Memorandum

TO: Doug McLeod

FROM: Anita Vandervalk, Dena Snyder, Tyrone Scorsone, Cambridge Systematics, Inc.

DATE: June 13, 2014

RE: Incorporating Reliability into FDOT Planning and Programming

---

1. Project Objectives

Following the guidance set forth by SHRP 2 L05, this project seeks to inform the Florida DOT how and where to incorporate reliability and operational improvements into the planning, programming, and budgeting processes. This memorandum documents the work steps and products we have produced to date in support of the L05 portion of the Task Work Order. It includes diagrams of the FDOT project planning and programming processes and an assessment matrix outlining where the Department currently stands in regards to meeting the four key steps for incorporating reliability from SHRP 2 L05. We have produced this work in support of subtask 1 of Task Work Order 22.

2. Summary of Work Steps

We began with a thorough inventory and assessment of documents describing the Department's planning and programming processes. Each document was reviewed in detail, with particular attention paid to what extent the processes outlined in the plan address reliability and incorporate performance measures. The following documents were reviewed in preparation for this task:

- The 2060 Florida Transportation Plan
- The SIS Strategic Plan
- The Statewide Comprehensive Plan
- The FDOT Program and Resource Plan
- The Long Range Program Plan
- The ITS Strategic Plan
- Florida's Statewide Systems Engineering Management Plan
- The State Planning and Research Program Plan
- Prioritizing Florida's Highway Investments
- The SIS Project Eligibility Matrix
- The FDOT ITS Performance Measures Quarterly Report
- The Final Report on Multimodal and Corridor Applications of Travel Time Reliability

- The Florida Statewide Intelligent Transportation System Architecture

Upon completion of this review, we constructed diagrams that depict the overall project development, planning, and programming processes within FDOT. This includes a high-level diagram that maps these processes from policy, to planning, to program development, and finally to project implementation, and shows how each program area fits into the larger project development and funding process. This allows a "10,000 foot view" of the dynamic and complex relationships between these planning and programming areas, and broadly illuminates areas where reliability may be most efficiently incorporated.

In addition to the high-level diagram, diagrams detailing important sub-processes, process flows, program-specific processes, and planning screens were constructed. These provide a better understanding of how projects are prioritized and the extent to which reliability is considered at a much smaller scale, and may better illustrate the specific areas where reliability is under utilized. The intent of the diagram is to document where improvements may be made to the process – in the form of tools, methods, policy or procedures.

After work was completed on both the high level and small-scale diagrams, we began work on a capability maturity matrix that captures FDOT's progress in meeting requirements of the four steps recommended by the SHRP 2 L05 project for incorporating reliability into planning and programming, as well as the specific dimensions of capability associated with each step. These are as follows:

- **Step 1. Developing and tracking reliability measures.** Dimensions of capability include the agency's use of reliability performance measures to reflect the reliability needs of the system.
- **Step 2. Addressing reliability in policy statements.** Associated dimensions of capability include the degree to which reliability is incorporated into an agency's vision/mission statements and goals and objectives; the level of planning cooperation/collaboration for reliability; and the organization structure and staffing in place to support reliability.
- **Step 3. Evaluating reliability needs and/or deficiencies.** Dimensions include the agency's capability to set reliability thresholds, analyze reliability needs/deficiencies, and use of forecasting to identify future deficiencies and related strategies.
- **Step 4. Incorporating reliability into planning and programming decisions.** Dimensions of capability include the degree to which reliability is incorporated into overall agency priority setting, planning and programming decisions, as well as the ability to implement and assess the effectiveness of reliability strategies.

This matrix provides a detailed assessment of how FDOT is performing in regards to specific dimensions of capability associated with each step, and includes an assessment of the Department's stage of maturity, its strengths and weaknesses in support of the dimension, and recommendations on how FDOT may advance to the next level of maturity.

