

Final Report
NCHRP 20-24 (105)
**Launching U.S. Transportation
Enterprise Risk Management Programs**

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Disclaimer

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Executive Summary

This project addresses the need for additional resources and support to assist state departments of transportation as they develop risk management programs. Presently, risk management is practiced unevenly across the country and agencies need assistance in filling the gaps within their risk management programs. This project included a workshop with state officials where risk management best practices from the public and private sector were discussed. Suggestions from the workshop participants and the project panel contributed to this Enterprise Risk Management (ERM) Roadmap.

The workshop also included a half-day exercise on risk identification, analysis, evaluation, prioritization and developing risk responses to expose the participants to the steps involved in the life cycle of risk management. The presentations, hands-on exercises, and the discussions helped the workshop participants contribute to the roadmap.

The Enterprise Risk Management Roadmap identifies activities, resources, and support to assist state agencies. National and state organizations may find it of interest as they consider supporting risk management efforts.

The Research Roadmap includes 29 items in all. The top 10 are:

- Provide a support structure to state transportation agencies to implement the risk roadmap and assist states with accessing training, advice, and coordination with other practitioners.
- Develop simple-to-use tools for front-line managers to assess and manage the practical, everyday risks they manage.
- Develop a maturity model that explains how agencies can “stair-step” to higher levels of maturity.
- FHWA and the National Highway Institute (NHI) should consider updating the risk management course to align with the new AASHTO enterprise risk management guide. The update should consider additional “modules” on how to apply risk management in state transportation agencies at different organization levels and activities.
- Some entity or voluntary collection of member states could form a risk management community of interest to enable sharing of information and practices among risk management practitioners. A community of interest is a voluntary group of staff from different agencies who share information, best practices, and common issues they face in advancing the state of risk management practice. A successful example can be seen in the two-year second Strategic Highway Research Program (SHRP2) organized R16 Community of Interest project. In this project a consultant was hired to facilitate structured in-person and virtual meetings between the Federal Railroad Administration, State transportation agencies, the Federal

Highway Administration and Class I railroads addressing challenges and best practices on projects involving railroad companies and transportation agencies. Similar to risk management, this was a new area of discussion and the community of interest provided the forum, structure and support to bring the parties together to collaboratively discuss and implement solutions.

- Provide financial support to the community of interest for professional support to organize and facilitate meetings until the group has enough “critical mass” to be self-sustaining through volunteer effort.
- Provide support and training to emphasize the close linkage of risk management to performance, asset, and strategic management, and emphasize that it is not a stand-alone activity but a practice integral to modern management systems.
- Provide a clearinghouse of information similar to FHWA’s 3P clearinghouse and ensure that it is updated, refreshed and maintained.
- Provide training and direct support to states that want to start risk management programs.
- Take advantage of risk management practices already used by rail, transit, aviation and the marine industry.

Roadmap items could be adopted by state or national organizations, academia, or by ad hoc groups. The intent is to assist the transportation community with focusing limited research and support activities to best advance the state of risk management practice.

The second part of this document includes an Executive Implementation Plan. It discusses how state agency officials could begin and sustain enterprise risk management programs within their agencies.

Background

This report fulfills one of two requirements of NCHRP 20-24 (105) which is to develop an Enterprise Risk Management roadmap “to make available to DOTs the training, tools, and guidance materials agencies need to develop and maintain effective ERM programs.” The other was to conduct a workshop. This report addresses the roadmap in two complementary and interrelated ways. First, it produced a roadmap that describes opportunities for research, development of tools, or support activities to assist states in the adoption of enterprise risk management.

The second product of this effort is an Executive Implementation Plan for state transportation agencies wanting to establish their own enterprise risk management programs. The state-agency portion summarizes steps agencies can take, resources they can develop, and templates they can follow to implement their own enterprise risk management programs.

Both elements build from many existing but incomplete resources. Participants in this project seemed to agree that it would assist states to have additional training, case studies, tools, and

guidance on how to establish enterprise risk management programs. They also seemed to agree that it would be helpful to states to have forums where they can exchange information and learn from peers in both the public and private sectors.

These two sections of this report reflect their era. Many state and Federal organizations recognize enterprise risk management's benefits but struggle to adopt it. Most importantly, they struggle with how to integrate it into mature agency practices, and into the maturing practice of performance management. At a time when performance management is taking root, risk management confuses some agency leaders who struggle to understand its role. The ERM Roadmap lays out a multi-year agenda to support the evolution of risk management. The Executive Implementation Plan allows agencies to start risk management programs now based on panelists' suggestion to "don't wait until you're perfect."

Both the roadmap and the implementation plan proceed on the premise that enterprise risk management should be viewed not as a new mandate. Instead, it represents a best practice that supports and complements agencies' performance management efforts. It also borrows best practices of stewardship and due diligence from the corporate world and applies them to the public sector.

MAP-21 and subsequent Federal legislation and rule contain few explicit risk requirements other than that States must develop risk-based transportation asset management plans and consider risk factors in highway safety efforts. The roadmap and implementation plan directly and indirectly support both areas by strengthening states' risk management capabilities. They also support MAP-21 requirements because of risk management's close linkage to performance management. As state transportation agencies seek to achieve mandated performance targets, the roadmap and implementation plan will help them reduce the variability and uncertainty that could affect that performance. The roadmap and implementation plan also could help states better identify opportunities and to take measured risks to achieve higher performance.

Steps to Developing the Roadmap

To develop the roadmap, the project team and panel pursued two complementary paths. First, an August 24, 2015, workshop with 20 states produced an initial list of items that could be pursued to support states' efforts. Second, interviews, a survey, and panel review resulted in an expanded and prioritized list of roadmap items.

The workshop included numerous presentations illustrating the emerging practices among states, and of one mature private-sector organization. The workshop presentations demonstrate the patchwork of emerging ERM practices. Three state transportation departments that presented at the workshop – Washington, California, and Minnesota – conduct enterprise-wide risk management efforts. Others apply risk management to specific programs, or areas. Project risk management represents a common application, and several states possess risk-based climate vulnerability assessments. Several state asset management plans also reflect analyses of asset management risks. The workshop illustrated the emerging and uneven application of risk management across the

nation's transportation agencies.

Despite the lack of uniform application of formal risk management, workshop comments confirm that agency officials regularly make risk-based decisions. However, the comments also illustrate that risk-based decisions generally are made informally, and often "in the heads" of executives. This informality results in the chief executives acting as de facto risk managers, without the benefit of their decisions being documented or communicated.

This common and informal practice of risk-based decision making contrasts with decisions based upon formal risk management. Workshop presentations by transportation departments from Washington, California, Minnesota, and a private sector organization demonstrate how more formal risk-based analysis builds from sound data, staff input, and quantification to present a rational approach to decision making. Two Washington State Department of Transportation (WSDOT) examples hold particular relevance. One risk-based analysis concluded that reducing highway lighting saved money without increasing the probability of night-time crashes. Another resulted in increased use of chip seals on higher-volume roads. Both options initially appeared risky but both turned out to be opportunities to maintain good performance with less cost. Data and risk-based analysis produced a record of decision making justifying both decisions.

Workshop proceedings document the increasing number of tools and resources available to agencies but they also document remaining gaps. Research reports, guides, or frameworks exist for assessing climate change vulnerability, some aspects of project risk management, and addressing risk in transportation asset management plans. NCHRP expects to complete and AASHTO plans to publish an enterprise risk management guide in 2016 under its 08-93 project, *Managing Risk Across the Enterprise: A Guidebook for State Departments of Transportation*. NCHRP also is producing a model risk register under NCHRP Project 08-36/Task 126, FY 2014 Development of a Risk Register Spreadsheet Tool. NCHRP project 20-24 (74) produced a report, *Executive Strategies for Risk Management by State Departments of Transportation*. NCHRP 08-36 (121) produced a report, *Successful Implementation of Enterprise Risk Management in State Transportation Agencies*. Additional Resources starting on page 49 includes a bibliography of U.S. and international sources.

The roadmap results from the following steps.

1. First, comments culled from the workshop discussion and presentations were summarized into 44 initial roadmap items seen below in Table 1.
2. Second, those 44 were circulated to the project panel and a few others recommended by the panel. The panelists and others recommended by the panel were interviewed further about the initial 44 items. Those interviews added more than 100 additional items, although many were variations on the initial 44.
3. Third, consulting staff summarized the potential roadmap items into seven categories and developed 30 questions summarizing the most frequently suggested roadmap activities.
4. Fourth, a brief questionnaire was distributed to panel members asking them for their top

10 priorities from the 30 summarized roadmap activities. This input was presented to the panel during a two-hour web-meeting.

5. Panelists reviewed the questionnaire and interview results and offered comments on the priorities that resulted in a revised list of roadmap priorities
6. The panelists reviewed the final draft roadmap activities and accompanying report and offered suggestions. The suggestions were incorporated into a final roadmap report that was accepted and is discussed below.

Step 1 - Initial Roadmap Activities

The two-day workshop summary documented 44 potential items for the roadmap organized into seven categories. The categories are:

- Promoting and embracing enterprise risk management within AASHTO
- FHWA activities to support enterprise risk management
- Creating state agency enterprise risk management forums or communities of interest
- Providing agencies direct risk management support or training
- Providing risk management resources
- Promoting risk management concepts
- Promoting existing public and private sector guides and resources

Table 1 below lists the suggested items. Some reflect steps specifically suggested during workshop discussions. Others, were extracted from comments made by presenters or comments made by participants in responding to presenters. The workshop proceedings include many inferred suggestions or issues which Table 1 includes.

Table 1 An initial list of roadmap items derived from workshop comments.

AASHTO-Related Issues	
1	Report to the AASHTO Board of Directors that the workshop was a success, document risk management’s benefits, and recommend the board’s support for risk management given its earlier position that members needed more information before endorsing risk management. Note: This activity was completed shortly after the workshop.
2	Ask the Board of Directors to pass a resolution supporting risk management as a worthwhile practice for DOTs.
3	Incorporate risk in the new CEO 101 sessions AASHTO conducts.
4	Introduce AASHTO committees to the many benefits of risk management and explain how it can apply to their disciplines.
FHWA-Related Issues	
5	State representatives suggested they could benefit from an update to the National Highway Institute (NHI) risk management training from its current focus on projects and FHWA-defined risks. Some said it may be advisable to develop more than one course. One course could focus on project risk management while another focuses on program and enterprise risk management.
The following suggestions are not specific to any organization but could be pursued by many organizations, individuals, or even by state agencies.	
Creating Forums or Communities	
6	Create a risk management community of interest to support those who practice risk management and to provide a support network for those who want to start.
7	Provide a national forum to bring States together and look for risks that cross State boundaries.
8	Share best practices and successes of enterprise risk management.
Provide Risk Management Support	
9	Assist DOTs with adopting enterprise risk management best practices.
10	Help states develop a tool to track risks so they can be reported to decision makers.
11	Offer training or a mechanism to frame questions to better understand the identification, assessment, and mitigation of risks.
12	Explore GIS tools that could assist with risk management such as mapping high-cost rights-of-way to avoid during project development.
13	Identify the skill sets needed to practice enterprise risk management and provide training for States to develop those skills.
14	Provide guidance to fund, hire, and train risk management employees.
15	Help agencies identify meaningful goals and objectives from which risks can be identified that can be managed practically, as opposed to developing overly broad aspirational objectives that do not lend themselves to risk management.

16	Help agencies identify the risks and assumptions surrounding their objectives.
17	Help states understand the interconnections between risks and understand how to compare risks to dissimilar objectives. Assist states which assessing risks across assets so that efforts to reduce risks to one asset class do not increase risks to another.
18	Help states set targets from which risks to the targets can be identified and managed.
19	Identify how to get more states involved in risk management given the different levels of risk management practiced today.
Provide Risk Management Resources	
20	Provide a web portal or other “one-stop-shop” for those who want information on risk management.
21	Build a suite of training material.
22	Provide a template for how to start and sustain a risk management program.
23	Produce a manual for how to manage a DOT including a section on risk management.
24	Publish best practices from the private sector to inform agencies of the benefits of ERM.
25	Develop an executive summary of risk management to introduce it to staff charged with development of strategic plans and other documents.
26	Provide a synopsis of the ERM programs in the DOTs in Washington, California and Minnesota.
27	Provide guidance on how to manage modal risks, not only highway risks.
28	Explain how risk can be used to make difficult tradeoffs such as deciding which low-volume roads are no longer paved.
29	Provide guidance on how to set targets based on risk, and contrast them to processes for setting targets with return on investment, or for the long-term sustainability of assets.
30	Provide guidance on how to prioritize to a meaningful few a long list of risks.
Promote Risk Management Concepts	
31	Emphasize that risk management is essential to agencies’ strategic plans. The workshop illustrated how risk management is not tangential but essential to agencies’ performance.
32	Illustrate how risk management can facilitate communication across silos.
33	Recognize that CEOs are the de facto risk managers.
34	Illustrate how risk management improves communication, or allows communication of tradeoffs and decisions facing agencies.
35	Set realistic objectives for which risks can be measured. Broad, global objectives don’t enable practical risk management.
36	Illustrate and emphasize the need for enterprise risk management, and not just risk management at a project or program level.
Promote Existing Public or Private Sector Guides, Tools, Resources	
	Provide guidance on how to:
37	Align risk management efforts with recognized frameworks such as ISO

38	Conduct risk-based scenario planning
39	Manage financial risks
40	Link risk management, performance and audit functions
41	Manage project risks
42	Manage information security risks, such as sensitive personnel data
43	Manage employee safety risks
44	Manage climate change risks

Summary of Initial Roadmap Items

The initial roadmap items and workshop comments about them reflect the breadth and depth of issues surrounding expansion of enterprise risk management. The following summarizes workshop comments that provide context for the initial items.

AASHTO-Related Items

The AASHTO-related suggestions reflect a need to secure senior leadership support for enterprise risk management. This support is needed not only in the highest levels of state agencies but also at the highest national levels.

Items 1 and 2 were addressed soon after the workshop. Workshop participants reported to the AASHTO board of directors that the workshop was successful. A resolution of support also was sought from the board, which tabled the suggestion pending additional information. The third suggestion to include risk management in the sessions for new chief executive officers (CEO) would further promote risk management. AASHTO's inclusion of it in the new CEO sessions would further legitimize the topic and raises its stature.

The final AASHTO-related suggestion is to introduce the topic to the many AASHTO committees and explain how it could apply to their disciplines. This step potentially could be catalytic given that AASHTO committees, subcommittees, and task forces address almost all disciplines within state transportation agencies. Having AASHTO committees understand and apply risk management achieves several important sub-goals.

- First, it demonstrates how risk management can be applied to key programs which do not currently consider risk.
- Second, it leads to a geometric increase in the number of state transportation employees exposed to risk management given the breadth of AASHTO committees and subcommittees.
- Third, it accelerates peer exchange opportunities given the committees' frequent meetings and activities.

FHWA-Related Issues

The only initial issue specifically directed to FHWA was to update the National Highway Institute's risk management course. The course originally was based upon FHWA's internal enterprise risk management process. The course is not specifically an enterprise risk management course but it does define risk and presents exercises on how risks can be identified, analyzed and treated. Workshop participants discussed the need for the course to be aligned with the NCHRP Guide. However, they did not specifically address how the course should be updated. NHI is in the process of updating the course.

The remaining suggestions are not directed to any particular organization. They could be adopted by many organizations, or could be pursued by ad hoc efforts by state agency officials or others.

Collaboration Suggestions

The next set of suggestions focus on organizing forums or communities of interest for state officials to share information and best practices. Workshop participants initially did not elaborate on this suggestion but in other disciplines collaborative forums vary from as simple as LinkedIn groups to formally sanctioned groups such as the AASHTO Transportation System Preservation Technical Services Program (TSP2). It sponsors organized regional and national meetings among state bridge and pavement preservation personnel to advance the state of the practice. The SHRP2 R16 community of interest that facilitated discussion on innovative solutions to address challenges on projects involving railroads and DOTs discussed earlier in this report is another good example of a collaborative forum that was managed by SHRP2 for two years. Other possible means for creating forums or communities of interest could include:

- Agency personnel informally organizing conference calls to share information.
- Risk management personnel holding "side meetings" at AASHTO, TRB or other conferences.
- AASHTO organizing a pooled-fund group.
- FHWA establishing an expert task group.
- TRB or AASHTO forming an enterprise risk management committee.
- FHWA's Every Day Counts initiative or another organization funding a community of interest group similar to the one managed by SHRP2 for the railroad/DOT project.

Although not discussed at the workshop, other options include creating a "virtual" information exchange through a website, newsletter, blog or other means.

Later during panelist interviews, the suggestion for forums or communities of practice was greatly expanded and elaborated upon.

Direct Support Suggestions

Workshop participants initially suggested 11 items related to providing training or other direct support to state agencies. This eleven can be grouped in the following categories:

- Assisting states with specific aspects of risk management such as identifying and managing risks and helping agencies identify specific and meaningful objectives that lend themselves to risk management;
- Supporting capacity-building such as identifying skills needed to hire and train risk staff;
- Developing a risk-register tool;
- Explore geographic information system (GIS) tools for mapping physical risks, such as high-cost rights-of-way to avoid if possible.

Workshop participants did not suggest which organizations should lead these items, nor did they describe them in detail.

