ENRICHING SUSTAINABLE TRANSPORT DECISIONS: INPUTS FROM OPERATIONS RESEARCH AND THE MANAGEMENT SCIENCES

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1. PRESENTATION CONTEXT AND OUTLINE

Findings from the 2008-2009 Transport Canada project, *Methodologies for Identifying and Ranking Sustainable Transport Practices in Urban Regions* (Wellar, 2008d) reveal that the research methodologies, methods, and techniques from a number of disciplines apply to the process of making decisions about sustainable transport practices. Evidence in that regard is provided by: 1) the results of keyword-based literature searches; 2) the responses of municipal governments to a survey on the methodologies, methods, and techniques that ***are used***; and 3), the commentaries of experts on the methods and techniques that ***could be used***. The findings are presented in eleven project reports which can be accessed at: http://www.wellarconsulting.com/.

This presentation first outlines the major elements and findings of the Transport Canada project. We then suggest how the Operations Research or Operational Research, and Management Sciences (OR/MS) fields could build on that project to enhance the OR/MS contribution to the body of methods and techniques used by municipal governments in making decisions about identifying, adopting, and implementing sustainable transport (ST) practices.

The third part of the presentation introduces several OR/MS-based initiatives that we believe could significantly expand the research agenda that has been initiated by the Transport Canada project. Our emphasis in this regard is on drawing attention to what we perceive to be fundamental needs that arise as a result of the empirical lessons learned from the Transport Canada project.

In the next several pages the titles of the PowerPoint slides are listed, followed by the texts, tables, and other graphics that appear on the slides. The presentation is concluded by a section that contains comments on the slides. We believe that these comments may be informative for viewers not in attendance at the presentation, and they may also be of assistance to conference attendees in raising questions about particular slides or the presentation in general.

It is noted in closing this section that the title used in the program for the CORS-INFORMS conference is, ***OR and MS Inputs to Decisions about Sustainable Transport Practices,*** and the abstract is similarly brief and generic. The emphasis on brevity complies with the instructions from conference organizers to authors.

The title that we use here provides more direction and detail about the intention of our presentation, and the content and outline description expands the abstract by adding details about the different topics that are covered in the slides and slide commentaries.

2. LIST OF SLIDES FOR 2009 CORS-INFORMS PRESENTATION

Part A. Background to the Transport Canada Project

The background is represented by 8 PowerPoint (PPT) slides, which are titled as follows:

Slide 1. Transport Project Overview: Synopsis Report
Slide 2. Methods and Techniques for Deriving Best Practices
Slide 3. Survey of Municipal Governments – Methodology
Slide 4. Survey of Municipal Governments – Research Procedures Used for Identifying Practices
Slide 5. Survey of Municipal Governments – Decision Procedures Used for Adopting Practices
Slide 6. Survey of Municipal Governments – Decision Procedures Used for Implementing Practices
Slide 7. Indicative List of Methods and Techniques that Could Be Used in Making Decisions about Sustainable Transport Practices
Slide 8. Commentaries on Selected Methods and Techniques

Part B. Building on the Transport Canada Project

Four slides contain suggestions on how the OR/MS fields could build directly on the Transport Canada project.

Slide 9. Examine the Survey Responses for OR/MS Aspects
Slide 10. Modify the Survey Questions to Focus on OR/MS
Slide 11. Add OR/MS Entries to the List of Methods and Techniques
Slide 12. Add Commentaries for Existing or New OR/MS Methods or Techniques

Part C. Suggested Initiatives for Extending OR/MS Research Involving Sustainable Transport Decisions and Practices

At the time of this writing four very important initiatives seem particularly appropriate for discussion at the 2009 CORS-INFORMS conference. However, and for the reasons given in Part C in the next section where we elaborate the initiatives, we are compelled to forewarn the viewer that each of suggestions could be as difficult to achieve as it is important.

As a result, the suggestions should not be taken at face value or treated casually, but should be subjected to careful consideration.

