complete list, but only a small selection of typical or interesting environmental indicators, some of which are included in regular reporting, others in one-time reports, while none of them are purely speculative indicators.

Some indicators in the list in fact challenge what is normally understood by transportation impacts. Those are the USEPA and other indicators that go beyond impact only from the *use* of the transportation systems (actual travel) and measure impact from *construction* of infrastructure, *production* and *scrappage* of vehicles, etc. A life-cycle approach to environmental reporting has generally not been adopted in the US and Canada, but it would be interesting to see if the conception of transportation system boundaries will change in the future reporting.

Sustainability, conceived as a system outcome, is interpreted in widely different ways leading to a variety of indicator types.

Impact	Indicator	Source
Air pollution and Air quality	Tons of mobile source emissions from on-road motor vehicles	USDOT 2000a
	Change in Criteria Pollutant Emissions compared to Vehicle Travel 1940-1997	USEPA 1999
	Criteria Pollutant Emissions from Transportation Vehicle and Equipment Manufacturing (car, rail, aircraft, etc.)	USEPA 1999
	VOC Emissions from Solvent Utilization in Surface Coating for Autos & Light Trucks	USEPA 1999
	Number of days the Pollution Standard Index is in an unhealthy range	NCHRP 2000
	Number of urban areas/pollution classified as in non-attainment	NCHRP 2000
	Customer perception of satisfaction with air quality	NCHRP 2000
	Mobile Source Contribution to Hazardous Air Pollution Inventories (HAPs = causing serious human health effects or ecosystem damage)	USEPA 1999
Climate Change	Share of CO2 Emissions from Transportation	USEPA 1999
	Full Fuel Cycle CO2 –equivalent Emissions for Light-duty Motor Vehicles (grams per mile)	USEPA 1999
	Estimated U.S. Emissions of CFC-12 and HFC-134a (all sources not only transportation)	USEPA 1999
Energy	Transportation energy use per dollar of GDP	USDOT2000b
	Daily energy use on the transportation system	MTC 1998
	Fuel Consumption per VMT	NCHRP 2000
	Average fuel consumption per trip for selected trips	NCHRP 2000
	Company Average Fuel Consumption for passenger cars	NRCAN2000
	Number of vehicle manufacturers submitting complete and timely fuel consumption data	NRCAN2000
Noise	Percent of U.S. Population Exposed to Different Levels of Transportation Noise	USEPA 1999
	Number of noise receptor sites above threshold	NCHRP 2000
	Number of people in U.S. exposed to significant aircraft noise levels	USDOT 2000a
Habitat, Land Use and Biological Resources	Land Area Occupied by Roadways	USEPA 1999
	Percent of region that is developed	NCHRP 2000
	Conversion of resource lands to transportation facilities	MTC 1998
	Wetland Losses and Creation Associated with the Federal Aid Highway Program	USEPA 1999
	Number of Animal Collisions with Motor Vehicles reported	USEPA 1999
Water Quality	Number of Fuel Spills and Total Volume of Fuel Discharged Annually	USEPA 1999
	Gallons of oil spilled by maritime sources per Million Gallon	USDOT 2000a
	Highway Salt Sales	USEPA 1999
	Amount of salt used per VMT or lane mile	NCHRP 2000
Hazardous Materials	Number of Hazardous Materials Incidents	USEPA 1999
	Gallons of hazardous liquid materials spilled per serious transportation incident	USDOT 2000a
Waste/ Recycling	Number of Motor Vehicles Scrapped Annually	USEPA 1999
	Estimated Annual Garbage Generation by U.S. Maritime Sectors	USEPA 1999
	Lead Acid Batteries in Municipal Solid Waste Streams	USEPA 1999
	Disposition of Scrap Tires	USEPA 1999
	Amount of recycled material in road construction	NHCRP 2000

Examples of 1 indicators used or proposed in the US and Canada

None of the US federal indicator systems that have been studied explicitly attempts to integrate transportation and sustainability, except the Interagency Working Group. The group has recently proposed three fairly conventional transportation indicators with no explicit reference to a definition of sustainability.

In California sustainability is one of 9 desired outcomes in transportation performance planning. In this case the conceptual link is clear, conceived in terms of the sustainability (preservation) of the transportation system itself. The proposed indicator, related to relative costs of maintaining the system, may be given up, but the idea of a 'system sustainability' indicator is certainly interesting.