Additional Resources Suggestions

Another 11 items center around providing additional resources. As seen in Table 1 these include creating a web portal as a comprehensive source of risk management information. Others address issues that are included in the pending enterprise risk management guide. These include a template on how to start and sustain a risk management program, best practices from the private sector, and a summary of ERM programs in Washington, California, and Minnesota. However, because the participants have not seen the guide it is uncertain if it addresses their suggested items to the depth they envisioned. Other items such as how to prioritize a long list of risks to a meaningful few are addressed in the NHI course. Again, however, few of the workshop participants have experienced the NHI course so they are unable to assess if it addresses their suggestions.

Promote Risk Management Concepts

The next set of items address concepts that could be stressed in risk management tools, guides, processes, or in advocating for risk management. As can be seen in Table 1, they address positive attributes of enterprise risk management such as its ability to support strategic planning, communicate across organizational silos, and communicate the tradeoffs agencies make. Some of these items are included in the risk management guide, the NHI course, and other resources. However, it is not clear if these resources address them to the extent envisioned by the workshop participants.

Promote Resources

Participants suggested either explicitly or as comments made during presentations that resources be provided in the eight areas listed under “Promote Existing Public or Private Sector Guides.” What those suggesting these topics may not have been aware of is that public sector guides or resources exist for several of these topics. For those not covered by public sector guides, private sec-

tor guidance probably exists in the form of trade association suggestions, text books, industry standards, or even in government regulation. The project portal will provide many of these resources.

Some resources already are available. For instance, the pending enterprise risk management guide is based on the ISO 31000 standard which may address how to align agency risk management efforts with recognized frameworks such as ISO. How to manage project risks are described in mature project risk management manuals produced by the transportation agencies in Washington and California. In addition, the SHRP2 produced A Guide for the Process of Managing Risk on Rapid Renewal Projects. NCHRP Report 658 is a Guidebook on Risk Analysis Tools and Management Practices to Control Transportation Project Costs. FHWA has produced a Climate Change & Extreme Weather Vulnerability Assessment Framework that describes a process for assessing climate change risks. FHWA's Office of Asset Management, Pavements, and Construction produced five brief reports on incorporating risk into asset management plans. It also produced five reports on developing financial plans, two of which address managing financial risks. NCHRP also is developing a financial planning guide that may include risk-based considerations. The enterprise risk management guide includes a section on how to use advanced tools such as Monte Carlo simulation to measure financial risks, such as risks surrounding revenue forecasts or construction-inflation forecasts. The insurance industry and private-sector workplace safety organizations provide extensive guidance on how to reduce and manage workplace injury risks.

Step 2- Panel Review of Initial Items

The initial list of items was circulated to panelists and interviews were conducted with 14 individuals, either panelists or state risk management officials suggested by the panelists. These more in-depth interviews revealed a deeper and more nuanced list of roadmap items. A complete list of their suggested items is included in Appendix A.

AASHTO Support for Risk Management

Everyone interviewed agreed that AASHTO should support risk management. Caveats included ensuring that risk at all agency levels is emphasized and not just enterprise risk management. Also emphasized was that AASHTO could leverage support for risk management by illustrating how each of its committee disciplines would benefit from managing risks to design, construction, planning, asset management, safety, freight, and so forth. Everyone agreed that consideration of risk should be integrated into all committees

Everyone agreed that understanding the benefits and value of risk management should be emphasized to the Board of Directors. One suggestion was that if the Board of Directors was led through a risk analysis of its strategic plan and other major decision documents its members would better understand risk management. Another was that risk management should be integrated into the "New CEO 101" training. Yet another was to add to board of director agendas updates on the value states experience from risk management. A fourth was to conduct a workshop with the AASHTO executive staff so they understand risk management.

Most of those interviewed supported creating an AASHTO risk committee or subcommittee, but that sentiment was not unanimous. While everyone interviewed agreed that AASHTO should integrate risk into the committees and subcommittees, some thought that creating a separate committee would further dilute AASHTO's focus. All agreed that risk should be institutionalized in the AASHTO structure and activities. Noted by some who were interviewed is that AASHTO at the time of this research is reorganizing its committee structures and will make a decision in 2016 about how to address risk management.

One veteran AASHTO committee member strongly recommended efforts to help state agencies develop "bottom up" and "top down" risk management efforts. This meant that guidance is needed for how executives can promote from the top echelons of the agency the adoption of risk management. At the same time, front-line managers should be given tools to help them practice risk management and "push up" their support of it to higher levels of the organization.

FHWA Related Roadmap Suggestions

Interviews with state and FHWA officials indicated several opportunities for collaboration to expand the use of risk management.

Partnering with States

Some suggested that state agencies and their FHWA division counterparts could conduct joint risk assessment efforts. Presently, FHWA divisions conduct annual risk assessments and develop risk registers. Some state risk officers suggested these efforts represent opportunities for the states and FHWA divisions to collaborate and jointly identify risks affecting the transportation system.

Another suggestion was that FHWA would be a logical advocate of multi-state risk assessments if certain risks affected one or more states, such as cross-border or other regional risks. With its risk-management experience, FHWA could collaborate with one or more states to assess common risks, such as those affecting metropolitan areas that span multiple states, or environmental or climatic risks common to multiple states.

Some suggested that when FHWA divisions identify and assess risks, they could invite the states to participate, or at least consult with all levels of the state agencies. Some respondents felt that FHWA's risk identification was too focused on compliance and did not capture other risks such as safety, performance, climate change, and issues important to the states. State officials interviewed did not want FHWA's risk assessment to be prescriptive or to dictate the risks states must manage. Other suggestions were states could benefit from:

- Learning how FHWA division staff use their risk assessment process;
- Participating in multi-state risk assessments where states and FHWA divisions identify and manage risks that cross state boundaries;
- Reading a case study of an FHWA division and a state agency conducting joint risk assessments, and;

- Organizing joint risk assessments among state agencies, FHWA and metropolitan planning organizations.

Those interviewed expanded upon the suggestion that additional training would be helpful. Several said it would be helpful to them to access multiple NHI courses focusing upon not only enterprise risk management but the application of risk management to specific program areas such as project management or climatic risks. Another suggestion about training in general was that any training should align with the new AASHTO enterprise risk management guide.

A state official whose agency applied FHWA's Climate Change and Extreme Weather Vulnerability Assessment Framework was complimentary of it and suggested any similar products addressing other risk areas would be helpful. The utility of the framework was that its step-by-step guidance made the application of risk meaningful to agency staff. The framework helped them walk through a practical risk assessment, making risk assessment meaningful and not theoretical.

Communities of Practice or Communities of Interest

The interviews produced repeated suggestions that formation of communities of interest or communities of practice would be helpful to state risk officials. Some listed it among the most critical roadmap activities. They cited reasons such as the importance of information exchange, sharing of best practices, building support networks, expanding the circle of advocates, and providing a forum to demonstrate the value added by risk management. A community of interest is a voluntary group of staff from different agencies who share information, best practices, and common issues they face in advancing the state of risk management practice. The SHRP2 formed a community of interest around its R16 project that promoted best practices between transportation agencies and railroads in developing project agreements. Strong support was stated for communities of practice to include state representatives from many disciplines, and to not include only enterprise risk managers. While the enterprise risk managers are critical, personnel from throughout the agencies should be able to meet with their counterparts to exchange information on how to apply risk management to many disciplines. Several who were interviewed encouraged participation from planning, programming, design, and others.

A related suggestion was that risk managers from other modes, from non-transportation agencies, and from the private sector be invited to participate in the communities of practice. Some noted that modal officials such as from rail, aviation, and transit agencies are advanced in applying risk-based decisions. Also, the participation of a private-sector risk manager at the CEO workshop illustrated the benefit of examples from outside of transportation agencies.

One suggested item was to provide a contractor to act as facilitator or organizer until the community of practice achieves enough critical mass to become self-sustaining. Another was to identify state agency risk practitioners who can be resources and offer advice to staff in other states.

Organize Forums, Conferences

Support also was expressed for organizing forums or conferences that bring together risk practi-

tioners from states, other modes, non-transportation agencies, international agencies, and the private sector. A regular risk management conference would bring together practitioners to share successes and solutions to common issues.

Provide a Support Structure

One veteran risk practitioner said although the risk management guide will provide a start, there needs to be a support structure to sustain risk management practices among states and FHWA. Resources need to be dedicated to training, promotion of risk management concepts, and ongoing support until risk management is fully integrated in agencies.

Link Risk Management to Performance, Strategic Planning

Several respondents emphasized that risk management should be closely linked to performance management, asset management, and strategic planning. Advocates said risk management is part of a suite of sound management and leadership practices that includes performance management, asset management, and strategic planning. One emphasized the risk and performance triangle developed by an AASHTO/FHWA international scan team that showed the relationship of risk to asset and performance management. Its helps emphasize that risk management is not a stand-alone activity but rather one that is integral to key agency objectives.

Related to this concept was a suggestion to use publication of the FHWA performance rules and the requirement to develop risk-based asset management plans as catalysts to promote risk management. Also suggested was to help leaders understand that risk management supports achievement of specific objectives, therefore risk statements should be clear and precise. Another suggestion was to demonstrate that risk management is a tool to measure achievement of specific goals and objectives.

A related suggestion was to help states understand the interconnections between risks and understand how to compare risks to dissimilar objectives. Agency staff also need help with assessing risks across assets so that efforts to reduce risks to one asset class do not increase risks to another.

Provide a Portal or Clearinghouse

A risk management portal is being developed as part of this project. The suggestion for it came during the workshop and its development is under way. During the interviews, some emphasized that resources be provided to update and sustain the portal. Its utility will suffer if its information is not maintained and refreshed. Another suggested that a template be the FHWA clearinghouse for public-private-partnerships which is on the FHWA website. It includes not only links to other resources but some analytical and training tools for agencies interested in public-private-partnerships.



Figure 1 The risk, asset management, and performance triangle.

Training and Skill Development

A frequently suggested roadmap item was to provide training and to help agencies develop employee skills. These included:

- Provide a template for how to integrate risk management within an agency.
- Provide a suite of training material suitable for different applications of risk management throughout an agency.
- Provide a template for how to start and then sustain a risk management program.
- Help agencies develop measureable goals and objectives that lend themselves to risk assessment, as opposed to lofty but hard-to-measure goals.
- Provide a risk management executive summary to introduce the concept to staff who are charged with developing strategic plans and other important documents.
- Identify the skill sets of employees needed to support risk management efforts.
- Help agencies develop position descriptions and duties so they can hire personnel with the appropriate skills to support risk management efforts.

Because the enterprise risk management guide was not published at the time of this report, it is unclear how many of these suggestions will be addressed by the guide.

Develop Decision Tools

Those interviewed said that additional tools would be helpful to state agencies that are adopting risk management. Examples of requested tools were:

- A tool to help agencies quickly in 30 minutes or less assess their level of risk management maturity;
- One to support risk-based cross-asset analysis that would support investment tradeoffs;
- Another to help executives reduce a large number of risks to a critical few;
- One to help executives track risks once identified and assessed;
- Another to assign risks to specific owners throughout the agency and then to measure progress toward managing those risks;
- Help with developing GIS tools for mapping risks such as high-value rights-of-way to avoid, or environmental or cultural resources that should not be affected;
- Simple-to-use tools for frontline managers to assess and manage the day-to-day risks they face.

Provide Case Studies

Interviewees expressed strong support for case studies of how risk management provides value to decision makers. Common to these suggestions was the request that case studies be brief, highly focused, and illustrate results and value from risk management. One suggested that case studies be “bite sized,” a concept endorsed by those interviewed later. Those interviewed suggested many useful case study examples they would like to see including:

- Successful practices that can document benefits and savings;
- Risk management practices in California, Washington, and Minnesota;
- Examples of agencies at different levels of risk management maturity;
- Examples of dealing with unplanned events such as road closures and culvert failures;
- Application of risk to highway operations;
- Risk management resources about catastrophic events produced by the World Road Federation;
- A DOT partnering with a private sector risk management professional;
- Examples of international agencies’ risk management practices, and examples from the past FHWA international scan;
- Examples of “walking people through real-life examples in real-world settings,” and;
- Resources for managing risks to a quality workforce.

Illustrate Risk-Based Tradeoffs

Another area of suggested research, case studies, or guidance relates to making tradeoffs and investment decisions. It was suggested the roadmap include examples on how decision makers can make risk-based decisions, such as deciding based upon risk considerations which low-volume roads are allowed to go unpaved when resources are constrained.

Another suggestion was for guidance or examples of how to set performance targets based upon risk and contrast those targets against ones based upon return on investment or the long-term sustainability of assets.

Provide a Maturity Model

Several suggested providing a risk management maturity model. One said it should allow agencies to “stair step” their way up different levels of sophistication and maturity. Another said it would be helpful if a brief assessment tool allowed an agency to assess its maturity in 30 minutes or less. This was suggested to be a simple tool that allowed users to answer questions and address attributes of their agency’s risk management practices and then receive an assessment of its maturity.

Involve and Learn from Other Modes

Several who were interviewed emphasized the roadmap activities should involve other modes and not just highways. They suggested that the communities of interest and conferences should include modal representatives. Others suggested that because transportation officials are often responsible for more than just highways, the roadmap should address how to address risks in other modes, such as bus, rail, marine, bike, and pedestrian modes. One noted that risk has been a long-standing consideration particularly in the aviation, rail, and marine sectors. Those sectors' maturity could provide lessons useful to highway agencies.

Capitalize on Existing Resources

Similar to the concept of capitalizing on the lessons learned from other modes were suggestions to capitalize upon resources already available from the private sector, from non-transportation government agencies, and from domestic and international transportation agencies. For example, Caltrans and the Washington State DOT already have comprehensive project risk management manuals that could be useful examples for other states. Also, Caltrans, Washington DOT, and the Minnesota DOT already have experience with enterprise risk management programs that could be useful to states who also want to develop ERM programs. Several of those interviewed expressed interest in the roadmap capitalizing upon these existing resources. The Additional Resources section of this report include 37 examples but it represents just a fraction of the guides, policies, and frameworks available internationally.

Promote Key Concepts

Those interviewed emphasize certain key concepts to be promoted in the roadmap. These are not necessarily steps to be taken or resources to be provided. Rather, they are concepts to be emphasized. These concepts include:

Several emphasized that risk management should be promoted as integral to performance and strategic planning. Messaging could emphasize that it is not an add-on or stand-alone activity. Instead, it is essential to sound, modern management. As one said, "use risk management to promote good management."

Emphasize that risk management is not about taking "no risks" but about taking "measured risks". Emphasize that it is essential to agencies' strategic plans. Emphasize the linkage to asset and performance management to gain support and demonstrate benefits. Emphasize improved decision making.

Emphasize the concept that states already are managing risks, they just are not capturing the full value of doing so. Adding a little more formality can magnify the benefits they receive from managing risks. As one said, if you don't formalize your risk management, you'll put your effort into fighting fires. Change the thinking from, "what am I doing today" to "what I can do to better prepare for tomorrow?"

Several urged the:

- Management of risks at all levels not just at the strategic or enterprise level;
- Capturing of opportunities, and not just the managing of threats;
- Importance of agencies adopting risk management policies to formalize its implementation;
- Value of capturing opportunity and managing of threats not only to economic value but also to social objectives such as social equality and other objectives not easily monetized;
- Importance of managing reputational risks;
- Recognition that agencies at different levels of maturity need different types of support and tools, and;
- Emphasis that risks at any level can become serious enough to affect the entire enterprise.

Advise that agencies should begin managing risk without waiting to be perfect at it. Even high-level risk analysis is worthwhile and can be a start. The practice of risk management can be perfected over time.

Step 3 - Initial 'Straw Man' Roadmap

The consulting team developed a summary paper that provided information on the seven major categories and the 29 sub-categories within the suggested items received from panel members and workshop participants. The paper included as Appendix B summarized items suggested during the interviews and provided the key conclusions relating to the risk management priorities in the seven categories along with background information. The interview suggestions were distilled to 30 representative activities and sent to the panelists with a link to a questionnaire requesting members to identify their top 10 priorities. That information was summarized and presented back to the panel for members' consideration and discussion during a web-based workshop. The initial list of items was as follows.

1. AASHTO should consider forming a risk management committee and integrate risk management into committee structures, activities, and missions.
2. AASHTO should not consider forming a risk management committee to avoid diluting the organization's focus but rather integrate risk management into existing committee structures, activities, and missions.
3. AASHTO should consider supporting states' efforts to develop/implement robust "bottom up" and "top down" risk management programs.
4. FHWA should consider offering to coordinate its divisions' risk management efforts with the states without making risk management a mandatory, compliance activity.