3. Evaluation of Planning and Programming Process

Figure 2 provides a high-level depiction of the overall Central Office planning and programming processes. Reading from left to right, the diagram depicts how, on the most broad scale, projects are prioritized through the guiding policies, continuing through both long range and short range planning, and finally how projects are programmed and implemented. The diagram is color-coded by program or process, with purple representing capacity improvement programs; orange modal plans and processes; green preservation programming; red operations and maintenance processes; aqua those plans and processes associated directly with ITS and traffic operations; and blue depicting processes associated with multiple, simultaneous plans or programs. Included are both uni-directional and bi-directional arrows. The directional arrows depict plans or processes that directly inform or give rise to the construction of additional plans or processes. Bi-directional arrows are used when particular processes inform each other simultaneously, or to show plans that are developed in conjunction.

The left-most side of the diagram represents the policies that serve as a guide to Central Office programs and plans. These policies are more of a general vision that outline key priorities within the department, and generally do not provide specific recommendations on how these priorities may be implemented. Continuing to the right, the planning stage includes longer-term project priorities and system needs. Many plans and processes in this stage require close coordination between FDOT offices, and between FDOT and local partners and MPOs. This close coordination is represented by a double-sided arrow, which is meant to express that the plans are developed congruently, and project needs and priorities are negotiated and agreed upon by both parties. The program development phase of the overall planning and programming process occurs after the highway and modal plans are completed, and represent the stage in which funding priorities are negotiated and projects are selected. Finally, the last stage is implementation, during which work supporting a project and construction begins. This is also the point in which feedback on the overall project identification and selection process is used to evaluate whether the Department is meeting its overall vision and whether it is necessary to make adjustments to any of the policies guiding the process.

Figure 3 depicts the project identification, prioritization, and selection process for SIS capacity improvements. The left-hand side of the diagram depicts the project identification phase, during which needed improvements and system deficiencies are identified by local governments and modal partners, communicated and coordinated through District and Central Office staff, and processed and prioritized using the Strategic Investment Tool (SIT). This provides the basis for the project prioritization phase, during which funding stipulations and projected availability, project timing and phasing, and the geographic distribution of projects are all considered. Finally, as a result of this prioritization, selected projects are incorporated into capacity improvement plans such as the Unfunded Needs Plan, Cost Feasible Plan, and Work Program plans. As we have pointed out on the matrix, the SIT plays a key role in the project selection process, and better incorporating reliability and operational projects into the SIT is one of the most important mechanisms to advance to the next level of maturity.

The identification and selection process for non-SIS capacity improvement projects is illustrated in Figure 4. In this process, MPOs and local governments in a region are provided discretionary funding based upon a statutory formula giving equal weight to the population and motor fuel taxes collected in the area. During the project identification phase, MPOs provide a prioritization list to local districts, who use it as a basis for their own, district-wide priority list. In the prioritization phases, districts consider the priorities of local partners and MPOs, funding availability, the timing and phasing of projects, and whether a requested project supports or is part of a larger transportation project being developed by the local partner or MPO. All of these factors, in addition to a wide geographic distribution of projects within the district, are used to prioritize projects at the district level. As depicted on the right hand side of this diagram, the result is the non-SIS capacity plans, which are utilized in district work programs. Broadly speaking, the process for non-SIS capacity improvement projects provides an opportunity to incorporate non-SIS highway or arterial capacity improvements that can increase reliability, including new roadways, roadway widening, street connectivity, grade separations, HOV/managed lanes, and multimodal corridors.

Two processes specific to Traffic Operations and Intelligent Transportation Systems are illustrated in Figures 5 and 6, which provide some insight into how this Office identifies and determines which operational improvements to fund. Figure 5 provides an overview of the process as a whole, illustrating how various plans and studies (e.g., Regional/State ITS Plans, Corridor Plans, Congestion Management Plans, ITS Feasibility Plans) inform the development of the Regional/State Intelligent Transportation System Architecture (RITSA/SITSA), which identifies short- and long-term ITS project priorities that have been identified to support user needs and selected market packages in the ITS architecture. Projects in the RITSA/SITSA are included in the MPO Long Range Transportation and Cost Feasible Plans, which are programmed at the statewide level through the FDOT 5-Year State Transportation Improvement Plan.