Nevertheless, most of the work on sustainability indicators focuses on the impact of transportation on *other* systems, including social, economic and especially environmental systems. The most extensive work is the Sustainable Transportation Performance Indicators (STPI) project in Canada. By adopting an explicit definition of sustainable transportation, candidate indicators are scrutinized for sustainability relevance, and new indicators proposed.

The STPI analysis points to four candidate indicators as currently the best ones available:

- Number of fatalities and injuries per year in transport
- Average portion of household expenditures devoted to transportation
- Portion of transportation-related costs paid by public funding
- Affordability of public transit service by lower income residents

Those indicators are rated high because they should enable "a strong quantified indication of progress for one or more element(s) of the definition of 'sustainable transportation'". Those indicators therefore deserve to be considered, but as the STPI project also points out more is needed, especially if progress towards *environmental* sustainability is to be measured.

To that effect a number of *indices* are proposed in the STPI project, including the 3 following ones, which would be very useful if they could be made operational:

- Index of specified transport emissions in relation to defined absorption capacity
- Index of specified transport wastes in relation to defined absorption capacity
- Index describing the rates of use of non-renewable materials in relation to the rates of growth of production of renewable replacements

The US and Canada can show many interesting examples of *performance measures*, understood as indicators linking government goals, actions and responsibilities to system outcomes. In many cases the particular indicators refer to particular programs and goals for a par-

ticular agency, and in that case they are not directly transferable to other contexts. In several other cases, the performance measures adopted could be very interesting.

Below some examples of (more or less specific) government performance goals and measures I have found inspirational are listed.

US DOT's performance plan:

- Acres of wetlands replaced for every acre affected by Federal-aid Highway projects
- Number of Environmental Justice cases that remain unresolved over one year

Transport Canada's Sustainable Development Strategy

- Develop and implement TC's own Environmental Management System (EMS) according to ISO 14000 principles.
- Lead and contribute to stakeholder consensus-building on the construction and achievement of a common definition, vision and principles of sustainable transportation
- Fully implement the process of strategic environmental assessment for any new program proposal involving direct budgetary transfers

Natural Resources Canada's Business Plan

- Number of Motor Vehicle manufacturers submitting complete and timely fuel consumption data (Obtain 100% submission rate and timely submission of data)

The National Highway Co-operative Research Program Guidebook

- Customer satisfaction with transportation decisions which impact the environment
- Number of Transportation Control Measures (TCM's) accomplished vs. planned

Todd Litman suggests

- Residents' participation in transportation and land use decision-making.

Finally, perhaps the most interesting challenge of all should not be forgotten, namely the call for *positive indicators of sustainable transportation* from Sue Zielinski, *Moving the Economy* in Toronto.

Sustainability should not only be about measuring limitations, ceilings and restrictions to determine, in effect, the *unsustainability* of transportation, but also about measuring the potential *accomplishments*, the *innovations*, and the *benefits* from transforming our transportation systems and policies to more sustainable ones.

9 Dissemination and use of information from the trip

The results of the study will be used and disseminated in various ways.

First of all this preliminary report will be circulated for comments from organizations visited at the trip and from selected colleagues in Denmark and elsewhere in Europe.

Second, the collected information will inform two ongoing research projects at the National Environmental Research Institute. One is a comparative project about "Indicators of Environmentally Sustainable Transport" conducted for the Danish Transport Council, to be completed in 2001. The other project for the Danish Environmental Protection Agency is to propose a framework of transportation indicators for possible inclusion in the coming National Strategy for Sustainable Development, also to be completed in 2001.

Third, the results will be used as inspiration for the Transport Sector chapter in the next version of the State of the Environment Report for Denmark, due in mid 2001, as well as for the shorter annual Selected Indicators report later in the year.

Fourth, the findings will be reported in a paper presented at "Trafikdage 2001", which is the annual Danish Transport Research Conference with 400 participants, taking place in Aalborg in August 2001.

Fifth, some key findings have already been published as an article in the Internal Newsletter of the National Environment Research Institute (December 2000).

Finally the experience and research ideas generated on the trip has already been used in a post-doc research grant proposal, that has just been awarded from the Danish Transport Council. The project will begin mid-2001 and continue the next 3 years.