5. FHWA and the National Highway Institute should consider updating the risk management course to align with the new AASHTO enterprise risk management guide.
6. FHWA and the National Highway Institute should consider developing additional risk management courses addressing specific areas such as enterprise and project risk.
7. FHWA should consider developing and providing support for risk-assessment frameworks and tools in additional areas similar to its climate adaptation risk assessment framework.
8. Some entity or voluntary collection of member states should form a risk management community of interest to enable sharing of information and practices among risk management practitioners.
9. Financial support should be provided to the community of interest for professional support to organize and facilitate meetings until the group has enough “critical mass” to be self-sustaining through volunteer effort.
10. The community of interest should involve most major disciplines within transportation departments – not only risk managers - and include modal agencies, non-transportation government agencies, and the private sector.
11. The community of interest or some other organization should organize regular forums or conferences to support interaction and information exchange.
12. Identify a pool of risk management practitioners who can be called upon by other transportation agency officials for advice on how to start and sustain risk management programs.
13. Some organization should provide a support structure to state transportation agencies to implement the risk roadmap and assist states with accessing training, advice, and coordination with other practitioners.
14. Provide support and training to emphasize the close linkage of risk management to performance, asset, and strategic management, and emphasize that it is not a stand-alone activity but a practice integral to modern management systems.
15. Provide a clearinghouse of information similar to FHWA’s 3P clearinghouse and ensure that it is updated, refreshed, and maintained.
16. Provide training and direct support to states that want to start risk management programs.
17. Identify the training and skills necessary for agency risk-management professionals.
18. Develop tools that support executives with risk management such as ones that help them focus upon the greatest risks and opportunities.
19. Develop or explain how to develop GIS tools to help states identify high-risk or high-importance physical assets, locations, environmental and cultural features, or properties important to planning decisions.
20. Develop simple-to-use tools for front-line managers to assess and manage the practical, everyday risks they manage.

21. Produce “bite-sized” workshops and case studies of practical, every-day risk management issues, successes, best practices, and examples of how managing risk can add value to a typical transportation agency practice.
22. Provide advice and examples of how to manage risk to all modes, not only highways.
23. Provide guidance on risk-based target setting.
24. Demonstrate how risk can be used to make tradeoffs.
25. Develop a maturity model that explains how agencies can “stair-step” to higher levels of maturity.
26. Take advantage of risk management practices already used by rail, transit, aviation, and the marine industry.
27. Promote use of FHWA’s climate change risk assessment tool.
28. Promote project risk management guides that are available from CalTrans, WSDOT, the Project Management Institute and two SHRP2 reports.
29. Promote examples from the new NCHRP risk management guide.
30. Capitalize on private sector tools, guides, and experiences.

Step 4 - Prioritization of Roadmap Items

The project panel held a review of the draft roadmap via conference call and web meeting on May 4, 2016. The consulting team presented the top 10 priorities derived from the panel’s feedback to the questionnaire. With the 10 ten priorities as background, the consulting team presented the original 30 interview suggestions to the panel for discussion.

The panel made only one significant change to the proposed top 10. Originally, the highest rated roadmap activity was to create an AASHTO risk management committee or subcommittee. However, that representative activity also received significant opposition on the grounds that adding more committees dilutes AASHTO’s focus, requires states to provide additional personnel to participate, and is being addressed by an AASHTO reorganization effort. The statement of, “AASHTO should form a risk management committee and integrate risk management into committee structures, activities, and missions” was replaced. Substituted was, “Some organization should provide a support structure to state transportation agencies to implement the risk roadmap and assist states with accessing training, advice, and coordination with other practitioners.”

The change produced the following top list of roadmap activities:

1. Some organization should provide a support structure to state transportation agencies to implement the risk roadmap and assist states with accessing training, advice, and coordination with other practitioners.
2. Develop simple-to-use tools for front-line managers to assess and manage the practical, everyday risks they manage.

3. Develop a maturity model that explains how agencies can “stair-step” to higher levels of maturity
4. FHWA and the National Highway Institute (NHI) should consider updating the risk management course to align with the new AASHTO enterprise risk management guide and to provide additional “modules” that meet state transportation agency needs. It should include modules that cover how to apply risk management at different organization levels and include addressing strategic agency objectives, programs, projects and high-risk activities. Also, include in the training how these different risks, that though distinct, link together.
5. Some entity or voluntary collection of member states should form a risk management community of interest to enable sharing of information and practices among risk management practitioners.
6. Financial support should be provided to the community of interest for professional support to organize and facilitate meetings until the group has enough “critical mass” to be self-sustaining through volunteer effort.
7. Provide support and training to emphasize the close linkage of risk management to performance, asset, and strategic management, and emphasize that it is not a stand-alone activity but a practice integral to modern management systems.
8. Provide a clearinghouse of information similar to FHWA’s 3P clearinghouse and ensure that it is updated, refreshed and maintained.
9. Provide training and direct support to states that want to start risk management programs.
10. Take advantage of risk management practices already used by rail, transit, aviation and the marine industry.

Step 5 – Panel Discussion of Prioritized Items

During the discussion of the proposed roadmap items, the panel discussed at some length two potential roadmap activities relating to FHWA updating its NHI risk management training. Discussion centered around whether the NHI course could be expanded to focus upon different aspects of risk, such as enterprise risk management, versus project risk management, versus risk to certain programs. The panel asked that the consultant team and panelist Michael Graf of FHWA confer on how to re-state the suggestions. It was suggested that the NHI courses should be “modular” meaning that they could be customized to meet the interests of individual states. The suggestions also highlighted the importance of communicating how these risks, although distinct, are linked.

Panelists also asked for clarification of what is a community of interest, as it was a term some were not familiar with. They asked for examples of such communities. The language relating to that item was to be expanded to clarify the intent. An example of the SHRP2-R16 Community of Interest to facilitate collaboration between transportation agencies and railroads has been added to the earlier part of the document to clarify. The SHRP2-R16A community of interest included state and federal transportation agencies, railroads, and the Federal Railroad Administration that met in-person and through virtual meetings to discuss and advance collaboration and mitigation strategies on projects involving railroads and transportation agencies. Also, the panel suggested that community of interest meetings could be added to existing meetings such as TRB or AASHTO committee meetings.

A community of interest is a voluntary group of staff from different agencies who share information, best practices, and common issues they face in advancing the state of risk management

Step 6 – Final Draft of Roadmap Activities

The final list of roadmap priorities is shown below organized within the seven categories. Items listed in bold are among the top 10. However, all items are important and are recorded here because they may warrant implementation, even if they are not among the top 10. The panel identified a top 10 assuming that implementation resources are limited.

AASHTO-Related Roadmap Suggestions

1. AASHTO should consider supporting states' efforts to develop/implement robust "bottom up" and "top down" risk management programs.

FHWA Related Roadmap Suggestions

2. **FHWA and the National Highway Institute (NHI) should consider updating the existing risk management course to align with the new AASHTO enterprise risk management guide and provide "modules" of how to apply risk management at different organizational levels. The course should address risks at strategic, program, project and activity levels and explain how these different risks, though distinct, are interrelated and linked.**
3. FHWA should consider offering to coordinate its divisions' risk management efforts with the states without making risk management a mandatory, compliance activity.
4. FHWA should consider developing and supporting risk-assessment frameworks and tools in additional areas similar to its climate adaptation risk assessment framework.

Communities of Interest/Practice and Forums

5. **Some entity or voluntary collection of member states should form a risk management community of interest to enable sharing of information and practices among risk management practitioners.**

6. **Financial support should be provided to the community of interest for professional support to organize and facilitate meetings until the group has enough “critical mass” to be self-sustaining through volunteer effort.**
7. The community of interest should involve most major disciplines within transportation departments – not only risk managers - and include modal agencies, non-transportation government agencies, and the private sector.
8. The community of interest or some other organization should organize regular forums or conferences to support interaction and information exchange.
9. Identify a pool of risk management practitioners who can be called upon by other transportation agency officials for advice on how to start and sustain risk management programs.

Provide Risk Management Support

10. **Some organization should provide a support structure to state transportation agencies to implement the risk roadmap and assist states with accessing training, advice, and coordination with other practitioners.**
11. **Provide support and training to emphasize the close linkage of risk management to performance, asset, and strategic management, and emphasize that it is not a stand-alone activity but a practice integral to modern management systems.**
12. **Provide a clearinghouse of information similar to FHWA’s 3P clearinghouse and ensure that it is updated, refreshed, and maintained.**
13. **Provide training and direct support to states that want to start risk management programs.**
14. Identify the training and skills necessary for agency risk-management professionals.

Provide Case Studies, Workshops and Support Tools

15. **Develop simple-to-use tools for front-line managers to assess and manage the practical, everyday risks they manage.**
16. **Develop a maturity model that explains how agencies can “stair-step” to higher levels of maturity.**
17. Develop tools that support executives with risk management such as ones that help them focus upon the greatest risks and opportunities.
18. Develop or explain how to develop GIS tools to help states identify high-risk or high-importance physical assets, locations, environmental and cultural features, or properties important to planning decisions.
19. Produce “bite-sized” workshops and case studies of practical, everyday risk management

issues, successes, best practices, and examples of how managing risk can add value to a typical transportation agency practice.

20. Provide advice and examples of how to manage risks to all modes, not only highways.
21. Provide guidance on risk-based target setting.
22. Demonstrate how risk can be used to make tradeoffs.

Promote Existing Public or Private Sector Guides and Resources

23. **Take advantage of risk management practices already used by rail, transit, aviation and the marine industry.**
24. Promote use of FHWA's climate change risk assessment tool.
25. Promote project risk management guides that are available from CalTrans, WSDOT, the Project Management Institute and two SHRP2 reports.
26. Promote examples from the new NCHRP risk management guide.
27. Capitalize on private sector tools, guides, and experiences.

Promote Risk Management Concepts

The following are concepts to be emphasized as risk management is promoted. The following are not necessarily steps to be taken but points to be stressed.

Emphasize Linkage of Performance, Leadership, Strategic Direction

Messaging to executives should emphasize that risk management is a core management practice that is integral to achieving strategic objectives, performance, and to modern management competencies. The triangle of asset management, performance management, risk and strategic objectives should be emphasized. Use risk management to promote good management. Emphasize that risk management is not about taking "no risks" but about taking "measured risks". Emphasize that it is essential to agencies' strategic plans. Stress that it is not tangential, but essential to good management. Emphasize the linkage to asset and performance management to gain support and demonstrate benefits. Emphasize improved decision making.

Note Large Gains Possible from More Formality

Emphasize the concept that states already are managing risks, they just are not capturing the full value of doing so. Adding a little more formality can magnify the benefits they receive from managing risks. If agencies don't formalize their risk management, they put their effort into fighting fires. Change the thinking from, "what am I doing today" to "what I can do to better prepare for tomorrow?"

Urge Widespread Adoption

Emphasize that every agency should adopt a risk management policy, and promote risk management concepts to the states.

- Emphasize managing risks at all levels, not just at the enterprise.
- Emphasize capturing of opportunity as well as managing threats.
- Demonstrate the capturing of opportunity and managing of threats not only to economic value but also to social objectives such as social equality and other objectives not easily monetized.
- Don't overlook managing reputational risks.
- Recognize agencies at different levels of maturity need differ types of support and tools.

Risk at Any Level Can Threaten the Enterprise

Emphasize the special importance of Enterprise Risk Management and emphasize that risks at any level can become serious enough to affect the entire enterprise. For example, a project risk can become so expensive that it affects the agency's budget and credibility, thereby affecting the entire enterprise.

Emphasize that agencies should begin managing risk without waiting to be perfect at it. Even high-level risk analysis is worthwhile and can be a start. The practice of risk management can be perfected over time.

The Executive's Implementation Plan

This section provides agency leaders a roadmap for establishing an enterprise risk management program within their organization. It summarizes the most commonly used international and public-sector frameworks, particularly those for transportation agencies. It also incorporates advice gleaned from the project workshop and interviews.

Making the Case for Enterprise Risk Management

The first step in establishing an enterprise risk management program is to justify it. Perhaps the most erudite justification for risk management comes from former investment theorist and risk author Peter L. Bernstein. He casts the managing of risk as the demarcation between enlightened and unenlightened thinking. "The revolutionary idea that defines the boundary between modern times and the past is the mastery of risk: the notion that the future is more than a whim of the gods and that men and women are not passive before nature."¹

Michelle Tucker of Caltrans used similar imagery in describing modern risk management. She said if ancient sailors were buffeted by storms they tried to survive with heroic seamanship and daring. Modern super-cargo ship captains map courses based on forecasts of weather and currents. They monitor weather with satellite-assisted technology, sail with redundant safeguards, and always develop contingency plans. The modern captain scans for risks, anticipates them, and avoids them thereby protecting crew and cargo. Measured, methodical and dependable risk management replaces improvised heroics.

If the leaders of today's transportation agencies want to embrace the best of modern management, they should consider incorporating risk management into their agencies. It represents further evolution of sound leadership and good management in the public sector.

Another rationale for adopting risk management is that the evolution of risk management parallels the evolution of performance management. As transportation agencies saw in MAP-21, more precise performance targets are expected of modern leaders than were expected of earlier ones. Along with expectation of performance comes the expectation they will manage risk to performance objectives. Many authors justify risk management by noting its presence denotes the boundary between mature organizational leadership and immature, improvisational, reactionary leadership.^{2 3}

Another author describes risk management as an essential component of a modern, comprehensive managerial approach.⁴ Risk management is not only about barricading the organization against threats but rather allowing leaders to rationally evaluate threats and opportunities so they can accept a reasonable degree of risk in order to capitalize upon opportunities. Risk management is about striking the balance between risk and opportunity or finding the "sweet spot" between the two. Any person or organization operating in a fiduciary role for stakeholders faces a responsibility to reduce uncertainty or variability, to manage volatility, maximize value and promote continuity. The alternative to managing risk is accepting the inevitable managing of crises. Conversely, avoiding

all risks ensures capturing few rewards.

Adding enterprise risk management to an agency's practices allows leaders to demonstrate they are incorporating in the public sector best management practices from the corporate world. Enterprise risk management programs are required for publicly traded companies, that is companies that issue stock to the public. The Sarbanes-Oxley Act of 2002 requires publicly traded companies to demonstrate they are identifying, disclosing, and managing risks. This is a safeguard to protect investors against risky behavior, and allows investors to dump stock if they fear the company's risk profile. Subsequent Federal rules based on the act, known as SOX, require that corporations form a high-level risk committee that reports directly to the board of directors. The risk committee evaluates how the corporation is controlling risks to its finances, operations, legal compliance, and other areas. These risks and how they are managed must be disclosed in the corporation's annual report and other required disclosure documents.

Similar best-management practices are required in Australia for transportation and other public agencies. As early as 1997, some state statutes required public sector risk management in Australia and the requirement was adopted nationally in 2013 with the Public Governance, Performance and Accountability Act. It specifies risk management as a part of a coherent system of governance and accountability to more effectively ensure that government entities meet high standards of governance, performance, and control.

One analysis summarized seven controls government officials must provide to comply with the act.⁵ Three of the seven relate to risk. They include establishing policies for controlling risks, assessing risks with providing government resources to other entities, and ensuring that risk taking does not undermine proper management of public resources.

The international public sector and U.S. corporate requirements illustrate a sharp contrast with U.S. transportation agencies. In much of the English-speaking world and in the U.S. corporate world, enterprise risk management is a basic, core competency. In the U.S., it is only emerging among a handful of transportation agencies.

Reasons to adopt risk management comprise the early components of the ISO 31000 standard which is one of the world's most widely recognized risk management frameworks. It, like many other frameworks, link the managing of risk with the ensuring of performance. Among ISO's listing of what risk management enables an organization to accomplish are:

- Increase the likelihood of achieving objectives
- Encourage pro-active management
- Improve the identification of opportunities and threats
- Improve governance
- Comply with legal requirements
- Allocate risk-treatment efforts

- Minimize losses
- Enhance health, safety and environmental performance, and
- Improve organizational resilience.

Robert S. Kaplan of Harvard University's Business School is famous for among other things co-authoring the "balanced scorecard" which is a performance management framework. It uses complementary performance measures to balance performance so that maximizing one area of performance does not reduce another's. An example would be balancing cutting costs with ensuring quality. Kaplan wrote in 2009 that the line between good risk management and good management is blurring.⁶ In an era of high-performance expectations, a leader can't ensure performance if he or she does not also identify and manage risks to that performance.

The leader's obligation to manage risk permeates public-sector risk management frameworks from Canada, to Great Britain, to Australia. Like the ISO standard, these other public-sector frameworks emphasize that protecting the public and managing risks to public objectives are among the leader's highest obligations.

The New South Wales, Australia, Treasury Department's risk management tool kit also lists as benefits the leader's increased awareness of the risks facing the agency.⁷ A comprehensive enterprise risk management program seeks to identify risks at all organizational levels. Front-line staff help identify risks that may not be apparent to senior executives. The agency leaders, and the public, develop increased assurance the agency has anticipated its risks and is taking steps to address them. It also says risk management enables agencies to function effectively in a changing environment. A dynamic and ongoing assessment of risks informs the leaders of shifts necessary to keep abreast of changing conditions and rising uncertainties. The toolkit also stresses that risk management is an essential tool to support conformance and performance. It can help identify risks to legal compliance and risks to failing to achieve agency performance objectives.

The Australian State of Victoria's Risk Management Framework adds as a rationale for risk management the creation of value and the support of continuous improvement.⁸ The State of Victoria sees risk management as so important that annually the agency heads must attest that their risk management efforts:

- Are in place and comply with national standards, similar to ISO's standard;
- Control risks effectively, and;
- Are verified by a responsible body or audit committee.

It goes on to say the leader should understand that only managing threats is no longer adequate. Risks to all organizational goals should be managed as part of an integrated framework of strategic planning, performance management, and effective governance.

British guidance requires public sector risk management because if agencies don't control risks to achieving their objectives they are failing to achieve their most basic reason to exist – providing

service to the public.⁹

The Canadian province of British Columbia's Risk Management Guideline for the BC Public Sector insists on risk management programs because government takes on many of society's biggest risks.¹⁰ Government exists for functions such as protecting public safety and health. If it fails to achieve those objectives, it inherently creates risk to the public.