Slide 13. Explain Sustainability by Mode in OR/MS Terms
Slide 14. Explain the Legacy Factor in OR/MS Terms across All Modes
Slide 15. Illustrate How OR/MS Analysis Can Be Popularized, and Made More Transparent (More of it "Outside the Box")
Slide 16. Demonstrate How the OR/MS Approach Can Open the Door to Creative, Path-Changing, Innovative Roles for Quantitative Analysts in Municipal Government.

3. CONTENT OF SLIDES FOR 2009 CORS-INFORMS PRESENTATION

(Note: Links are included to assist readers who wish to examine the Transport Canada project report associated with the content of the respective slides.)

Part A. Background to the Transport Canada Project

1. Transport Project Overview: Synopsis Report
www.wellar.ca/wellarconsulting/TCProjectSynopsis.pdf

Project Understanding
Key Issues
Approach and Methodology

2. Methods and Techniques for Deriving Best Practices
www.wellar.ca/wellarconsulting/TC Project Research Report 1.pdf

Methods and Techniques that:
Are Used
Could Be Used
Should Be Used

3. Survey of Municipal Governments – Methodology

www.wellar.ca/wellarconsulting/TC Project Research Report 1.pdf

Table 1. Preliminary Selection of Values, Principles, and Assumptions that Could Be Used in a Philosophical Framework to Guide Research on How to Identify, Adopt or Implement Sustainable Urban Transport Practices

4. Survey of Municipal Governments – Research Procedures Used for Identifying Practices

www.wellar.ca/wellarconsulting/TC Project_IR6_Revised_Final.pdf

What research procedures are used to identify sustainable urban transport practices?

5. Survey of Municipal Governments – Decision Procedures Used for Adopting Practices

www.wellar.ca/wellarconsulting/TC Project_IR6_Revised_Final.pdf

What decision procedures are used to choose between sustainable urban transport practices to adopt and sustainable urban transport practices to not adopt?

6. Survey of Municipal Governments – Decision Procedures Used for Implementing Practices

www.wellar.ca/wellarconsulting/TC Project_IR6_Revised_Final.pdf

What decision procedures are used to choose between sustainable urban transport practices to implement and sustainable urban transport practices to not implement?

7. Indicative List of Methods and Techniques that Could Be Used in Making Decisions About Sustainable Transport Practices

www.wellar.ca/wellarconsulting/TC Project Research Report 2.pdf

Table 1. Initial Selection of Methods and Techniques that *Could Be Used* in Making Decisions about Identifying, Adopting, and Implementing Sustainable Transport Practices

1. Anatomical Sourcing
2. Attitudinal Surveys
3. Authority
4. Brainstorming
5. Charrette
6. Committee Approach
7. Common Sense
8. Comparative Analysis
9. Copycat/Follow the Leader
10. Cost-Benefit Analysis
11. Cost-Effectiveness Analysis
12. Counterfoil Research
13. Cross-Impact Analysis
14. Econometric Analysis
15. Focus Groups
16. Follow the Money
17. Forecasting Delphi
18. Highest and Best Use
19. Impact Assessment
20. Indicators
21. Indexing
22. Life-Cycle Analysis
23. Modelling
24. Normative Delphi
25. NIMBY Strategy
26. Open House
27. Opinion Polls
28. Optimization
29. Panel Evaluation
30. Pilot Study
31. Policy Delphi
32. Pre-Test
33. Referenda
34. Roundtables
35. Scaling
36. Simulation
37. Squeaky Wheel
38. Surveys
39. Trial Run
40. Walking Security Index
41. Workshops
42. YIMBY Strategy

8. Commentaries on Selected Methods and Techniques

www.wellar.ca/wellarconsulting/TC Project Research Report 3.pdf

Table 2. Commentaries on Selected Methods and Techniques that *Could Be Used* in Making Decisions about Identifying, Adopting, and Implementing Sustainable Transport Practices, and Names of Commentators