10 Acknowledgements

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My deepest thanks goes to all the organizations and individuals in the US and Canada who took the time to meet with me and answer my questions. I cannot mention all the people who have contributed to this extraordinary experience. I can say, however, that everybody has been extremely helpful and every meeting I had was certainly worthwhile the trip, and more.

I would like especially to express my gratitude for the help and hospitality of the following outstanding individuals:

- Roger Gorham with the World Bank in Washington D.C
- Richard Gilbert, Center for Sustainable Transportation, Toronto
- Todd Litman, Victoria Transport Policy Institute
- Joseph Greenblott, US Environmental Protection Agency
- Ted Heinz, David Berry (DOI), Lark Lovering (HUD), and Fred Williams (DOT) all with the Interagency Working Group on Sustainable Development Indicators

Appendix A. Selected references

BTS 1999

Bureau of Transportation Statistics: Source & Accuracy Compendium for performance measures in the DOT 2001 Performance Plan and 1999 Report.

CALTRANS 2000

California Department of Transportation: Transportation System Performance Measures: Status and Prototype Report Transportation System Information Program. Sacramento, October 2000.

IAWG SDI 1998

Sustainable Development in the United States: An Experimental Set of Indicators. A Progress Report Prepared by the U.S. Interagency Working Group on Sustainable Development Indicators, 1998.

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Lyons 1995

Lyons, William M: Policy innovations of the US Intermodal Surface transportation Efficiency Act and Clean Air Act Amendments. *Transportation* 22, pp. 217-240, 1995.

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MTC 1998

1998 Regional Transportation Plan. Draft Environmental Impact Report. Metropolitan Transportation Commission. August 1999.

NCHRP 2000

A Guidebook for Performance-Based Transportation Planning. Transportation Research Board. NCHRP report 665 National Cooperative Highway Research Program. National Academy Press, Washington DC 2000.

NR Can 2000

Business Plan 1999-2000. Office of Energy Efficiency. Natural Resources Canada, Ottawa 2000.

NERI DK 1997

Holten-Andersen, J. et al. (eds.): State of the Environment in Denmark, 1997 Technical report nr 243. National Environmental Research Institute, Roskilde 1997.

OMB 2000

OMB Circular No A-11 Part 2. Preparation and Submission of Strategic Plans, Annual Performance Plans, and Annual Program Performance Reports. Executive Office of The President. Office Of Management And Budget July 2000.

TC 2000a

Towards Sustainable Transportation. A discussion Paper for Transport Canada's Second Sustainable Development Strategy. Transport Canada, May 2000.

TC 2000b

Transport Canada Sustainable Development Strategy Performance Measures Project Report, Program evaluation Branch, Policy Group, Transport Canada. April 2000.

TC 1997

Transport Canada: Transport Canada's Sustainable Development Strategy Ottawa, 1997.

TERM 2000

EEA: Are we moving in the right direction? Indicators on transport and environment integration in the EU. TERM 2000. Environmental issues series No 12. European Environment Agency, Copenhagen 2000.

US DOT 2000a

1999 Performance Report 2001 Performance Plan. U.S. Department of Transportation URL: http://www.dot.gov/ost/ost_temp/

US DOT 2000b

Transportation Indicators. September 2000. U.S. Department of Transportation. Bureau of Transportation Statistics.

USDOT 2000c

1999 Status of the Nation's Highways, Bridges, and Transit: Conditions and Performance United States Department of Transportation Federal Highway Administration. June 2000.

US EPA 2000

Greenblott, Joseph: Measuring Performance under GPRA. Presentation to the Science Advisory Board, Ecological Processes and Effects Committee. 21st September 2000.

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US EPA: Condition of the Mid-Atlantic Estuaries. United States Environmental Protection Agency, November 1998.