The World Road Federation, known by its French acronym PIARC, cites additional justifications specifically for transportation agencies. Transportation systems are life-support networks as essential as are water systems, communication networks, or electricity grids.¹¹ In a more populous and interconnected world, a transportation agency failure imperils the safety and competitiveness of people and the economy. It cites the impacts of Hurricane Katrina as an example of the catastrophic impact that events can have in a more densely populated world.

PIARC also stresses the increased performance expectations facing transportation agencies today. Agency leaders are expected to ensure that sophisticated management practices exist to account for assets, ensure efficiency, and sustain the value of public resources. These increased performance expectations create more opportunities for failure. In effect, if public expectations are low, less can go wrong. If expectations are high, more opportunity for failure exists. Risk management supports leaders in this more complex environment by modernizing and professionalizing what had been intuitive decision-making processes. Risk management provides leaders with an assessment of risks to their objectives, and a means to document they have analyzed and are managing them.

In an increasingly litigious world, risk management also provides a degree of legal defense. It allows agencies to demonstrate they tried to identify threats to the public safety and took steps to address them. Risk-based allocations of resources allow agencies to demonstrate they considered risks when allocating scarce resources to critical programs such as highway safety, roadway lighting, winter operations, or even related areas such as pavement friction.

The Essence of an ERM Program

The following pages detail how to establish enterprise risk management programs. Before the details are enumerated, an important point needs emphasized. Conceptually, enterprise risk management is not complicated. It may not require a large staff. It should not be expensive. It should not be disruptive to existing processes, such as performance management. Although this document and many others like it discuss the comprehensiveness of enterprise risk management, comprehensiveness does not equate with complexity, cost, or disruption. Instead, enterprise risk management should be like a partner and collaborator with the agency's performance management efforts.

At its simplest, at every level of the organization officials ask:

- What objectives are we trying to accomplish?
- What uncertainty or variability surrounds those objectives?
- Can we control the uncertainty or variability?

- Is the cost of controlling the uncertainty or variability worth it?
- Does the uncertainty or variability create opportunities we should take?
- Which internal and external partners help us control the uncertainty or variability or capitalize upon them?
- How can we best communicate the uncertainty and variability horizontally and vertically through and outside of the organization?

The NCHRP enterprise risk management guide emphasizes that agencies from British Columbia to Australia conduct their enterprise risk management programs with small staffs of two to three people. The success, however, lies in all agency units participating in enterprise risk management as part of their normal performance cycle.

A key assumption underlying the claim that ERM is not expensive is that agencies have a performance management process already in place. This assumes that agencies already have set goals, objectives, and targets. It also assumes they have a management process that drills performance objectives down through the agency and that a reporting feedback loop exists to report back up to executives the success of those objectives.

If agencies possess weak performance management processes, developing enterprise risk processes becomes more complex. Without clear performance objectives, officials throughout the agency face a more difficult task of identifying risks. They ask, risks to what? If they are asked to address risks to clearly stated objectives, it is easier for risk management to gain traction. Also, the cycle of identifying risks and identifying response strategies can occur commensurate with the periodic performance management cycle. As objectives and targets are set and assigned throughout the organization, risks to those objectives and targets are also identified. Risk response strategies are recorded at the same time as work units are identifying strategies, plans, and programs to achieve their objectives and targets. Enterprise risk management does not have to be complex if it parallels a performance management process.

If agencies lack a top-to-bottom performance management process, executives still can manage strategic risks they identify. It will be more difficult, however, to cascade risk management to every level of the organization.

Leader Takes Active Role

Most guides and frameworks emphasize the importance of leadership in developing successful risk management programs. The active support, involvement, and advocacy of the leader can be one of the most important components of risk management. Leadership can be exhibited through:

- Routinely using risk management in decision making;
- Adopting and promoting a risk management policy;
- Appointing a chief risk officer;

- Participating in efforts to identify, assess, and manage the agency’s strategic risks;
- Establishing a risk-reporting and update process so that managing risks becomes an on-going process, and:
- Promoting to external audiences the agency’s risk management efforts, and how it is managing its most important risks.

Incorporating Risk in Major Leadership Activities

Closely related to taking an active role in supporting the agency’s risk management efforts is for the agency leader to incorporate risk considerations in key leadership activities. An example could be for the leader to communicate the agency’s major risks when testifying to the legislature. Agency leaders set the tone, tenor, and agenda for their agencies by what they highlight to key external stakeholders such as legislators, the governor, or the media. Incorporating the agency’s risk-management priorities sends a strong message about the importance of managing risks.

Often, legislatures task agencies with implementing major programs such as reducing crash numbers, or building a program of projects, or reducing environmental impacts. The success of implementing these types of strategic initiatives depend upon the agency managing the risks to them. The leader can communicate those risks and inform legislators and the governor of the uncertainties surrounding the objectives. At the same time, the leader can explain steps taken to reduce the uncertainty or variability.

During a set of workshops on financial risks held in the U.S. in 2013 under the auspices of the FHWA, an Australian financial planning expert explained that by emphasizing risks agencies are, in effect, sharing the risks with legislators and governors. The agency is expected to achieve the objectives given to it. Remaining silent about the risks to those objectives infers the agency does not recognize them, or they are not important. The Australian financial planning expert said that by stressing the risks that surround major objectives the agency is informing legislators of them and enlisting their support in addressing them. The agency is not the sole bearer of the risk. Rather, the risks are shared by all parties in the decision-making process such as legislators, the governor, as well as the agency. If the legislature adopts an overly optimistic long-range revenue forecast knowing full well the risks that surround it, then the legislature, the governor, and the agency are the “co-owners” of the risk.

Beginning an Enterprise Risk Management Program

International frameworks and guides provide consistent advice for leaders who want to create enterprise risk management programs. ISO portrays it as a framework to embed risk management as a parallel and complementary function to the agency’s strategic planning and performance management process.

As seen in Figure 2, ISO portrays adopting a risk management framework as a basic “plan, do, check, implement” framework common to all basic management systems. ISO says the success of

enterprise risk management relies on how effectively it is embedded throughout the organization. A firm integration with the agency’s strategic planning and performance management process embeds risk consideration at every level of the organization. It also facilitates communication horizontally and vertically. As performance information flows through the organization, so does risk information.

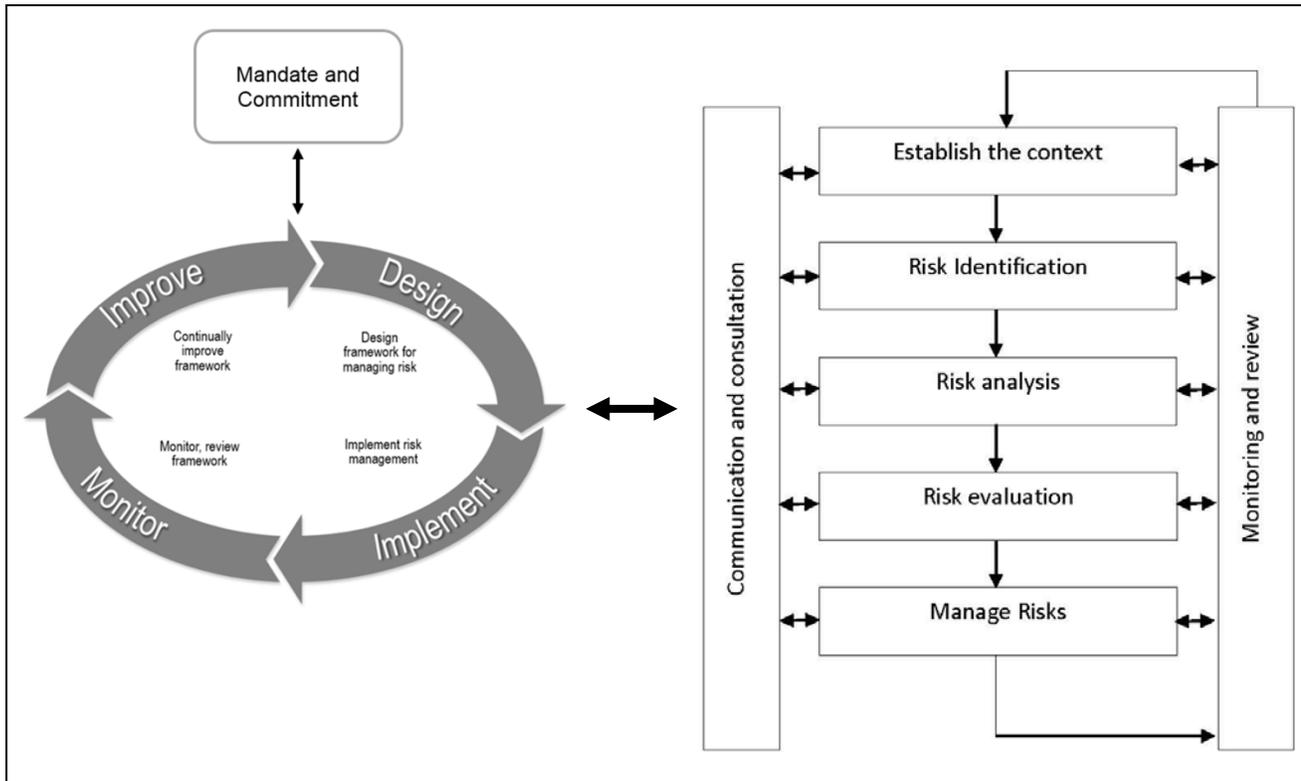


Figure 2 The ISO framework and process.

The ISO framework on the left of Figure 2 calls for agencies to first adopt a mandate and commitment to risk management. Then it recommends that the agency design its internal framework for how it plans to manage risks. As the framework is implemented, it is monitored for effectiveness. Periodically, the process is improved. This is a very basic concept universal to most management systems but it illustrates how ISO envisions risk management to operate in parallel with performance management functions.

On the right, Figure 2 shows the idealized ISO risk management process. Agencies apply the process when examining risks. The steps include:

First establishing the context, or defining what are the agency objectives and what is the financial, environmental, and political context in which it seeks to achieve those objectives? Or, if the risk management process is applied only to a project or program, what are the project or program objectives, environment, scope, budget, and schedule?

Second, identify all the potential risks either to the agency, project, or program. Facilitation and

risk-identification techniques are recommended to draw out from a wide array of perspectives all the risks that could exist and which could be opportunities or threats.

Third, analyze the risks including what are their root causes, what are their timeframes, who is affected and who could manage them?

Fourth, evaluate the risks which involves measuring their likelihood and impact and then placing them in rank order or groups based upon the combination of likelihood and impact.

Fifth, manage the risks by identifying who will manage risks and how. This is intended to be an active process in which staff are assigned risks and expected to track, monitor, and manage them while updating their leaders and peers of the risk status. Different risk frameworks vary but they generally recommend that agencies decide whether to:

Treat the risk by taking some action to mitigate it;

Tolerate it by accepting it as either being of low impact, low likelihood or too costly to address;

Transfer it which could be through insurance or some other agreement;

Terminate it such as ending the practice or situation that causes the risks;

Take advantage of it by recognizing it as an opportunity and capitalizing on it.

The ISO guideline emphasizes that risk management should be a fundamental business practice woven into all processes, and not treated as an "add on" function that is the responsibility of an isolated unit. It says that in mature organizations, risk management is comprehensive and recordable. That means that clear accounting for risk in all major programs can be identified.

The NCHRP 08-93 enterprise risk management guide says the leader's path for successful enterprise risk management includes developing risk policies, giving employees tools to succeed in applying risk, and integrating risk into agency operations. The tripartite approach intends to legitimize risk management by grounding it in policy. The tools, and training on how to use them, allows employees to succeed.

Successful agencies integrate risk into agency practices and procedures. An illustration of how this integration occurs at the Victoria Australia transportation agency is in Figure 2. It illustrates the concept that as work units identify projects, develop programs, or conduct activities they include assessment of risks to them. While they are developing schedules, budgets and work plans for those projects and programs they also develop a list of risks to them. Included in work plans and schedules is acknowledgement of the risks and steps taken to manage them. While it is common for agencies to have department-wide reporting systems to measure progress on objectives, in an enterprise risk management organization the agency also would be measuring progress to managing risks to those objectives. Parallel to tracking budget and schedule on projects, the agency staff would monitor and report on managing risks to the project budget and scope. While program managers report on whether they are achieving their program's objectives they concurrently would re-

port on risk to the objectives. The parallel and concurrent managing of risks while managing performance integrates risk management into agency processes.

As seen in Figure 3, the business plan or project objectives form the context for the risk assessment. The business plan or project objectives define what is to be accomplished, and from that definition the risks can be identified. As seen in the box "Business or Project Objectives" the agency's key results areas (KRAs) are important considerations as the agency establishes its risk environment or context. As the agency business plans and project objectives advance through the agency's processes and policies they are analyzed for their risks. When the risk analysis is complete, the project and program schedules, budgets, and activities include recognition of the risks and what is needed to manage them.

Not as Complicated as It Looks

Those new to risk management may see Figure 3 as complex. However, the level of complexity should be no more than absolutely necessary.

As example, project risk management guides at Caltrans and Washington State emphasize that risk analysis for small projects should not be overly complex. For a small project, the risk analysis may consist of project managers noting the risks and ensuring they are discussed at project meetings. The risks are shared with all project team members to ensure everyone is aware of them and manages them. However, on a major project over \$100 million, a formal risk workshop may be held. In some cases, Monte Carlo simulation is used to estimate the probability that risks to cost, and schedule could affect the project. For major projects, the risk analysis is commensurate with the risks and costs facing the agency.

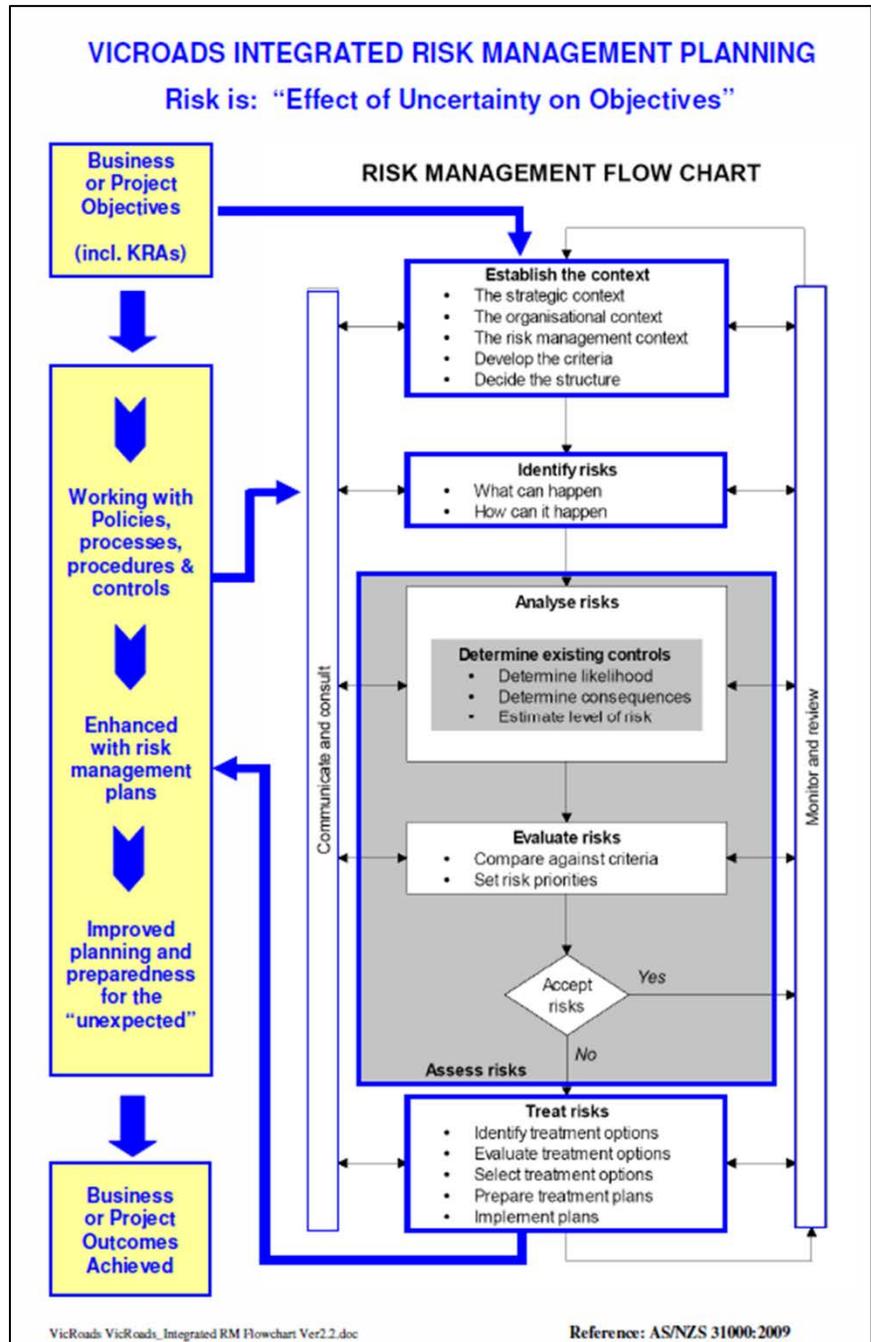


Figure 3 VicRoads risk and performance management framework.