Name of Method or Technique	Commentator
1. Anatomical Sourcing	Barry Wellar
2. Benefit-Cost Analysis Cost-Benefit Analysis	Barry Wellar
3. Common Sense	Barry Wellar
4. Counterfoil Research	Barry Wellar
5. Cross-Impact Analysis	Victor Bañuls
6. Delphi Trend Forecasting	Murray Turoff
7. Dynamic Delphi	Connie White
8. Follow the Money	Barry Wellar
9. Forecasting Delphi	Murray Turoff
10. Impact Assessment (1)	William Garrison
11. Impact Assessment (2)	Barry Wellar
12. Indexing	Barry Wellar
13. Life-Cycle Analysis	Barry Wellar
14. Multi-Criteria Decision Making	Anjali Awasthi
15. Normative Delphi	Barry Wellar
16. Open House	Barry Wellar
17. Policy Delphi	Murray Turoff
18. Surveys	Jean Andrey
19. Walking Security Index	Barry Wellar

Part B. Building on the Transport Canada Project

9. Examine the Survey Responses for OR/MS Aspects

www.wellar.ca/wellarconsulting/TC Project_IR6_Revised_Final.pdf

Responses may: a) be prepared by people trained in OR/MS; b) represent an OR/MS culture in a municipal government; or c), “inadvertently” reflect OR/MS methodologies, methods, and techniques. The survey offers a starting point for ascertaining the status of OR/MS in municipal governments.

10. Modify the Survey Questions to Focus on OR/MS

www.wellar.ca/wellarconsulting/TC Project Interim Report 3.pdf

What **OR/MS** procedures are used to identify sustainable urban transport practices?

What **OR/MS** procedures are used to choose between sustainable urban transport practices to adopt and sustainable urban transport practices to not adopt?

What **OR/MS** procedures are used to choose between sustainable urban transport practices to implement and sustainable urban transport practices to not implement?

11. Add OR/MS Entries to the List of Methods and Techniques

www.wellar.ca/wellarconsulting/TC Project Research Report 2.pdf

The current selection of Ms and Ts includes some OR/MS entries. There is need for more entries from the OR/MS communities.

12. Add Commentaries for Existing or New OR/MS Methods or Techniques

www.wellar.ca/wellarconsulting/TC Project Research Report 3.pdf

The experiment of providing two-page, plain-language, self-contained commentaries on research methods or techniques that ***could be used*** in making decisions about non-trivial sustainable transport practices was positively received. Additional contributions from the OR/MS communities will enrich the discourse.

Part C. Suggestions for Extending OR/MS Research Involving Sustainable Transport Decisions and Practices

For this part of the paper, we draw on experience in both curiosity-driven research and client-driven research (Wellar, 2005b) in proposing the selected initiatives. Before doing so, however, it is necessary that we preface our

suggestions with a *caveat*. This way, the viewer is disabused from the outset of any notion that what we have in mind for the OR/MS communities will be easy.
In brief, the concept of sustainability has considerable popular appeal, and is widely accepted in principle (Wellar, 2006). Unfortunately, the evidence from extensive literature searches (Wellar, 2006, 2008c, 2008f), and from an initial survey of municipal governments (Wellar, 2008h, 2009a, 2009b), appears to demonstrate that much of the attraction and acceptance of the idea of sustainability is of a visceral nature. That is, relatively little analytical thought and vigorous effort has gone into rigorously critiquing the concept of sustainability, and ensuring that we are not looking through rose-coloured glasses when it comes to the matter of achieving sustainable transport practices.

In offering the following suggestions, therefore, we also emphasize that each of them is at the upper end of the degree of difficulty scale, and will involve considerable amounts of mental heavy lifting, and persistence, to move them forward in the public policy arena.

13. Explain Sustainability by Mode in OR/MS Terms

This initiative represents a large opportunity for the OR/MS communities to make a major contribution to enriching sustainable transport decisions through quantitative work that:

1) Encompasses all modes and systems of transport for moving people, freight, and data.