Figure 6 provides further detail on the integration of the ITS plan and regional architecture into the development of the MPO Needs Plan and Long Range Transportation Plan. National, statewide, and regional ITS strategic plans provide guidance that local partners use to define their ITS needs, visions, goals, and objectives. As a result of this, each partner agency provides a list of their ITS project priorities, which is next incorporated into the RITSA. The olive-colored boxes are used to represent the public participation process, in which the MPO evaluates each all the ITS projects input by their local partners and assesses needs for the MPO area as a whole. These projects are ultimately used in the creation of the MPO's Needs and Long Range Transportation plans, during which the MPO and all interested parties are kept up to date on project lists and priorities through drafts of the plans.

4. Assessment of Capability Maturity in Incorporating Reliability into Planning and Programming Processes

Table 1 provides a capability maturity assessment matrix that considers each step in incorporating reliability measures into the planning and programming processes and evaluates

FDOT's current status on each of these steps. The table is organized around the four steps recommended by SHRP 2-L05 for incorporating reliability into planning and programming, each of which are listed in the "key step" column, as well as specific dimensions that are necessary to fully meet the objectives of the step. Each dimension of capability is evaluated, and we provide a bullet-point list of what we see as FDOT's strengths and weaknesses in the particular area in the third and fourth columns of the table. Considering both the strengths and weaknesses, the fifth column provides our assessment of the level of maturity FDOT is currently displaying for each step or dimension. The levels of maturity are defined in Figure 1 below, and range from a level one to four, defined as follows:

- **Level 1: Ad Hoc.** At level 1, an agency has no formal process for incorporating reliability into planning or programming; rather it is performed at an ad-hoc or opportunistic basis.

- **Level 2: Developing**. By level 2, an agency begins to acquire the capabilities to better incorporate reliability, and processes/methods of assessing and tracking reliability have been identified.

- **Level 3: Specified**. In level 3, reliability measures are on the path towards integration. At this stage, processes are documented, and an agency and its partners are in agreement on the specific measures and how they'll be utilized, but reliability has not yet been fully integrated.

- **Level 4: Mainstreamed**. Full integration of reliability measures occurs at level 4, which features formal programs, partnerships, and incorporation into all levels of policy, strategy, and project planning.

The final column contains our recommendations on how FDOT could advance each step or dimension into the next level of maturity. The recommendations we provide are items that warrant potential consideration, and these will continue to be refined as we develop a more specific approach on how to best incorporate reliability into FDOT planning and programming.