This advice to make risk analysis and management commensurate with the magnitude of the objective runs consistently through all risk management guides. ISO and other frameworks emphasize that risk management should not create a new burden. It should be exercised commensurate with the potential threats and opportunities surrounding the objective. This is true whether risk management is being applied at the enterprise, program, project, or activity level.

Adopting a Risk Management Policy

Most international frameworks recommend executives formalize risk management in policy. When executives issue a risk management policy it legitimizes the effort and informs agency staff of its importance. The State of Queensland, Australia's, Guide to Risk Management typifies the policy suggestions included in most frameworks.¹² It says an executive's risk management policy should include:

- Commitment from the accountable officer or statutory body;
- Clear integration with governing processes such as strategic planning, operational planning, and executive management;
- Intent to create a strong organizational culture of risk awareness that encourages a risk-informed workforce and culture;
- Commitment to support risk management with staff education, training, and development;
- Clear lines of responsibility and risk ownership;
- Proactive cross-agency communication, and;
- Commitment to draw upon current experiences and past lessons learned.

The British Treasury says agency leadership should address seven key questions¹³ related to risk and good governance:

1. Do senior management support and promote risk management?
2. Are people equipped and supported to manage risk?
3. Is there a clear strategy and risk priorities?
4. Are there effective arrangements for managing risks with partners?
5. Do the organization's processes incorporate effective risk management?
6. Are risks handled well?
7. Does risk management contribute to achieving outcomes?

The New South Wales (Australia) Risk Management Toolkit for NSW Public Sector Agencies provides steps for agency leaders to take to implement the ISO framework.¹⁴ The first of these is to define and endorse a risk management policy. The policy should clearly state the objectives for risk man-

agement and the agency's commitment to it. Next is to align the agency's culture and the risk management policy. Steps to align the culture include adopting a risk management vision statement, demonstrate management engagement, develop agency systems with which the management regularly engages, re-align the structure to emphasize risks, develop performance agreements with staff that includes risk efforts, and effectively communicate the risk commitment.

The NSW toolkit also suggests steps the leader should take to create the internal organizational architecture to support risk management. These can include creating an Audit and Risk Committee, appointing a chief risk officer, requiring managers to certify that they have an effective risk management program in place, identifying risk owners and assigning responsibility for individual risks to them, and requiring contractors to comply with the organization's risk framework. The guide also says that identifying the standing series of reports that the agency requires for its risk process helps to standardize and focus departments upon their accountability for managing their risks.

The Australian Government's Better Practice Guide to Risk Management framework (2008) calls for ensuring the function of four critical elements. These are:

1. Resourcing the risk management function to have the capability to function successfully;
2. Developing communication and training functions to build awareness and capacity;
3. Developing a sound risk assessment process;
4. Developing the ability to profile risks and report upon their nature, impact and management.

Among the early decisions a leader should address in the policy is the levels at which the agency will manage risk. By identifying risk levels, the executive can assign "risk owners." The NCHRP enterprise risk management guide suggests managing risks at four levels.

Enterprise Risks – These are risks to the organization's strategic objectives or which involve multiple levels of the agency. In some frameworks, these are called strategic risks because they affect the basic mission of the organization. These risks generally are "owned" by the chief executive and senior staff. Executives own these risks because they often affect multiple levels of the agency and

Definitions

Risk is the positive or negative effects of uncertainty or variability upon agency objectives.

This broader definition emphasizes the scope and breadth of issues that could be considered in a risk management framework.

Risk management is the cultures, processes and structures that are directed towards the effective management of potential opportunities and threats.

The risk management process is the systematic application of policies, procedures, and practices to the identification and management of uncertainty or variability upon achievement of agency objectives.

The three definitions support an approach that emphasizes:

- *risks are things, events or actions that create uncertainty or variability for objectives;*
- *risk management is the architecture of managing risks, and;*
- *the risk process is the active use of the architecture for managing risks.*

These definitions support an active, participatory approach to managing risks led by agency executives.

require management from someone with a broad span of control. Strategic or enterprise risks also often involve external parties best reached by the executive staff.

Program Risks – These are risks that are common to programs, which are described as groups of common projects intended to achieve an agency’s objectives. The agency leader needs to decide which programs will be involved. At a minimum, programs likely to be included are safety, core infrastructure programs such as for bridges and pavements, workplace safety, financial resources, environmental compliance, and information adequacy and security. These risks generally are owned by program owners such as deputy directors. Although routine program risks are managed at the program level, program risks can become so acute they elevate to enterprise risks. An example could be major price increases or delays that affect an entire program, such as the safety program or pavement program. These programs are so central to the agency mission that failure in them affects the agency’s strategic objectives. When they rise to that level, the management of them is shared by both the program owner and agency executive leadership.

Project Risks – These are risks to individual projects, usually within a larger program. They are the most common risks agencies typically address. Project risks can address cost, scope, schedule, quality or impacts, such as noise or environmental impacts during or after construction. Not surprisingly, project risks generally are assigned to the project owners.

Activity Risks – The NCHRP enterprise risk guide introduces the concept of activity-level risks because transportation agencies rely on many critical activities. Examples could include collecting and processing adequate crash data, without which the safety program is less effective. Another could be winter operations, or traffic counting, or materials testing. These basic activities can create threats or opportunities that can matriculate up and affect projects, programs, and even the entire enterprise. If an agency had a scandal in materials testing and acceptance, it could create serious reputational risk that the leader must address. The common, everyday activities such as materials testing generally go smoothly but when risks in them arise they can create major impacts. Hence, the risk guide suggests managing risks at the activity level as well as at the enterprise, program, and project levels.

In a mature risk management agency, the “owners” of the enterprise, the programs, projects and the activities would periodically review their risks and take active steps to manage them. The risk management process could operate in parallel with other management expectations for these “owners.” While they deliver their expected programs, projects and activities they enhance their performance by concurrently managing their risks.

Providing Basic Risk Management Tools

Relatively simple risk tools commonly support enterprise risk management programs. The leader can direct staff to examine tool examples from ISO and the many frameworks mentioned in this report which can be modified for the agency’s use. Adoption of a common set of tools helps ensure consistency and understanding across the agency. Common tools put all staff on a similar footing when they consider questions such as what is a high or a low risk? Or how should they conduct a

risk workshop? And what do they do with the risks when they identify them? The common set of tools includes a likelihood and consequence matrix, a risk map, a risk register, and a common set of definitions.

A simple example of a risk likelihood and consequence matrix is seen in Figure 4. It is a nearly universal tool to provide users with a simple way to plot risks based upon their perceived likelihood and impact. Most risk analyses occur in workshops, or even in brief meetings. The team is given a matrix such as this so everyone works from a common scale. After they identify risks, they plot them by their likelihood and consequence to determine a raw risk score. For example, in this table, a risk rated as possible in the likelihood range and high in the consequence range produces a score of 120.

The leader also directs staff to develop a manual that defines what is meant by “very rare” or “low” and so forth. Some manuals say a “possible” likelihood means the event or risk could occur once a year, or once every two years. A low impact could mean there are no injuries, or significant delay, or costs above a minimum threshold expected from a risk. It is beyond the detail of this summary to elaborate but these scales would be defined in the agency’s risk support material, such as an agency risk manual.

Likelihood and Consequence Matrix, or the Risk Matrix						
Likelihood		Values	Risk Scores			
	Almost Certain	5	5	50	200	350
	Probable	4	4	40	160	280
	Possible	3	3	30	120	210
	Rare	2	2	20	80	140
	Very Rare	1	1	10	40	70
			Values			
			1	10	40	70
			Low	Moderate	High	Severe
			Consequences			

Figure 4 A likelihood and consequence matrix

Another tool would be the risk map seen in Figure 5. It again is a simple matrix that allows risks to be physically plotted so they can be seen and compared. As the risks are analyzed by likelihood and consequence they are plotted on the risk map. The map provides a visual icon of which risks are most highly rated and therefore most deserving of treating. Lower risks may be only monitored if treatment is beyond the agency’s control, budget, or authority.

The risk map is intended to be a visual tool for quick representation to internal staff and external stakeholders. It intentionally is not complex and does not require detailed parsing. How the risks are plotted on it represents the agency’s official expression of which risks it judges to be most important. It supports clear prioritization of which risks the agency takes most seriously and will treat.

Those appear in red. Yellow risks will be closely monitored and green risks will be monitored to ensure that existing controls can address them, or they are so low they can be tolerated.

Risk maps can exist at the different risk levels. The executive staff could have an enterprise risk map showing the agency’s highest strategic or enterprise risks. Program owners could have maps showing their program’s risk which are focused upon during staff meetings, performance reviews, budget development, or other key milestones. Similarly, project owners could have risk maps for individual projects that communicate to all project staff and contractors what are the risks to be managed.

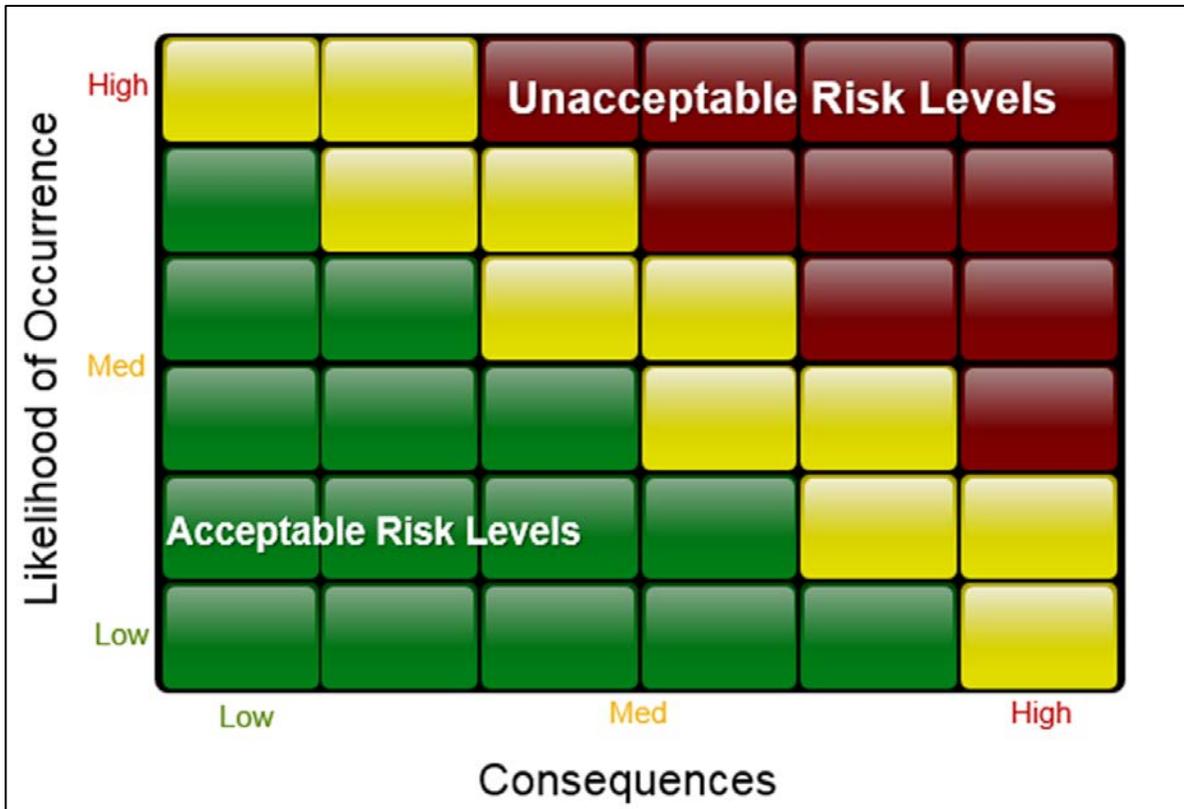


Figure 5 A risk map.

The risk register is another tool that builds from the risk matrix and maps. The risk register generally is a spreadsheet that records information about each risk. Risk registers are placed on web sites or shared drives so they can be updated easily and shared widely. They are intended to be updated frequently to keep staff apprised of any changes to individual risk or the agency’s enterprise-wide risks.

The British Columbia government’s sample agency risk register is an Excel spreadsheet with 26 columns. It is not illustrated here simply because it is too wide to be legible on a page. Moving from left to right, the column headings have the user cite the risk, show its likelihood and consequence value, explain what types of programs it impacts, cite its mitigation strategies, note who is responsible for the risk, and list key dates related to risk mitigation. Risk registers are created at all four

levels, enterprise, program, project, and activity. If risks increase in importance they may matriculate up from one level to another.

By inclusion on a widely available website or shared drive everyone can monitor the risk registers and track management of risks. Risk registers operate parallel to performance dashboards. While dashboards track progress on agency objectives, the risk register monitors the ebb and flow of risk severity or importance.

To capitalize on the risk register, the leader may want to direct staff to summarize changes to the risks and report them during periodic management meetings. The risks could be reviewed at monthly or quarterly executive management meetings, reported to an agency commission, or reviewed during annual performance updates. The intent is for the risk register to be a widely available tool that supports the agency’s tracking of its risks, and communicates the agency’s risk profile. The risk profile is the summation of what risks the agency faces, and how it is managing them.

Figure 6 is an example of just part of the Washington State DOT risk register. This portion captures information technology risks. As can be seen it captures risks in eight performance areas. Five risks are rated as high, 10 as medium and 25 as low. Drilling into the risk register would indicate who is managing the risks, the status of the management, and other relevant facts.

Number of Risk Impacts in Relationship to the Area of the Risk Impact (Effect)						
		(# of Impacts)				
Rank	Risk Impact Categories	Very High	High	Med	Low	Group Subtotal
1	Financial		2	2	5	9
2	Trans. System Performance		2	0		2
3	Reputation & Credibility		1	1	4	6
4	Dept. Performance			6	10	16
5	Core Workforce & Competency			1		1
6	Legal Compliance				6	6
7	Health & Safety					
8	Environment					
	Total	0	5	10	25	40
		0.0%	12.5%	25.0%	62.5%	100.0%

Figure 6 A portion of WSDOT's risk register.

Advanced Tools

Agencies can move beyond the basic tools for enterprise risk management and capitalize upon more sophisticated ones for analyzing program and project risks. These tools include Monte Carlo simulation, “decision trees,” and scenario analysis. Corporations use these tools for analyzing risks such as stock price variability, changing insurance rates, and currency-exchange fluctuations. Several of these tools can be used by transportation agencies to address uncertainties they face in their business operations. However, in transportation agencies that are in the early stages of adopting formal risk management, simplicity of tools is important. Although these tools can be helpful, they

do not have to be fully mastered for an agency to have a successful enterprise risk management program.

The NCHRP 08-93, Risk Guide entitled, “Managing Risk Across the Enterprise, A Guide for State Transportation Departments,” discusses several simple Excel add-in tools that agencies can use to analyze various risks. The guide discusses tools that support a quantified analysis of program, project, and activity risks, including the use of deterministic and probabilistic computations incorporating variability of uncertain parameters. Since transportation agencies are focused on financial planning to support MAP-21 requirements for long-term asset management, the guide discusses the use of Excel add-ins and other off-the-shelf Monte Carlo simulation tools to analyze financial risks. These tools account for uncertainties in various input parameters and their impacts on the forecasting of revenues and expenditures. The tools could help an agency quantify the risk or uncertainty surrounding its financial forecasts, or whether it is likely to achieve a 10-year bridge, pavement, or maintenance target.

The guide also discusses the use of a “decision tree” tool to simplify the selection from amongst many mutually exclusive and complex choices with different costs and probabilities of success.

Once agencies understand the use of such tools, they can use them to analyze other risks, such as the impact of delays on project schedules, or changes to scope or cost of components, or delays in acquiring rights-of-way. No one tool may be perfect to manage all risks or all levels in all agencies. As agencies advance up the risk management maturity ladder, they may choose to migrate from simple Excel-based tools to more complex ones. They may also consider the use of tools to advance risk management practice at multiple levels. Irrespective, the tools can help manage risks and support transparency in decision-making. The tools also can help agency executives present the pros and cons of various choices and investments on the transportation infrastructure to the state’s political leadership and other stakeholders.

Building Risk Management Capacity

The Victoria, Australia, government’s risk management framework emphasizes the importance of leaders building their agency’s capacity. This includes developing training, producing manuals, and guiding employees on how to integrate risk into their existing priorities. It says success can be measured when risk management enters the agency’s culture, which it simply describes as “the way we work around here.” In a risk-aware culture, employees routinely consider risk and make risk-based decisions as a matter of routine. For risk to enter an agency’s culture and have an impact, it needs to be adequately staffed by people who can provide training and support to work units grappling with how to manage their risks.¹⁵

A common step for leaders to take is to appoint a chief risk officer. The risk officer can serve as the primary point of contact, lead trainer, and policy developer for the agency’s risk management effort. In the corporate world, the chief risk officer generally reports to a high-level official such as the chief financial officer or even the CEO. A review of annual reports from several of the 30 companies within the Dow Jones Industrial Average shows that their chief risk officers support a subcom-

mittee of the board of directors. Several require that the risk officer even bypass the CEO to report directly to the board. This safeguard is intended to ensure that the CEO cannot mask legal, financial or performance risks the board should understand.

Interviews with risk officials in Minnesota, California, Washington State, the England Highways Agency and Translink in British Columbia reveal that the agencies do not have large risk staffs. General two to three people form the core of the risk unit. Their duties typically include:

- Developing risk management manuals and policies;
- Organizing and leading risk workshops;
- Supporting an annual or periodic cycle of risk identification, management and reporting;
- Managing the risk register and other central reporting tools;
- Advising the CEO or commission about the agency's risk profile and changes.