2) Provides a substantive basis for ranking sustainable transport practices from worst to best.

14. Explain the Legacy Factor in OR/MS Terms Across All Modes

Current transport systems and components are an imprint of decisions of the past, and this legacy is locked in by historic path dependence. For each transport mode, the legacy lock needs to be examined and explained in the quantitative ways of OR and MS in order for municipal governments to make enlightened sustainable transport decisions.

15. Illustrate How OR/MS Analysis Can Be Popularized, and Made More Transparent (More of it "Outside the Box")

Transportation issues are daily topics in the popular media such as newspapers, television, and radio. A challenge to the academic and practitioner OR/MS communities is to express OR/MS analyses in ways that are suitable for use in the popular media, and are readily understandable by ordinary folk.

16. Demonstrate How OR/MS Can Open the Door to More Creative, Path-Changing, and Innovative Roles for Quantitative Analysts in Municipal Government

The tasks of identifying, adopting, and implementing sustainable transport practices all require new ways of thinking about the problem and its solution set. In our experience many local governments are hungry for suggestions from the academic and practitioner OR/MS communities that substantively and imaginatively contribute to this discourse. A creative options style is recommended.

4. COMMENTS ON THE POWERPOINT SLIDES

Our objective is to make the report behind the 2009 CORS-INFORMS presentation as self-contained as skills, time, and resources permit. As a result, brief comments on the slides are included to explain positions taken, provide pointers to guide proposed research activities by the OR/MS communities, and/or attempt to address potential questions about particular slides or the presentation in general.

Part A. Background to the Transport Canada Project

Slide 1. Transport Project Overview: Synopsis Report

Comment: The core elements of the contract for the Transport Canada project are summarized in the synopsis report (Wellar, 2008d). The synopsis is required reading for those who wish to fully understand the project's research design, connections between research reports, and project findings.

Slide 2. Methods and Techniques for Deriving Best Practices

Comment. The validity of claims about purported "best practices" is directly affected by the bases upon which the claims are made. As a result, it is imperative that the bases upon which claims of "best practices" rely are critically evaluated before accepting or rejecting such claims. As suggested by the Transport Canada project, the importance of documenting and understanding the how -- methods and techniques – of deriving the practices cannot be over-emphasized (Wellar, 2008g).

Slide 3. Survey of Municipal Governments – Methodology

Comment. The term "methodology" frequently appears in municipal government documents, but seldom is it defined functionally and structurally. This part of the survey is designed to ascertain whether and how methodologies are explicitly part of the bases for deriving sustainable transport practices in general, and purported best practices in particular. Of paramount interest are values, principles, assumptions, and other methodological parameters (Wellar, 2008h).

Slide 4. Survey of Municipal Governments – Research Procedures Used for Identifying Practices

Comment. In the interests of avoiding bias or otherwise influencing responses, the term "research procedures" was used in the survey as the way of ascertaining the research methods, research techniques, research operations, inquiring instruments, inquiring procedures, or whatever other means are used by municipal governments to identify sustainable transport practices. The central point of this question is that sustainable transport practices do not magically emerge from the ether, they are derived, and this part of the survey seeks information on how that derivation process works.

Slide 5. Survey of Municipal Governments – Decision Procedures Used for Adopting Practices

Comment. There is a body of logic, reasoning, experience, etc., that comprises or represents the procedures used by municipal governments in their decisions to adopt or not adopt a sustainable transport practice they have identified. This part of the survey asks them to provide information as to what those procedures are, that is, to report on the lines of thinking or reasoning that lead to decisions to adopt or not adopt a practice.

Slide 6. Survey of Municipal Governments – Decision Procedures Used for Implementing Practices

Comment. Similarly, there is a body of logic, experience, etc., that comprises or represents the procedures used by municipal governments in their decisions to

implement or not implement a sustainable transport practice that has been adopted. This part of the survey asks them to provide information as to what those procedures are, that is, to report on the lines of thinking or reasoning that lead to decisions to implement or not implement a practice.