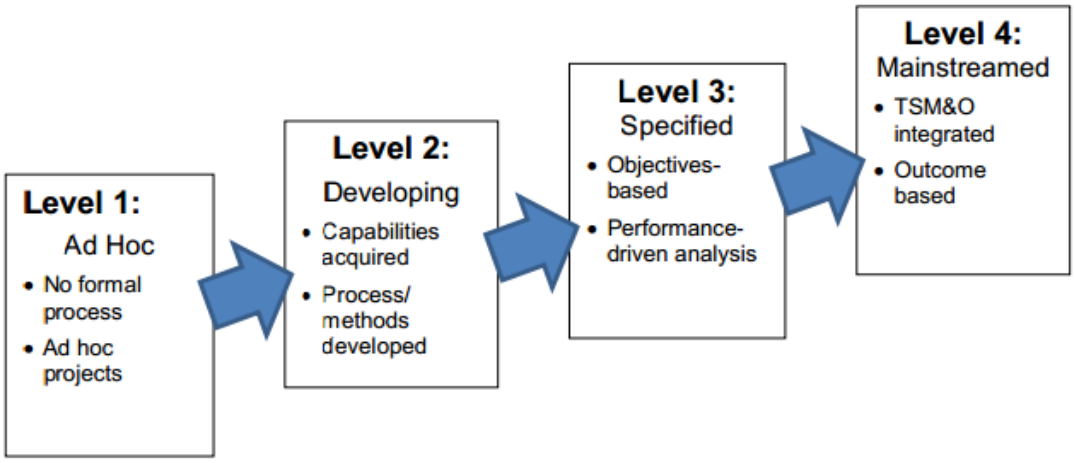

Figure 1. Levels of Maturity

5. Recommended Actions to Advance to the Next Level of Maturity

Table 1 provides a number of actions that FDOT could consider to more fully integrate reliability into planning and programming. Based on these recommendations and our inventory of the Department's current planning and programming work flow, we believe the following high priority actions may best accomplish this integration:

- **Specifically address how FDOT will monitor reliability in key policy statements.** While reliability is emphasized in key documents such as the Florida Transportation Plan, neither specific performance measures nor how reliability will be used to assess system performance are addressed. Policy statements are crucial in that they define a strategic direction and communicate transportation priorities. Ensuring that reliability is addressed in these statements is a critical step towards incorporating reliability into planning and programming processes. The pending updates to the FTP and SIS Strategic Plan present an excellent opportunity to address this action, and reliability champions should be collaborating closely with appropriate staff as the plans develop. The ITS Strategic Plan and Program and Resource Plan are additional opportunities.

- **Establish reliability outreach and education programs through periodic presentations to FDOT at all levels and other local/regional stakeholders.** Having an outreach program not only communicates and better educates and promotes a broader understanding of reliability among staff, it also provides an opportunity to engage with stakeholders and facilitate inter-agency collaboration on data collection and analysis. This action could facilitate the integration of reliability in planning products such as modal plans (e.g., Spaceport Master Plan, Seaport Master Plan, etc.) and MPO Long

Range Transportation Plans. Note that this is already underway as part of the Multimodal Mobility Performance Measures program.

- **Develop tools to assess and compare the positive impact of addressing system needs through operational vs. capacity improvements.** A tool that provides the mechanism needed for trade-off analysis would allow users to assess system needs and understand the benefits that are rendered by addressing deficiencies through operational improvements. The SIT plays a vital role in the project prioritization and selection process, but presently can only evaluate projects listed on existing roadways and is not closely linked to reliability measures. Better incorporating reliability performance measures in the SIT could strongly impact the project prioritization process and help favor projects featuring operational improvements for inclusion in the Cost Feasible Plan and Work Program. A working group comprised of Planning and Operations staff from Central Office could be formed and tasked with reaching out to District Staff and MPOs to ensure they have the tools and expertise necessary to evaluate, prioritize and select operations projects for inclusion in MPO Transportation Improvement Programs (TIPs), project priority lists, and District/Turnpike Work Programs.

- **Pursue a policy change regarding the use of SIS funds for non-capacity projects and continue to find ways to incorporate operational improvements into broader capacity projects.** Statutory obligations currently limit the extent to which operational improvements can be considered in the planning and programming process. SIS funds, which represent 75% of all project funds, are currently defined by statute to be limited to capacity projects. While there are ways of building operational improvements into capacity projects, many of which are being increasingly utilized by the Department, a high-level policy change away from this requirement would be the most effective way to better incorporate reliability into all planning and programming processes. The FDOT Program and Resource Plan is the best place to make a change in how operations improvements are funded, as well as legislative budget requests. A reliability champion should be tasked with bringing the issue before Executive Management to make the change.

Figure 7 depicts where specific actions related to collaboration and tool development could occur to incorporate reliability into the overall Central Office policy, planning, program development, and implementation processes.