The agency leader should decide how deeply to ingrain the risk management effort. However, to have a true enterprise-wide risk program the leader will want to instruct the risk officer to drill the risk effort down to the front lines. The Translink agency in British Columbia describes taking the risk-identification and management effort down to the garage level while also managing strategic risks assigned to the agency's board.

Integrating Risk into Major Activities

A key consideration for the agency leader regards how to link risk management to major agency activities, programs, and objectives. Without these linkages, risk management is less likely to become ingrained in agency practice. Some examples follow. Their diversity reflects the broad range of risks facing agencies from the strategic level down to the shop floor.

Long-Range Planning and Strategic Objectives

Risks surround most major assumptions in a transportation agency's long-range plan. In an uncertain and changing world, any 20-year forecast will face many uncertainties. In long-range plans, agencies make assumptions about revenue, traffic growth rates, land use, modal shifts, economic changes, and political priorities.

An agency leader could be well served to direct the planning staff to incorporate risk management in the long-range planning activities for several reasons. First, the inclusion of risk considerations in such a high-profile document illustrates the importance the agency assigns to risk management. Second, because risks are so prevalent in a long-range plan's assumptions, risk considerations can strengthen the plan and increase its credibility. Third, because other programs and priorities flow from the long range plan, it is the fountainhead for many other agency activities that benefit from risk management.

Project Development and Delivery

Directing staff to manage risks in the project and program-development processes ingrains risk into one of the most common and widespread agency practices. Formal project and program risk management are logical for several reasons including:

- Uncertainties surrounding project cost, scope, and schedule create major reputational, financial, and maintenance of traffic issues for departments. If costs increase more than expected they can ripple through an entire program leading to cost overruns and inability to fund all anticipated projects.
- Also, templates for managing risks are proven and can be applied to most project-development activities. The Washington State and Caltrans examples are only two. International examples exist as well.
- Risks affect every stage of project development and every stage could benefit from risk management. The New South Wales transportation agency's project risk register includes sections for identifying and managing risks at the planning stage, during detailed design, during bidding, construction, and at finalization.¹⁶
- Scaling up risk management from the project to the program level also provides important benefits. The leader often manages key agency objectives through programs, such as the safety, bridge, pavement, transit, or traffic programs. When risk to the projects within those programs are managed, the leader is better informed of whether the programs will achieve the agency objectives.

Safety

Many highway safety programs already are risk-based even if they are not described in those terms. When agencies prioritize safety efforts based upon crash-reduction probabilities such as those described in the Highway Safety Manual they are making risk-based decisions. Explaining those decisions in terms of risks can help communicate to the public how the agency makes rational investment tradeoffs to minimize threats to public safety.

Asset Management

Foundational to an agency's overall success is sustaining its core infrastructure such as pavements and bridges. The costs of replacing these assets is so large that if they deteriorate the agency faces massive costs that absorb resources needed for every other program.

An agency's bridge, pavement, and other asset programs rely on many years of steady, predictable investment if they are to remain in good condition for the foreseeable future. Key risks leaders could direct staff to address include:

- Revenue forecasts of how much money the agency expects to be able to invest for the 10 years of the asset management plan. Any 10-year forecast will include uncertainties such as state fuel tax growth rates, Federal-aid amounts, bond capacity, or likelihood of major state or Federal tax-rate changes;

- Inflation rate assumptions pose significant risks because of the large size of bridge, pavement and other asset programs. This risk is compounded by the 10-year timeline. A forecast of 1 percent annual inflation growth produces a much lower investment need at the end of 10 years than would a 3 percent growth rate. A risk-based forecast could include scenarios with estimates of the probability that any given scenario might occur.
- Models pose significant risks to a 10-year forecast for needed investment levels. If the agency lacks confidence in the bridge or pavement model it faces significant uncertainty regarding the investment it must anticipate to meet bridge and pavement targets.
- Program development risks can be significant in an asset management plan. Agencies need to start project development activities years in advance for high-cost assets such as major bridges or pavement reconstruction projects. If, however, the revenue fails to materialize or project costs increase, the agency may not be able to afford the expensive projects, it may need to scale them back, and it wastes project-development investments.

Information and Decision Making

Agencies' information systems are like the instruments by which a pilot flies. Bridge, pavement, and maintenance management systems indicate how much investment is needed, in what types of treatments, and to which assets. When agencies become more sophisticated they rely increasingly on the management system data for decision making. If the data, data analysis, or modeling are inaccurate, the agency's investments can go off course.

The modern leader could consider instructing staff to assess information risks. These increase when data are not current, poorly collected, models are not calibrated, or the models are not adequately staffed and supported.

Employee Health and Safety

Managing risks to employee health and safety represents one of the most long-established and traditional risk management focus areas. In fact, many agency risk management programs began by focusing specifically upon lowering insurance costs by reducing workplace accidents and insurance claims. These types of claims are particularly relevant to transportation agencies because of their workers' compensation costs. Highway maintenance work brings much higher probability of injury and expensive insurance claims than would white-collar office work. The key to lowering insurance costs is to avoid injuries which obviously is better for employees, and saves the taxpayers money.

A robust workplace safety, accident-reduction, and injury-recovery program represents a standard risk-management program in well-managed agencies. Transportation agency leaders who want examples of practical risk management programs could include a workplace safety and accident-reduction program. Organizations such as the Public Entity Risk Institute (PERI) offer several strategies for managing workers' compensation risks.¹⁷ PERI estimates that up to 50 percent of all workers' compensation benefits are litigated in some states. Reducing this litigation threat can represent an effective risk-management program.

Climate Risk Analysis

FHWA's Climate Change and Extreme Weather Vulnerability Assessment Framework provides a template for agencies to analyze their risks from extreme weather events.¹⁸ It provides the key steps for conducting vulnerability assessments and uses examples to demonstrate ways to assess vulnerabilities.

The framework resembles an ISO-like process of establishing the context of what assets exist and the climatic variables that could affect them. It walks the agency through a process of identifying potential risks, and analyzing their likelihood and impact. It recommends risk treatment analysis leading to the prioritization of which risks will be treated and which must be tolerated.

The framework provides a ready-made template for agencies wanting to identify and manage climatic risks.

Risks Are Not Always Negative

For public-sector decision makers, one of the hardest concepts to grasp is that risks are not always negative. Most people when first exposed to risk management think of it as "threat management." This is partially correct. Reducing the likelihood or impact of threats is an important aspect, particularly with public services such as transportation that can affect the public's health and well-being.

However, for risk managers on Wall Street, risk represents opportunity. High returns only are possible with high risks. This concept can be adapted for the public sector. Leaders may want to take well-reasoned risks such as trying new technologies, materials, construction techniques, or products if their inherent risks come with greater potential reward. An example is cable median barrier. When first available in the early 2000s, it was not obvious that it would be effective. Its effectiveness could be diminished if not placed properly on slopes. Some worried it represented a threat to motorcyclists. Its effectiveness for truck crashes was doubtful. All of these uncertainties created risks that cable-median barrier's cost would not be offset by its benefits. However, by taking measured risks by experimenting with cable median barrier agencies eventually determined it is effective when placed properly. Now, cable barrier is common and represents a justified risk. Other examples could be accelerated bridge construction, or warm mix asphalt. Both represented risks when they were immature technologies.

An important aspect of risk management is that leaders can use it to document the well-reasoned risks they are taking. Rather than being risk-adverse at all times, agencies may need to take some measured risks. Risk management can document that an agency was aware of certain risks but decided to take them in order to achieve greater potential rewards.

Establishing an Ongoing Reporting and Support Process

Emphasized by ISO and other frameworks is the need for ongoing updating and reporting of the risk

management process for it to remain meaningful, relevant, and current. A “one and done” effort will not lead to the effective managing of ever-changing risks.

Establish Escalation and Trickle-down Protocols

One of the important aspects of risk management is to have the right person manage the risk at the right level at the right time. To ensure timely management of risks, an organization should establish and communicate clearly the protocols for how risks will be handled and communicated up and down the organization.

Some risks that are occurring at lower levels of the agency may have wider impacts and may also impact higher level objectives and activities. Hence, effective management of risks may require that some risks be escalated from the bottom levels up the chain of command appropriately. It will require the establishment of protocols that make it clear to all levels of agency personnel when to escalate the communication of a risk up to the next level. In this bottom-up process of risk escalation, clear direction should be given on who should address the risk and at what point in the management of a risk it should be escalated to the next level. This will ensure that risks from lower levels that bubble up through the organization will get addressed at the appropriate level before requiring action from the senior leadership. The escalation protocol will also ensure that risks are managed well at all levels and are not escalated to higher levels unnecessarily. An important benefit of having such protocols is that risks identified at lower level risks are managed appropriately and will not pose risks to program and agency objectives.

Similar to such a bottom-up escalation approach, clear protocols should also be established for top-down communication. This will provide direction on when and who will communicate a risk down the chain when the risks identified at higher levels trickle down and impact the objectives and activities at lower levels in the organization.

Escalation and trickle-down protocols as described above will ensure that responsibility for managing risk is assigned at the right levels in an organization and concerns about risks are methodically handled before they impact other levels in an organization.

Establish an Update Cycle

Organizations with active risk management programs develop annual or periodic risk-identification-and-assessment cycles. These are often tied to the organization’s performance-reporting cycle. As the organization’s units develop monthly, quarterly, or annual performance reports, they also update their risk registers. This provides feedback up through the organization to senior leaders of how both performance and risk-management efforts are proceeding.

An important consideration for leaders who want to establish a risk management program is for them to formally create the risk-update cycle. The cycle could coincide with annual budget periods or other formally recognized cyclical processes. Translink officials describe a risk-update process that generates up from front line managers and down from senior leaders at the same time that annual budget requests are being developed. The process links the performance-update process,

the budget-update process, and the risk-update processes together.

Establish a Reporting Repository

To support the risk cycle, agency leaders probably want to create a central repository where teams report their risk registers. These generally are websites available to internal staff where they can post their registers, view risk registers from other divisions, and exchange other information.

Risks should be categorized by subject area or program. The large number of risks require categorization and assignment to specific programs, projects, or other “risk owners.” Categorization also helps identify when risks overlap and where a common risk may affect more than one program area, requiring coordination across silos.

Because of the large number of risks generated by many different divisions, the repository needs naming conventions so that risk registers, and individual risks can be sorted and identified. Over time, a large amount of information will be compiled in the risk repository. Analysts who support the senior leadership will need to track and summarize risks, and risk-management efforts. A naming convention can help the sorting and tracking of risks.

Establish Feedback Loops

Perhaps most important to the long-term maintenance of an organization’s risk management efforts are the feedback loops that emphasize to front-line staff that senior leadership values their management of risks. Feedback can come in the form of senior leadership acknowledgement of the risk-management efforts, the follow-up on risk-management reports, and leadership’s adopting of recommended risk-treatments. Risk management easily could degrade into another routine compliance exercise if it is not actively used by the leadership for making decisions, balancing tradeoffs, and investing resources.

Monthly and or quarterly reporting meetings of the executive team will reflect changes to strategic priorities which will impact the risk management treatments. This should cascade down to all levels and serve as alerts to other areas of the organization of risks they need to be aware of.

The NCHRP risk management guide emphasizes the active management of risks as opposed to the creation of static policies and structures. It emphasizes that the field should be thought of as “managing risks” to connote an active effort as opposed to a routine compliance exercise. The senior leader can be like the ship captain who scans for risks and sets a course that avoids them or capitalizes upon them. Most guides emphasize that the active leadership and engagement of the senior staff is the most important component in risk management success.

Additional Resources

Risk Management Frameworks

NCHRP 08-93 Managing Risk Across the Enterprise: A Guidebook for State Departments of Transportation

Committee of Sponsoring Organizations of the Treadway Commission, Enterprise Risk Management – Integrated Framework, Executive Summary, September 2014

International Standard 3100, Risk Management – Principles and guidelines, International Organization for Standardization, Geneva, Switzerland

Government Manuals and Processes

Australian Government, Better Practice Guide Risk Management June 2008, available at http://www.finance.gov.au/sites/default/files/Better_Practice_Guide.pdf

HM Treasury, Risk Management assessment framework, a tool for departments, July 2009, available at https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/191516/Risk_management_assessment_framework.pdf

HM Treasury, The Orange Book Management of Risk – Principles and Concepts, October 2004, available at https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/220647/orange_book.pdf

HM Government, Managing Information Risk, a guide for Accounting Officers, Board members and Senior Information Risk Owners, available at <http://webarchive.nationalarchives.gov.uk/+http://www.nationalarchives.gov.uk/documents/information-management/information-risk.pdf>

Minnesota Department of Transportation Enterprise Risk Management Framework, 2013

New South Wales, Australia, Risk Management Toolkit for NSW Public Sector Agencies, Volume 1, Guidance for Agencies, 2012

NZ Transport Agency Risk Management framework 2010-2013, accessed at <http://www.nzta.govt.nz/assets/resources/risk-management-framework/docs/risk-management-framework.pdf>

Province of British Columbia Risk Management Branch and Government Security Office, Risk Management Guideline for the BC Public Sector, March 2012

Queensland Government, A Guide to Risk Management, July 2011, Financial Management Framework

Transit New Zealand, Risk Management Process Manual, September 2004, available at <https://www.nzta.govt.nz/resources/risk-management-process-manual/>

Victorian Government Risk Management Framework, March 2011, available at http://www.google.com/url?sa=t&rct=j&q=&esrc=s&source=web&cd=1&ved=0CB4QFjAAahUKEwjl64D19-LGAhXMWj4KHSLZC-4&url=http%3A%2F%2Fwww.dtf.vic.gov.au%2Ffiles%2Fd8012780-85db-4411-a918-a1cd00b55f20%2FVic-Gov-Risk-Management-Framework-April2011.pdf&ei=blypVcj8Csy1-QGisq_wDg&usg=AFQjCNHj7Rois493keav9rDHRQusVY5yZg&bvm=bv.98197061,d.cWw

Washington State Office of Financial Management, Risk Management Basics, Risk Management Division, February 2010, available at <http://des.wa.gov/SiteCollectionDocuments/RiskManagement/riskManagementBasics.pdf>

Project Risk Management

California Department of Transportation Project Risk Management Handbook: A Scalable Approach, Version 1 (June 2012)

Project Management Institute, A Guide to the Project Management Body of Knowledge, Third Edition, Newtown Square, Penn.

Montana Department of Transportation, Risk Management Guidelines, Managing project costs through identification and management of risks, Draft, January 2014.

New York State Department of Transportation, Project Development Manual - Risk Management for Project Development, Appendix 15

Second Strategic Highway Research Program Guide for the Process of Managing Risk on Rapid Renewal Projects, The Transportation Research Board, 2014 available at http://onlinepubs.trb.org/onlinepubs/shrp2/SHRP2_S2-R09-RW-2.pdf

Washington Department of Transportation Project Risk Management Guide, November 2014 available at <http://webarchive.nationalarchives.gov.uk/+http://www.nationalarchives.gov.uk/documents/information-management/information-risk.pdf>

Risk-Based Asset Management

Risk-Based Transportation Asset Management Report 1: Evaluating Threats, Capitalizing on Opportunities, available at <http://www.fhwa.dot.gov/asset/pubs.cfm?thisarea=risk>

Risk Based Transportation Asset Management Report 2: Examining Risk-based Approaches to Transportation Asset Management available at <http://www.fhwa.dot.gov/asset/pubs.cfm?thisarea=risk>

Risk-Based Transportation Asset Management Report 3: Achieving Policy Objectives by Management Risks available at <http://www.fhwa.dot.gov/asset/pubs.cfm?thisarea=risk>

Risk-Based Transportation Asset Management Report 4 Managing Risks to Critical Assets available at <http://www.fhwa.dot.gov/asset/pubs.cfm?thisarea=risk>

Risk-Based Transportation Asset Management Report 5 Managing External Threats Through Risk-Based Asset Management, available at <http://www.fhwa.dot.gov/asset/pubs.cfm?thisarea=risk>

NCHRP Reports

Executive Strategies for Risk Management by State Department of Transportation, prepared for NCHRP 20-24, accessed at [http://onlinepubs.trb.org/onlinepubs/nchrp/docs/NCHRP20-24\(74\)_ExecutiveSummary.pdf](http://onlinepubs.trb.org/onlinepubs/nchrp/docs/NCHRP20-24(74)_ExecutiveSummary.pdf)

Successful Implementation of Enterprise Risk Management in State Transportation Agencies, NCHRP 08-36 Task 121, available at [http://onlinepubs.trb.org/onlinepubs/nchrp/docs/NCHRP08-36\(121\)_FR.pdf](http://onlinepubs.trb.org/onlinepubs/nchrp/docs/NCHRP08-36(121)_FR.pdf)

International Scan Report

Transportation Risk Management: International Practices for Program Development and Project Delivery, FHWA Office of International Programs available at <http://international.fhwa.dot.gov/scan/12030/12030.pdf>

Enterprise Risk Management Books

Coleman, T. A Practical Guide to Risk management, CFA Institute, 2011

Crouhy, M, Dan Falai, Robert Mark, The Essentials of Risk Management, McGraw Hill 2006

Fone, M. Peter Young, Managing Risk in Public Organizations, Perpetuity Press, 2005

Government Accountability Office, Information Security Risk Assessment Practices of Leading Organizations, November 1999

Kendrik, T., Identifying and Managing Project Risk, AMACOM, 2009

Lam, J. Emerging Best Practices in Developing Key Risk Indicators and ERM Reporting, sponsored by Cognos

J. Lam, Enterprise Risk Management from Incentives to Controls, John Wiley and Sons, 2003

Narvaez, K., Success Stories, Public Entities Adopt ERM Best Practices, Public Entity Risk Institute, 2011

Appendix A Initial Road Map Suggestions

This is the full list of suggested roadmap items developed during panelist interviews.