Slide 7. Indicative List of Methods and Techniques that Could Be Used in Making Decisions about ST Practices

Comment. Appreciation and evaluation of the methods and techniques that are used depends in part upon the number and types of methods and techniques that could be used. The array in Table 1 provides an indication of the potential body of methods and techniques that could be used, and serves as an informal context for examining responses to the survey.

Slide 8. Commentaries on Selected Methods and Techniques

Comment. There are likely 80 to 100 or more methods and techniques that could be used in making decisions about sustainable transport practices. These commentaries provide an illustration of how the methods and techniques can be described in lay terms, and provide a basis for further contributions.

Part B. Building on the Transport Canada Project

Slide 9. Examine the Survey Responses for OR/MS Aspects

Comment. It could informative for the OR/MS communities (academic, practitioner) to review the survey responses for opportunities to learn about the state of OR/MS use in municipal governments. Further, the responses might suggest municipal governments that could make better use of OR/MS research procedures and decision procedures during the processes of identifying, adopting, and implementing sustainable transport practices.

Slide 10. Modify the Survey Questions to Focus on OR/MS

Comment. The initial survey was of a general, open-ended nature. A follow-on survey that focuses on OR/MS methodologies, methods, and techniques could be a very productive way to learn more about the status of and future prospects for municipal governments' use of quantitative procedures in identifying, adopting, or implementing sustainable transport practices, and then monitoring and evaluating the associated decisions and outcomes. A contribution of particular value would be to support and advance earlier work on revising and improving the measures of transportation system performance (Garrison, 1965; 2007; Garrison and Levinson, 2006: Steger, 1966; Wellar, 2007a, 2008b).

Slide 11. Add OR/MS Entries to the List of Methods and Techniques

Comment. Research Report 1 (Wellar, 2008e) lists 32 disciplines and academic programs that have acquired reputations for contributing methods and techniques to the process of making decisions about identifying, adopting, and implementing sustainable transport practices. It is likely that researchers in some of those disciplines and programs, as well as in disciplines and programs not cited, will increase the representation of their disciplines beyond the methods and techniques shown in the list prepared for the Transport Canada project.

In the work done for the Transport Canada project, the OR/MS fields did not surface as a force in the sustainable transport practice department. In the event of an unfair determination, it is requested/recommended that the OR/MS communities make a special effort of correcting the oversight by comprehensively informing municipal governments of their disciplines' offerings.

Slide 12. Add Commentaries for Existing or New OR/MS Methods or Techniques

Comment. Post-project requests have been received from politicians, professional staff, university students, ordinary citizens, and journalists for similar commentaries on more methods and techniques. The Transport Canada project appears to provide a good model for OR/MS researchers, and seems to have created an audience for this kind of communication. No doubt additional commentaries from the OR/MS communities would be received with great interest by anyone wishing to learn more about how OR/MS methods and techniques could be used to enrich sustainable transport decision processes and outcomes.

Part C. Suggestions for Extending OR/MS Research Involving Sustainable Transport Decisions and Practices

Slide 13. Explain Sustainability by Mode in OR/MS Terms

Comment. The term "sustainability" is widely used in the learned, popular, government, interest group, and other literatures, and on January 29, 2009 when the term was "Googled" it recorded 30,600,000 results or hits. It comes as no surprise, therefore, that discussions with other researchers, as well as extensive, keyword-based search engine literature searches (Wellar, 2008c), reveal that the concept of sustainable transport is a sustainability element that has received considerable attention.

However, and this is where OR/MS communities need to come to the forefront, few of those discussions and search results involve materials that measure sustainability in a quantitative way, or explain how to do so in a rigorous manner.

As a result, sustainability is still very much a concept that remains to be elaborated in (numerically) operational terms across all modes of transport for moving people, freight, and data.