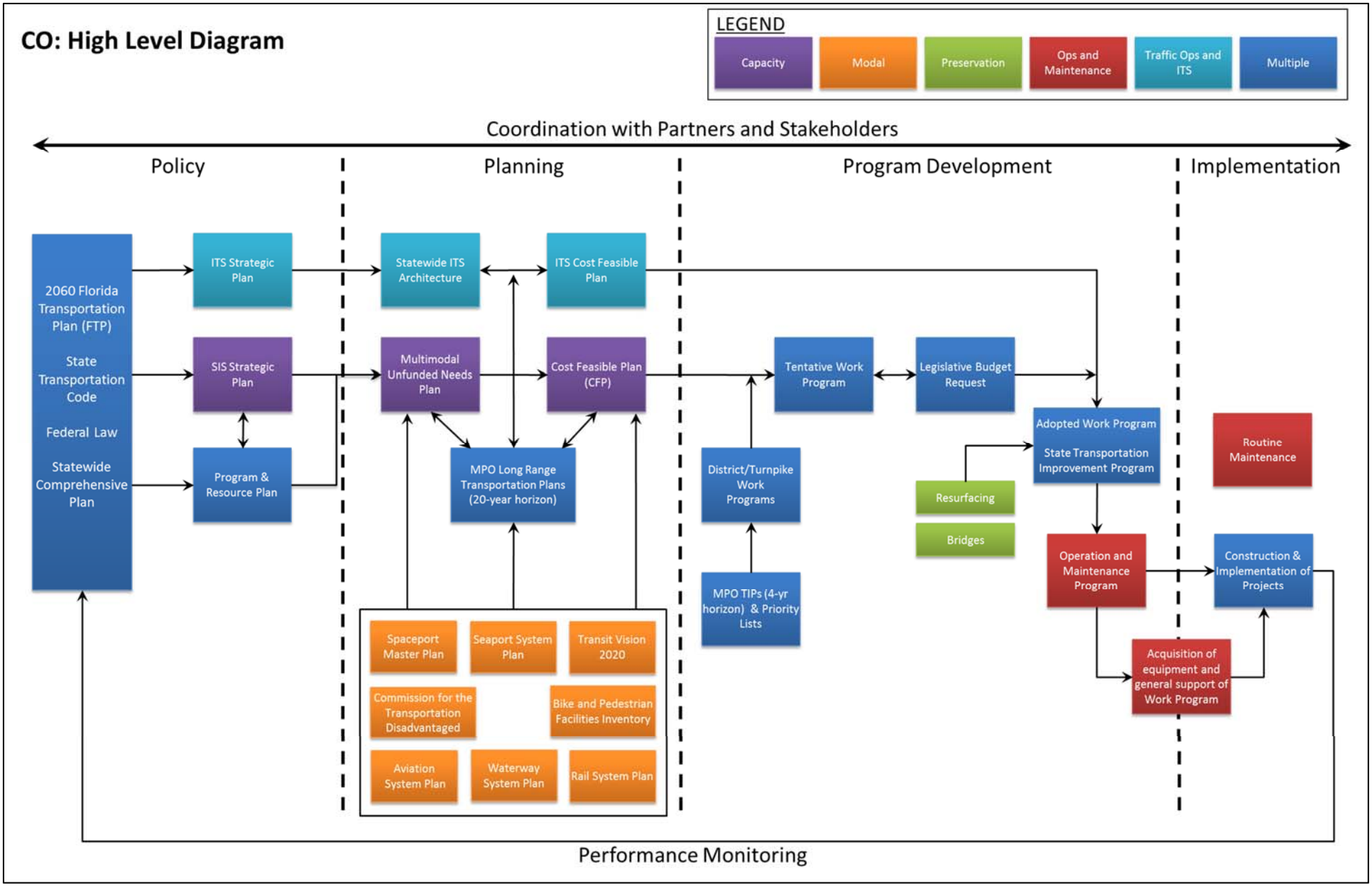

Figure 2: High Level Diagram of Central Office Planning and Programming Processes