AASHTO-Related Suggestions	
1	Report to the AASHTO Board of Directors that the workshop was a success, document risk management's benefits, and recommend the board's support for risk management given its earlier position that members needed more information before endorsing risk management.
2	Ask the Board of Directors to pass a resolution supporting risk management as a worthwhile practice for DOTs.
3	Ask the Board of Directors to pass a resolution supporting risk management as a critical, integral component of sound management.
4	On the agendas for the AASHTO Board of Directors and Committees have an item where agencies provide updates on value added by ERM implementation in the states.
5	Instead of creating a new AASHTO risk management committee, integrate risk managing into all current committees. (A new committee further waters down AASHTO's focus.)
6	Incorporate risk in the new CEO 101 sessions AASHTO conducts.
7	Risk management is not about zero tolerance but taking measured risk. Conduct less than half day CEO workshops and training sessions to communicate and show value of the taking measured risks.
8	Have a mechanism to communicate and facilitate the implementation at the DOTs the of risk management from "Bottom up" and "Top down."
9	Providing continuing exposure to risk management for existing CEOs and for senior staff who participate with AASHTO.
10	Introduce AASHTO committees to the many benefits of risk management and explain how it can apply to their disciplines.
11	Determine if AASHTO should form an enterprise risk management committee, subcommittee, or other standing body.
12	Determine what information the Board of Directors request in order for it to make an informed decision on whether to form a risk committee or subcommittee
13	Create an AASHTO committee of enterprise risk management.
14	Create an AASHTO committee but leverage the efforts of other groups such as asset management and performance management.
15	Institutionalize risk management into the AASHTO structure.
16	Develop case studies of risk management application at different levels of maturity.
17	Emphasize to AASHTO that risk can be practiced at all levels therefore support for risk management should be integrated and cascaded through all committees and all disciplines.
18	Integrate risk into major decisions and objectives of the AASHTO leadership.
19	Conduct a workshop for the AASHTO executive team and provide them a briefing on

	risk management.
20	In supporting risk management, AASHTO should provide support to all levels of risk management, at the enterprise, program, and project level ensuring its integration into all major transportation disciplines. (project delivery, planning, operations, as well as enterprise and liability risk management.)
21	Align FHWA and the state's risk management efforts.
22	Update the National Highway Institute (NHI) risk management training from its current focus on projects and FHWA-defined risks. It may be advisable to develop more than one course. One could focus on project risk management while another focuses on program and enterprise risk management.
23	Separate courses could be developed addressing different topics. Example TAM, Enterprise risks, Financial risks, Programming and Project Delivery, Inventory Management, etc.
24	FHWA should be partners with states in managing risks but FHWA should not be prescriptive in directing states to address particular risks. Risk management should not become compliance based. Make risk management value based.
25	When interacting with states, FHWA should not only work with the agency's senior executives to identify risks but with also agency staff at all levels.
26	Very important that FHWA risk activities with DOTs are not focused on compliance and legislative mandates. FHWA's risk assessment is generally focused on compliance, not broader risks facing the state.
27	When FHWA conducts its risk identification and management it should coordinate with the states and not merely tell the states what risks FHWA identified.
28	Provide states with additional tools like the climate change and adaptation risk framework and provide support to states on how to use them.
29	Provide risk assessment and gap analysis that help identify risks across the agency and leads to establishment of processes to implement risk management.
30	FHWA division administrators and staff be advocates to the state DOTs of the practical application of risk management. FHWA staff could communicate the benefits of risk management to their counterparts in the state agencies. They could have a checklist of risk management practices at all levels.
31	Provide support for a new partnership of risk management for cross-jurisdictional workshops between DOTs, MPOs and other who may share risks.
32	Support states in implementing risk management by offering additional tools such as the existing climate change vulnerability framework.
33	Offer risk management gap analyses and identify processes for states to address their gaps.
34	Advocate slowing down the update of the NHI course until the NCHRP risk guide is published to take advantage and align the course with the guide.
35	The NHI course should be consistent with the risk roadmap effort results.
36	Develop a clearinghouse where all material is kept up to date with latest activities, materials and resources. Make it a one-stop shop similar to the 3P Tools website. It needs

	managed and refreshed.
37	FHWA's internal risk management is generic and focused on internal risks. FHWA is in process reviewing its internal risk management practices and striving for more consistency.
38	FHWA is developing a maturity model for itself with the intent of taking it to its units as a self-assessment tool. The feedback will help FHWA tailor its training.
39	FHWA needs to allocate resources both internally and in supporting states in risk management training, assessment tools, workshops, webinars and other activities to allow states and MPOS early in risk management to get familiar with get comfortable with starting the adoption of risk management.
40	Create a risk management community of interest/practice to support those who practice risk management and to provide a support network for those who want to start. This is critical to success of risk management national. Use the community of interest/practice to share risk management practices.
41	Identify facilitator and organizer for the community of practice until it is able to continue on its own.
42	Need to have resources allocated to facilitating and conducting these community of interest/practice until we have a strong risk management culture. Focus these forums on making risk management relatable.
43	Provide a national forum to bring States together and look for risks that cross State boundaries. (Forums need to engage the broad transportation community and more disciplines within agencies and not only include enterprise risk managers. Discussion should include multiple topics and different participants could be invited depending upon their expertise.)
44	Share best practices and successes of enterprise risk management.
45	Encourage participation in the forums from groups beyond the typical ones that manage risks to liability, projects, and enterprise to bring in areas such as planning, programming, design and others.
46	Include private sector and non-transportation government sectors in enterprise risk management forums at the state level.
47	The roadmap suggestions need to be put into an action plan and prioritized for implementation.
48	The risk management guide will be a beginning but we need to have a support structure in place to sustain risk management practice among states and FHWA. Resources need to be dedicated to training of risk management concepts.
49	Assist DOTs with adopting enterprise risk management best practices.
50	Help States develop a tool to track risks so they can be reported to decision makers.
51	Develop tools to customize communication of risks to different levels of decision makers and personnel across the agency. Provide the right tool for the right level of manager.
52	Offer training or a mechanism to frame questions to better understand the identification, assessment, and mitigation of risks.

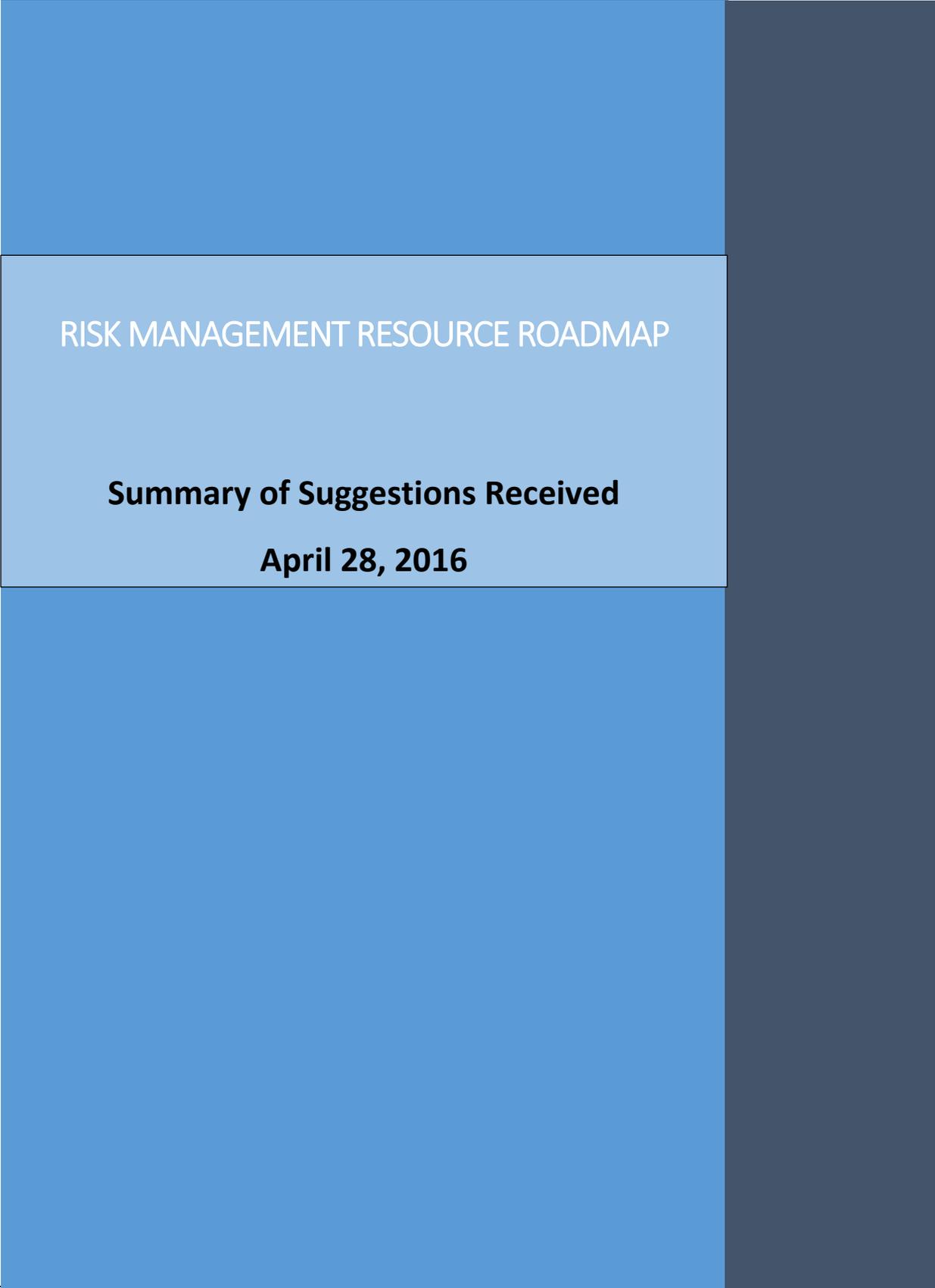
53	Explore GIS tools that could assist with risk management such as mapping high-cost rights-of-way to avoid during project development.
54	Identify the skill sets needed to practice enterprise risk management and provide training for States to develop those skills.
55	Emphasize and encourage states to hire and train the staff necessary to manage risks effectively across the enterprise.
56	Provide guidance to fund, hire, and train risk management employees.
57	Agencies struggle with writing concise risk statements. Help agencies identify meaningful goals and objectives from which risks can be identified that can be managed practically, as opposed to developing overly broad aspirational objectives that do not lend themselves to risk management.
58	Recognizing the turnover of leadership and the lack of management training, emphasize that developing risk management skills is an essential component of developing good management skills for agency leaders. Risk management is part of the essential grouping of management skills include performance management, strategic management, asset management, financial planning.
59	Demonstrate how risk management is a tool to manage and measure achievement of various strategic goals and objectives.
60	Use publication of the final performance and asset management rules as the catalyst to demonstrate how risk can help make trade-off decisions.
61	Develop cross-asset analysis tools.
62	Develop simple activity-level risk tools for assessing and managing front-line risk.
63	Emphasize the relationship between strategic objectives, performance and risk management and how they are tied to one another. Use the risk, performance, and asset management triangle to emphasize the relationship between the efforts.
64	Illustrate the importance of disaggregating risks to strategic objectives at different levels and tying the mitigation to specific work plans and assignments across the agency.
65	Support development of tools to allow comparison and tradeoffs between different types of risks, and risks to different categories of assets.
66	An exhaustive list of risks can overwhelm leadership. Help states reduce risk registers to critical items understandable to and manageable for leadership.
67	Help agencies identify the risks and assumptions surrounding their objectives.
68	Help states understand the interconnections between risks and understand how to compare risks to dissimilar objectives. Assist states with assessing risks across assets so that efforts to reduce risks to one asset class do not increase risks to another.
69	Capitalize on the need to develop risk-based asset management plans to introduce agencies to enterprise risk management. The asset management requirement can be the opening to engage states with risk management.
70	Help states set targets from which risks to the targets can be identified and managed.

71	Identify how to get more states involved in risk management given the different levels of risk management practiced today.
72	Provide support to states to manage risks to their assets.
73	Assist states with managing risks to the operation of their transportation network.
74	Identify a network of risk management practitioners who can communicate the value of risk management to peers, particularly in neighboring states.
75	Conduct topic-focused “bite-sized” workshops using successful agency practitioners to share with other agencies how to address specific risks.
76	Develop case studies of the benefit and value of risk management to an agency and demonstrating measurable successes.
77	Develop bite-sized case studies that demonstrate the value of risk management.
78	Provide many small case studies on the application of risk management to practical, everyday situations.
79	Develop a risk management maturity model. Provide tools for agencies to “stair step” their way up the maturity model.
80	Have a website similar to the FHWA Center for Environmental Excellence website.
81	Develop a risk management maturity model and use it to help states advance their levels of maturity.
82	Provide a web portal or other “one-stop-shop” for those who want information on risk management.
83	Build a suite of training material.
84	Provide a template for how to start and sustain a risk management program.
85	Produce a manual for how to manage a DOT including a section on risk management.
86	Publish best practices from the private sector to inform agencies of the benefits of ERM.
87	Develop an executive summary of risk management to introduce it to staff charged with development of strategic plans and other documents.
88	Provide a synopsis of the ERM programs in the DOTs in Washington, California and Minnesota.
89	Provide guidance on how to manage modal risks, not only highway risks, and integrate the management of the risk across all modes.
90	Explain how risk can be used to make difficult tradeoffs such as deciding which low-volume roads are no longer paved.
91	Provide guidance on how to set targets based on risk, and contrast them to processes for setting targets with return on investment, or for the long-term sustainability of assets.
92	Provide guidance on how to prioritize to a meaningful few a long list of risks.
93	Develop case studies of practical application of risk management in state DOTs. An example could be managing culverts, unplanned road closures.

94	Develop a case study of FHWA/State DOT conducting risk assessment together. Share lessons learned.
95	Develop training that specifically walks people through real-life examples in real-world settings.
96	Develop a simple on-line application for managers to assess the maturity of their agency's risk management. (Less than 30 minutes.)
97	Capitalize on PIARC's risk management resources about catastrophic events and develop a case study on it.
98	Develop case study of DOT partnering with private sector risk management information exchange.
99	Develop case studies and examples from international transportation agencies and capitalize upon the findings of the international scan.
100	Promoting Risk Management Concepts should be amongst the first steps. Starting the process of training on concepts is a low-hanging fruit that can expedite the understanding of risk management.
101	Encourage every agency to adopt a risk management policy.
102	Once the guide comes out, promote risk management concepts discussed in the guide to state agencies.
103	Address the ambiguity of who champions risk management and identify the champions.
104	Use risk management to promote good management. It is an essential component of good management.
105	Emphasize that risk management is essential to agencies' strategic plans. The workshop illustrated how risk management is not tangential but essential to agencies' performance.
106	Emphasize the linkage of risk management, asset management and performance management to gain support and demonstrate its benefits.
107	Illustrate how risk management can facilitate communication across silos.
108	Recognize that CEOs are the de facto risk managers.
109	Illustrate how risk management improves communication, or allows communication of tradeoffs and decisions facing agencies.
110	Set realistic objectives for which risks can be measured. Broad, global objectives don't enable practical risk management.
111	Illustrate and emphasize the need for enterprise risk management, and not just risk management at a project or program level.
112	Recognize that states at different levels of maturity will need different levels of tools and support.
113	The concept of reputational risks should not be overlooked.
114	Emphasize the taking advantage of opportunities as well as the managing of threats.
115	Emphasize the need to clearly assign ownership of risks to individuals.
116	Emphasize the need to actively manage risks and not merely record them in a risk register.

117	Demonstrate capturing risks and opportunities not only to economic value but to achieve other objectives such as social goals, equality, and other goals that cannot be monetized.
118	Emphasize the concept that states already are managing risks, they just are not capturing the full value of doing so. Adding a little more formality can magnify the benefits they receive from managing risks. If you don't formalize your risk management, you'll put your effort into fighting fires. Changing the thinking from, "what am I doing today" to "what I can do to better prepare for tomorrow?"
119	Emphasize the special obligation of ERM and emphasize that risks at any level can become serious enough to affect the entire enterprise. For example, a project risk can become so expensive that it affects the agency's budget and credibility, thereby affecting the entire enterprise.
120	Don't over-estimate technical skills in recruiting risk management staff. Critical thinking and analysis skills are very important.
121	Emphasize agencies should begin managing risk without waiting to be perfect at it. Even high-level risk analysis is worthwhile and can be a start. The practice of risk management can be perfected over time.
	Provide guidance on how to:
122	Align risk management efforts with recognized frameworks such as ISO.
123	Conduct risk-based scenario planning.
124	Manage financial risks.
125	Promote proactive risk management through examples of auditing and other risks that facilitate a move to understand how to take advantage of these as opportunities
126	Link risk management, performance and audit functions.
127	Manage project risks.
128	Manage information security risks, such as sensitive personnel data.
209	Manage employee safety risks.
129	Manage climate change risks.
130	Take advantage of risk management practices already in use by other modes such as rail, transit, marine and aviation.
131	Promote private sector tools, guides, and experiences.
131	Promote examples and tools provided in the guide
133	Use familiarity with risk management as a criterion for hiring.