In our view, this measurement challenge is one that calls for a leading role by the OR/MS communities in two ways:

1) Specifying the quantitative methods and techniques most appropriate for the task.

2) Directing and/or undertaking the necessary empirical analyses.

Slide 14. Explain the Legacy Factor in OR/MS Terms across All Modes

Comment. It appears fair to say that municipal government officials and the public at large could benefit from an increased understanding that current transport systems are the imprint of past decisions, and that future transport systems will be the imprint of present-day decisions (Garrison, 1965, 2000, 2002a, 2002b, 2007; Garrison and Ward, 2000). This situation is referred to as historic path dependence, and can be illustrated by the decision to rely on out-dated standards rather than create designs that are tailored to circumstances (Hughes, 1989; Wellar, 1975, 2008b). .As a result of earlier choices, municipal governments become locked into particular patterns or situations, and it is that "lock-in" process that needs to be examined and addressed if new, sustainable transport practices are to be effectively and efficiently achieved. (Brown, 2008; Garrison and Souleyrette, 1996; Grubler, 1990; Wellar, 2002, 2006, 2007b)

In regard to the scope of the legacy matter, it includes decisions to build all parts and pieces of transportation infrastructure for all modes, including expressways, freeways, ramps, roads, bridges, parking lots, parking garages, railways and marshalling yards, transit stations, subways, sidewalks, bike paths, rights-of-way, etc., for moving people and goods, and the wiring, relay stations, towers, etc., to move data. As we noted above, the challenge to the OR/MS communities to provide explanations of how the legacies associated with the different modes of transport for moving people, cargo, and data affect achieving sustainability is very significant, with major implications for success or failure. And, as we also note above in the form of a "heads up", arriving at explanations that are readily understood by municipal government officials, the media, and lay people will likely be a difficult task, even for the very capable OR/MS communities.

Finally, to complete this brief legacy issue outline, there is the matter of the lock-in process itself that needs to be thoroughly examined and explained from a sustainability perspective. Enlightenment is needed here in part to break away from old, bad habits, and in part to avoid creating new, bad habits. We suggest that a strong dose of thoughtfully derived and carefully explained quantitative

measures would make a major contribution towards better understanding and respecting the lock-in process and its consequences.

Slide 15. Illustrate How OR/MS Analysis Can Be Popularized, and Made More Transparent (More of it "Outside the Box")

Comment. As demonstrated by media items (newspapers, TV, radio) from cities around the world, there is limited interest in running transportation stories that involve details about differential equations, integral calculus, polynomials, multivariate analysis, statistical inference, mathematical programming (linear, dynamic, quadratic, parametric, etc.), Lagrange multiplier, queuing models, stochastic processes, input-output tables, decision analysis, sensitivity analysis, and other quantitative procedures that are the daily fare of members of the OR/MS communities. As examination of these same media items reveals, however, they regularly deal with problems, concerns, and issues that in fact involve making OR/MS-type decisions about which road route minimizes time, cost or distance of trips, which public transit routes maximize passenger loadings, what spacing of subway transit stations best combines revenues from passengers with overall system efficiency, which mode of transport gives "the best bang for the buck", which signal light configurations most efficiently move pedestrians in downtown cores, and so on.

The challenge to the OR/MS communities is to figure out how to represent their models, methods, and techniques in ways that they are readily understood and appreciated by the media, and by ordinary folk. We suggest that the commentaries prepared for the Transport Canada project could be a useful introduction to the task of explaining complex phenomena in straightforward terms. We hasten to add here, however, that it might be instructive for the OR/MS communities to first look at the commentaries on such methods and techniques as Anatomical Sourcing, Common Sense, Follow the Money, and Open House to gain an appreciation of some of the less-than-analytical bases for decision making that are present in many local governments.