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Appendix B Some useful Internet Links

CANADA

Centre for Sustainable Transportation
<http://www.cstctd.org/CSThomepage.htm>

Environment Canada Environmental Indicators Bulletin
<http://www.ec.gc.ca/Ind/English/Transporto/default.cfm>

Moving the Economy Toronto
<http://www.city.toronto.on.ca/mte/>

National Round Table on the Environment and the Economy
http://www.nrtee-trnee.ca/eng/home_e.htm

Natural Resources Canada Office of Energy Efficiency
<http://oee.nrcan.gc.ca/english/>

Transport Canada Sustainable Development Strategy
<http://www.tc.gc.ca/envaffairs/english/sustain.htm>

Victoria Transport Policy Institute
www.vtpi.org

USA

Bureau of Transportation Statistics Transportation Indicators
<http://www.bts.gov/transtu/indicators/>

Caltrans Transportation System Performance Measures
<http://www.dot.ca.gov/hq/tsip/tspm/>

Interagency Working Group on Sustainable Development Indicators
<http://www.sdi.gov/>

OMB - Management Reform/GPRA planning
<http://www.whitehouse.gov/OMB/mgmt-gpra/index.html>

Transportation Research Board. NCHRP web documents
<http://www4.nas.edu/trb/crp.nsf/reference%5Cappendices/Web+Docs>

US General Accounting Office
www.gao.gov

US DOT Strategic and Performance Planning
<http://ostpxweb.dot.gov/budget/8measure.htm>

US EPA Strategic and Performance Planning
<http://www.epa.gov/ocfopage/>

US EPA Transportation indicators
<http://www.epa.gov/oppetptr/rap.htm>

OTHER

European Environment Agency TERM
<http://themes.eea.eu.int/theme.php/activities/transport>

National Environmental Research Institute Denmark
http://www.dmu.dk/1_english/default.asp

Appendix C. Map of cities visited



Appendix D. Meetings

USA

Washington DC

- US EPA Office of Transportation and Air Quality
- US EPA Office of the Chief Financial Officer
- Department of the Interior, Office of Policy Analysis
- The Interagency Working Group on Sustainable Development Indicators
- Transportation Research Board
- US General Accounting Office
- The Office of Management and Budget (OMB)
- The World Bank
- US Department of Transportation
- Federal Highway Administration
- Bureau of Transportation Statistics
- Federal Transit Administration

Sacramento

- Caltrans

San Francisco/Oakland

- Cambridge Systematics
- Bay Area Metropolitan Transportation Commission

Boston

- Volpe National Transportation Systems Center

Canada

Ottawa

- Transport Canada
- Natural Resources Canada
- Environment Canada
- Commissioner of the Environment and Sustainable Development
- Office of the Auditor General
- Treasury Board of Canada
- National Round Table on the Environment and the Economy
- Institute on Governance
- Public Policy Forum

Toronto

- IBI Consulting Group
- The Center for Sustainable Transportation
- University of Toronto, Environmental Studies
- City of Toronto, Moving the Economy
- Jed Brugmann/ICLEI

Victoria

- Tony Hodge Consulting
- Victoria Transport Policy Institute
- BC Ministry of Transport
- BC Ministry of Environment

Vancouver

- Translink

National Environmental Research Institute

The National Environmental Research Institute, NERI, is a research institute of the Ministry of Environment and Energy. In Danish, NERI is called *Danmarks Miljøundersøgelser (DMU)*.

NERI's tasks are primarily to conduct research, collect data, and give advice on problems related to the environment and nature.

Addresses:

URL: <http://www.dmu.dk>

National Environmental Research Institute
Frederiksborgvej 399
PO Box 358
DK-4000 Roskilde
Denmark
Tel: +45 46 30 12 00
Fax: +45 46 30 11 14

Management
Personnel and Economy Secretariat
Research and Development Section
Department of Atmospheric Environment
Department of Environmental Chemistry
Department of Policy Analysis
Department of Marine Ecology
Department of Microbial Ecology and Biotechnology
Department of Arctic Environment

National Environmental Research Institute
Vejlsøvej 25
PO Box 314
DK-8600 Silkeborg
Denmark
Tel: +45 89 20 14 00
Fax: +45 89 20 14 14

Environmental Monitoring Co-ordination Section
Department of Lake and Estuarine Ecology
Department of Terrestrial Ecology
Department of Streams and Riparian areas

National Environmental Research Institute
Grenåvej 12-14, Kalø
DK-8410 Rønde
Denmark
Tel: +45 89 20 17 00
Fax: +45 89 20 15 15

Department of Landscape Ecology
Department of Coastal Zone Ecology

Publications:

NERI publishes professional reports, technical instructions, and the annual report. A R&D projects' catalogue is available in an electronic version on the World Wide Web.

Included in the annual report is a list of the publications from the current year.