Appendix B Questionnaire



CEO Risk Management Roadmap

A CEO Risk Management Workshop was held in August 2015 at Minneapolis when several roadmap suggestions were made by workshop participants. Several suggestions were also discussed by the project panel established for the CEO Risk Management Resource Roadmap during a panel web-meeting held on March 15, 2016. In April 2016, interviews of panel members and few additional stakeholders recommended by the project panel were conducted to expand on the suggestions made during the August 2015 CEO risk management workshop in Minneapolis and those discussed during the March 15, 2016 panel web-meeting.

The feedback received from the August workshop, the March 2016 panel meeting and April 2016 interviews are summarized below. The feedback is broadly captured under the following categories:

- AASHTO-Related Roadmap Suggestions
- FHWA Related Roadmap Suggestions
- Communities of Interest/Practice and Forums
- Provide Risk Management Support
- Provide Case Studies, Workshops and Support Tools
- Promote Existing Public or Private Sector Guides and Resources
- Promote Risk Management Concepts

Key conclusions relating to risk management priorities from each of the above categories have been compiled into numbered bullets (totaling 30) that are summarized at the end of the description of each category. The objective is to distil these 30 suggestions into a top-10 list. To this end, a questionnaire has been developed to obtain additional feedback from the panel on identifying the top-10 risk management priorities from the above mentioned list. The responses from the questionnaire will be summarized and disseminated to panel members before the May 4, 2016 panel web-meeting. The May 4 web-meeting agenda will be to review, amend, or expand upon the roadmap activities suggested to date.

The questions you will see in the questionnaire are embedded in textboxes, preceded by the explanation, in each of the seven categories of possible roadmap activities. The link to the questionnaire is at the end of this document. This document summarizes suggestions and provides context for the questions. Please read the entire document to appreciate the context of the questions. This questionnaire is being sent only to the project panel members.

We appreciate you providing your feedback via this questionnaire. This questionnaire should take less than 10 minutes and will close on Monday May 2, 2016.

Background Information-Summary of Suggestions Received

1 - AASHTO-Related Roadmap Suggestions

AASHTO Support for Risk Management

Everyone agreed that AASHTO should support risk management. Caveats included ensuring that risk at all levels is emphasized and not just enterprise risk management. Also emphasized was that AASHTO could leverage support for risk management by illustrating how each of its committee disciplines would benefit from managing risks to design, construction, planning, asset management, safety, freight, and so forth. Everyone agreed that consideration of risk should be integrated into all committees

Creating Executive Understanding of Risk Management

Everyone agreed that understanding the benefits and value of risk management should be emphasized to the Board of Directors. One suggestion was that if the Board of Directors was led through a risk analysis of its strategic plan and other major decision documents, its members would better understand risk management. Another was that risk management should be integrated into the “New CEO 101” training. Yet another was to add to BOD agendas, updates on the value states experience from risk management. A fourth was to conduct a workshop with the AASHTO executive team so they understand risk management.

Create an AASHTO Risk Committee or Subcommittee

Most of those interviewed supported creating an AASHTO risk committee or subcommittee, but that sentiment was not unanimous. While everyone interviewed agreed that AASHTO should integrate risk into the committees and subcommittees, some thought that creating a separate committee would further dilute AASHTO’s focus. However, that was a minority opinion. All agreed that risk should be institutionalized in the AASHTO structure and activities. The question(s) in the textboxes are what you will see in the questionnaire.

1. AASHTO should form a risk management committee and integrate risk management into committee structures, activities, and missions.
2. AASHTO should not form a risk management committee to avoid diluting the organization's focus but rather integrate risk management into existing committee structures, activities, and missions.
3. AASHTO should support states' efforts to develop/implement robust "bottom up" and "top down" risk management programs.

2 - FHWA Related Roadmap Suggestions

Partnering with States

Some suggested that when FHWA divisions identify and assess risks, they should include the states, or at least consult with all levels of the state agencies. Some respondents felt that FHWA's risk identification was too focused on compliance and did not capture other risks such as safety, performance, climate change, and issues important to the states. States do not want FHWA's risk assessment to be prescriptive or to dictate the risks states must manage. Other suggestions were:

- FHWA division staff could use their risk assessment process to illustrate the benefits of risk management to their states
- FHWA could help organize multi-state risk assessments where states identify and manage risks that cross state boundaries
- FHWA could conduct joint risk assessments and produce a case study of the effort
- FHWA could organize joint risk assessments of common risks shared by multiple organizations such as FHWA, the state, and MPOs.

The question(s) in the textboxes are what you will see in the questionnaire.

4. FHWA should offer to coordinate its divisions' risk management efforts with the states without making risk management a mandatory, compliance activity.

NHI Training

Respondents asked that the NHI risk training be updated to correspond to the upcoming NCHRP risk management guide. They also supported multiple courses, such as ones focusing on enterprise, project, external risks and so forth. A strong suggestion was to slow down a current update of the NHI course until the risk guide is published.

5. FHWA and the National Highway Institute should update the risk management course to align with the new AASHTO enterprise risk management guide.
 6. FHWA and the National Highway Institute should develop additional risk management courses addressing specific areas such as enterprise and project risk.

The question(s) in the textboxes are what you will see in the questionnaire.

Provide Additional Tools

A respondent experienced with using FHWA's climate change risk assessment framework was complimentary of it and recommended FHWA develop more products like it, focusing on additional risks. (This is elaborated on in the Tools section below.)

The question(s) in the textboxes are what you will see in the questionnaire.

7. FHWA should develop and provide support for risk-assessment frameworks and tools in additional areas similar to its climate adaptation risk assessment framework.

3 - Communities of Interest/Practice and Forums

Create Communities of Interest

Respondents expressed strong support for creating communities of interest, or communities of practice. Several listed it as a critical activity that would allow practices to be shared, risk management to be promoted, and for those starting out, to learn from more experienced persons. There was a suggestion that these communities be resourced and facilitated by subject matter experts until such time that risk management becomes part of the management culture.

The question(s) in the textboxes are what you will see in the questionnaire.

8. Some entity or voluntary collection of member states should form a risk management community of interest to enable sharing of information and practices among risk management practitioners.
9. Financial support should be provided to the community of interest for professional support to organize and facilitate meetings until the group has enough "critical mass" to be self-sustaining through volunteer effort.
10. The community of interest should involve most major disciplines within transportation departments – not only risk managers - and include modal agencies, non-transportation government agencies, and the private sector.
11. The community of interest or some other organization should organize regular forums or conferences to support interaction and information exchange.
12. Identify a pool of risk management practitioners who can be called upon by other transportation agency officials for advice on how to start and sustain risk management programs.

Include Many Disciplines

Strong support was stated for communities of practice to include state representatives from many disciplines, and to not include only enterprise risk managers. While the enterprise risk managers are critical, personnel from throughout the agencies should be able to meet with their counterparts to exchange information on how to apply risk management to many disciplines. Encourage participation from planning, programming, design, and others.

Include Other Modes, Industries, Agencies

A related suggestion was that risk managers from other modes, from non-transportation agencies, and from the private sector be invited to participate in the communities of practice. Some noted that modal officials such as from rail, aviation, and transit are far ahead of highway officials in applying risk-based decisions. Also, the participation of a private-sector risk manager at the CEO workshop illustrated the benefit of examples from outside of transportation agencies.

Provide Support to Organize Communities

One suggestion was to provide a contractor to act as facilitator or organizer until the community of practice achieves enough critical mass to become self-sustaining. Another was to identify risk practitioners who can function as a resource and offer advice to other states.

Organize Forums, Conferences

Support also was expressed for organizing forums or conferences that bring together risk practitioners from states, other modes, non-transportation agencies, international agencies, and the private sector.

4 - Provide Risk Management Support

Create a Support Structure

A respondent said that although the risk management guide will provide a start, there needs to be a support structure to sustain risk management practices among states and FHWA. Resources need to be dedicated to training, promotion of risk management concepts, and ongoing support until risk management is fully integrated in agencies.

The question(s) in the textboxes are what you will see in the questionnaire.

13. Some organization should provide a support structure to state transportation agencies to implement the risk roadmap and assist states with accessing training, advice, and coordination with other practitioners.
14. Provide support and training to emphasize the close linkage of risk management to performance, asset, and strategic management, and emphasize that it is not a stand-alone activity but a practice integral to modern management systems.

Link Risk Management to Performance, Asset Management Initiatives

Several respondents emphasized that risk management should be closely linked to performance management, asset management, and strategic planning. Support should not be limited to risk management alone but rather it should emphasize that risk management is part of a suite of sound management and leadership practices that includes performance management, asset management, and strategic planning.

Related to this concept was a suggestion to use the publication of the performance rules and the requirement to develop risk-based asset management plans as catalysts to promote risk management. Also suggested was to help leaders understand that risk management supports achievement of specific objectives, therefore risk statements should be clear and precise. Another suggestion was to demonstrate that risk management is a tool to measure achievement of specific goals and objectives.

Provide a Clearinghouse of Information

Develop a clearinghouse where all material is kept up to date with latest activities, materials and resources. Make it a one-stop shop similar to the 3P Tools website. It needs to be managed and refreshed. Provide resources to keep it current and refreshed.

15. Provide a clearinghouse of information similar to FHWA's 3P clearinghouse and ensure that it is updated, refreshed and maintained.

The question(s) in the textboxes are what you will see in the questionnaire.

Provide a Risk Template, Training Material

Respondents asked for several related support materials including:

- A suite of training material.
- A template for how to start and sustain a risk management program.

- Help agencies develop measurable goals and objectives from which risks can be identified, as opposed to overly broad, hard-to-measure goals.
- An executive summary of risk management to introduce the concept to staff charged with developing strategic plans and other important documents.

The pending NCHRP enterprise risk guide includes these elements. Once published, respondents can judge if the guide adequately addresses these needs.

16. Provide training and direct support to states that want to start risk management programs.

17. Identify the training and skills necessary for agency risk-management professionals.

The question(s) in the textboxes are what you will see in the questionnaire.

Help Identify Skill-Sets

Provide support to identify the skill-sets needed to practice enterprise risk management and provide training for States to develop those skills to hire the right personnel, train them and integrate them into the organization.

Don't over-estimate technical skills in recruiting risk management staff. Critical thinking and analysis skills are very important.

Emphasize Interconnectivity of Risks

Another suggestion was to help states understand the interconnections between risks and understand how to compare risks to dissimilar objectives. Support should also be provided to assist states with assessing risks across assets so that efforts to reduce risks to one asset class do not increase risks to another. Another repeated request was for tools to allow cross-asset analysis that consider risks.

5 - Provide Case Studies, Workshops and Support Tools

FHWA Provide Additional Tools

FHWA could provide additional risk-assessment tools such as its climate change risk framework and the training on how to use them. A user of the climate change risk assessment process was complementary of it and said that using the tool made risk management practical, applied, and understandable to agency staff. One such tool that was suggested was a gap-analysis tool that would allow agencies to self-assess their risk management maturity or competencies.

Provide Tools for Executives

Several called for tools to help summarize, communicate, and track risks, particularly to support executives' managing of risks. One noted that an exhaustive listing of risks can overwhelm executives who need assistance in prioritizing and managing the top risks. Another suggested support tool is one that

helps executives assign risks to owners at different levels of the organization and across the organization.

18. Develop tools that support executives with risk management such as ones that help them focus upon the greatest risks and opportunities.

The question(s) in the textboxes are what you will see in the questionnaire.

Identify Skill-Sets

Provide support to identify the skill-sets needed to practice enterprise risk management and provide training for States to develop those skills to hire the right personnel, train them and integrate them into the organization. Another was to encourage states to consider risk management skills as a priority when they evaluate job candidates.

Develop GIS Tool

One suggestion was to help states develop GIS tools allowing them to map high-risk assets, such as expensive rights-of-way, or sensitive environmental or cultural resources.

19. Develop or explain how to develop GIS tools to help states identify high-risk or high-importance physical assets, locations, environment and cultural features, or properties important to planning decisions.

The question(s) in the textboxes are what you will see in the questionnaire.

Provide Front-Line Manager Tools

Another suggestion was to develop simple tools for managing front-line activity-level risks. These tools should be simple to use and allow front-line managers to address the practical, every-day risks they face when conducting basic agency functions.

The question(s) in the textboxes are what you will see in the questionnaire.

20. Develop simple-to-use tools for front-line managers to assess and manage the practical, every-day risks they manage.
21. Produce “bite-sized” workshops and case studies of practical, every-day risk management issues, successes, best practices, and examples of how managing risk can add value to a typical transportation agency practice.

Provide Focused, “Bite-sized Workshops and Case Studies”

Small “bite-sized” workshops and case studies on specific, practical application of risk management to everyday “real world” situations were suggested and endorsed by several. Suggestions included:

- Case studies, particularly of successful practices that can document benefits and savings.
- Case studies of the risk management practices in California, Washington, and Minnesota.
- Case studies of agencies at different levels of risk management maturity.
- Case studies of dealing with unplanned events such as road closures and culvert failures.
- Case studies of risk applied to highway operations.
- Capitalize on PIARC’s risk management resources about catastrophic events.
- Develop a case study of a DOT partnering with a private sector risk management professional.
- Develop case studies of international agencies’ risk management practices, and examples from the past FHWA international scan.
- Develop case studies for walking people through real-life examples in real-world settings.
- Develop case studies or resources for managing risks to a quality workforce.

The question(s) in the textboxes are what you will see in the questionnaire.

22. Provide advice and examples of how to manage risk to all modes, not only highways.

Include Other Modes

Provide guidance on how to manage modal risks and to manage risks across all modes.

Provide Guidance on Risk-Based Targets

Provide guidance on how to set targets based on risk, and contrast them to processes for setting targets based on return on investment, or for the long-term sustainability of assets.

The question(s) in the textboxes are what you will see in the questionnaire.

23. Provide guidance on risk-based target setting.
24. Demonstrate how risk can be used to make tradeoffs.

Provide a Maturity Model

A risk management maturity model was requested by several participants. One asked for a model that could assist states with “stair-stepping” the maturity levels.

The question(s) in the textboxes are what you will see in the questionnaire.

25. Develop a maturity model that explains how agencies can “stair-step” to higher levels of maturity.

Demonstrate Risk-Based Tradeoffs

A request was made for an explanation of how risk can be a decision-making factor for tradeoffs such as deciding which low-volume roads will no longer be paved.

6 - Promote Existing Public or Private Sector Guides and Resources

This category included suggestions to capitalize on existing guides and resources from other public and private sector sources. Few respondents offered elaborating comments but no one disagreed with the concepts. Those who did comment emphasized capitalizing on work from other modes, from international agencies, and from private sector examples.

26. Take advantage of risk management practices already used by rail, transit, aviation and the marine industry.
27. Promote use of FHWA’s climate change risk assessment tool.
28. Promote project risk management guides that are available from CalTrans, WSDOT, the Project Management Institute and two SHRP2 reports.
29. Promote examples from the new NCHRP risk management guide.
30. Capitalize on private sector tools, guides, and experiences.

The question(s) in the textboxes are what you will see in the questionnaire.

7 - Promote Risk Management Concepts

The following are concepts to be emphasized as risk management is promoted. ***The following are not necessarily steps to be taken but points to be stressed.***

Emphasize Linkage of Performance, Leadership, Strategic Direction

Messaging to executives should emphasize that risk management is a core management practice that is integral to achieving strategic objectives, performance, and to modern management competencies. The triangle of asset management, performance management, risk and strategic objectives should be emphasized. Use risk management to promote good management. Emphasize that risk management is not about taking “no risks” but about taking “measured risks”. Emphasize that it is essential to agencies’ strategic plans. Stress that it is not tangential, but essential to good management. Emphasize the linkage to asset and performance management to gain support and demonstrate benefits. Emphasize improved decision making.

Note Large Gains Possible from More Formality

Emphasize the concept that states already are managing risks, they just are not capturing the full value of doing so. Adding a little more formality can magnify the benefits they receive from managing risks. If you don’t formalize your risk management, you’ll put your effort into fighting fires. Change the thinking from, “what am I doing today” to “what I can do to better prepare for tomorrow?”

Urge Widespread Adoption

Emphasize that every agency should adopt a risk management policy, and promote risk management concepts to the states.

- Emphasize managing risks at all levels, not just at the enterprise.
- Emphasize capturing of opportunity as well as managing threats.
- Demonstrate the capturing of opportunity and managing of threats not only to economic value but also to social objectives such as social equality and other objectives not easily monetized.
- Don’t overlook managing reputational risks.
- Recognize agencies at different levels of maturity need differ types of support and tools.

Risk at Any Level Can Threaten the Enterprise

Emphasize the special importance of Enterprise Risk Management and emphasize that risks at any level can become serious enough to affect the entire enterprise. For example, a project risk can become so expensive that it affects the agency’s budget and credibility, thereby affecting the entire enterprise.

Emphasize that agencies should begin managing risk without waiting to be perfect at it. Even high-level risk analysis is worthwhile and can be a start. The practice of risk management can be perfected over time.

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