And, a further report that could be of value is one that took on the challenge of making connections between the field of geography and the media (Wellar, 2005). Clearly, making the OR/MS-media connection is a more difficult assignment, but the design of the geography-media report warrants consideration as a possible precedent from which useful lessons can be learned about how to popularize OR/MS methods and techniques through the media.

Slide 16. Demonstrate How the OR/MS Approach Can Open the Door to Creative, Path-Changing, Innovative Roles for Quantitative Analysts in Municipal Government

Comment. Making recommendations as inputs to decisions about identifying, adopting, and implementing sustainable transport practices involves dealing with new issues, new problems, new solution sets, new participants in public affairs, new constraints, new decision processes, etc., in many municipal governments. That being the case, it will likely be necessary for quantitative analysts such as those from the OR/MS communities to think in new ways, to do things is new ways, to embrace innovative transportation ideas and processes, and to educate and encourage politicians, entrepreneurs, and ordinary citizens to do likewise (Garrison, 1965:Steger, 1966; Wellar, 1975, 2007b, 2008b).

In our view, therefore, it is important for the OR/MS communities to demonstrate how the OR/MS approach can assist and promote the cause of quantitative analysts in municipal governments. Further, we advise that the OR/MS communities adopt a creative options style as a means of connecting OR/MS ideas with the thinking of municipal government officials and ordinary citizens

We note in closing this comment that we are aware that work by the OR/MS communities has traditionally been oriented towards the needs of the private sector, and for federal and state/provincial departments and agencies. However, the success of the sustainable transport file depends on the performance of many thousands of local governments around the world. As a result, we strongly recommend that the OR/MS communities turn much more of their attention to those governments, which we believe could greatly benefit from an increased OR/MS presence when it comes to making decisions about identifying, adopting, and implementing sustainable transport practices.

5. SUMMARY

This paper responds to an invitation to discuss the Transport Canada project on sustainable transport practices at the 2009 CORS-INFORMS conference. The core of the paper is eighteen slides and associated comments, some of which will be used for the conference presentation. As noted in section1, we believe that these comments may be informative for viewers not in attendance at the presentation, and they may also be of assistance to conference attendees who wish to raise questions about particular slides or the presentation in general.

The first eight slides overview the Transport Canada project on sustainable transport, and provide a basis for suggesting how the OR/MS communities could enrich the process of making decisions to identify, adopt, and implement sustainable transport practices.

We then propose and discuss four initiatives by the OR/MS communities that build directly on the Transport Canada project. The suggestions are as follows.

- Examine the Survey Responses for OR/MS Aspects
- Modify the Survey Questions to Focus on OR/MS
- Add OR/MS Entries to the List of Methods and Techniques
- Add Commentaries for Existing or New OR/MS Methods or Techniques

The next part of the paper draws on lessons learned from the Transport Canada project *per se*, and makes four suggestions that we believe warrant serious attention by the OR/MS communities.

- Explain Sustainability by Mode in OR/MS Terms
- Explain the Legacy Factor in OR/MS Terms across All Modes
- Illustrate How OR/MS Analysis Can Be Popularized, and Made More Transparent (More of it "Outside the Box")
- Demonstrate How the OR/MS Approach Can Open the Door to Creative, Path-Changing, Innovative Roles for Quantitative Analysts in Municipal Government

In our experience it is most useful if proposals about a research agenda are combined with substantive suggestions about designing and implementing the agenda. We attempt to meet that condition by proposing several elements of a research agenda that we believe are of great importance to achieving sustainable transport practices. Further, we believe that the initiatives we suggest are not only best done by the OR/MS communities, but the involvement of the communities in the ways that we suggest will be very beneficial for the operations/operational research and management sciences fields.

We are pleased to post these materials in advance of the conference, and are looking forward to receiving feedback. Of particular interest are:

1) Communications regarding oversights of pertinent, published work, including materials by academic, practitioner, and other members of the OR/MS communities; and,

2) Suggested improvements to the proposals about how to enrich the OR/MS contributions to decision processes involving sustainable transport practices.

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