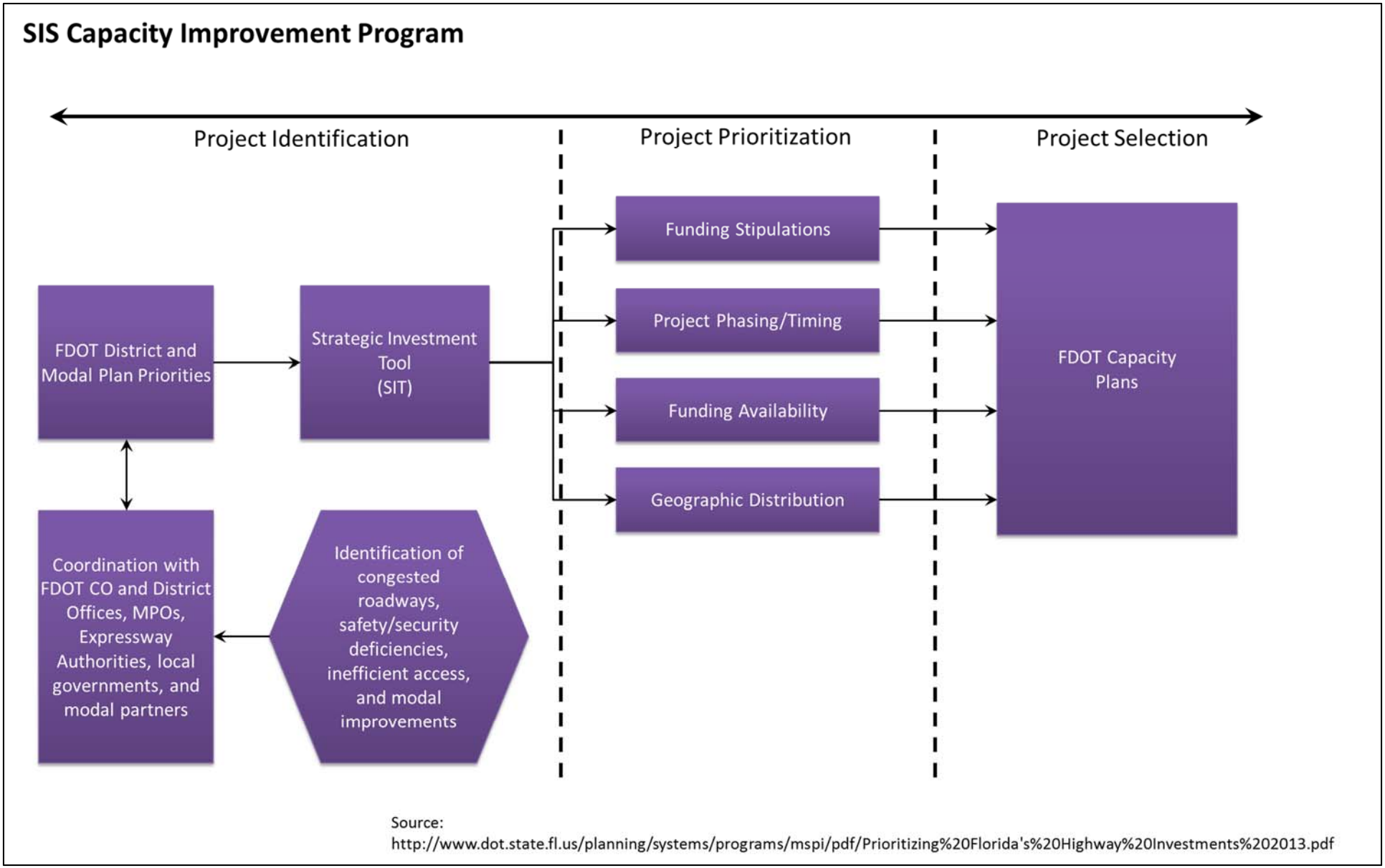

Figure 3: SIS Capacity Improvement Program

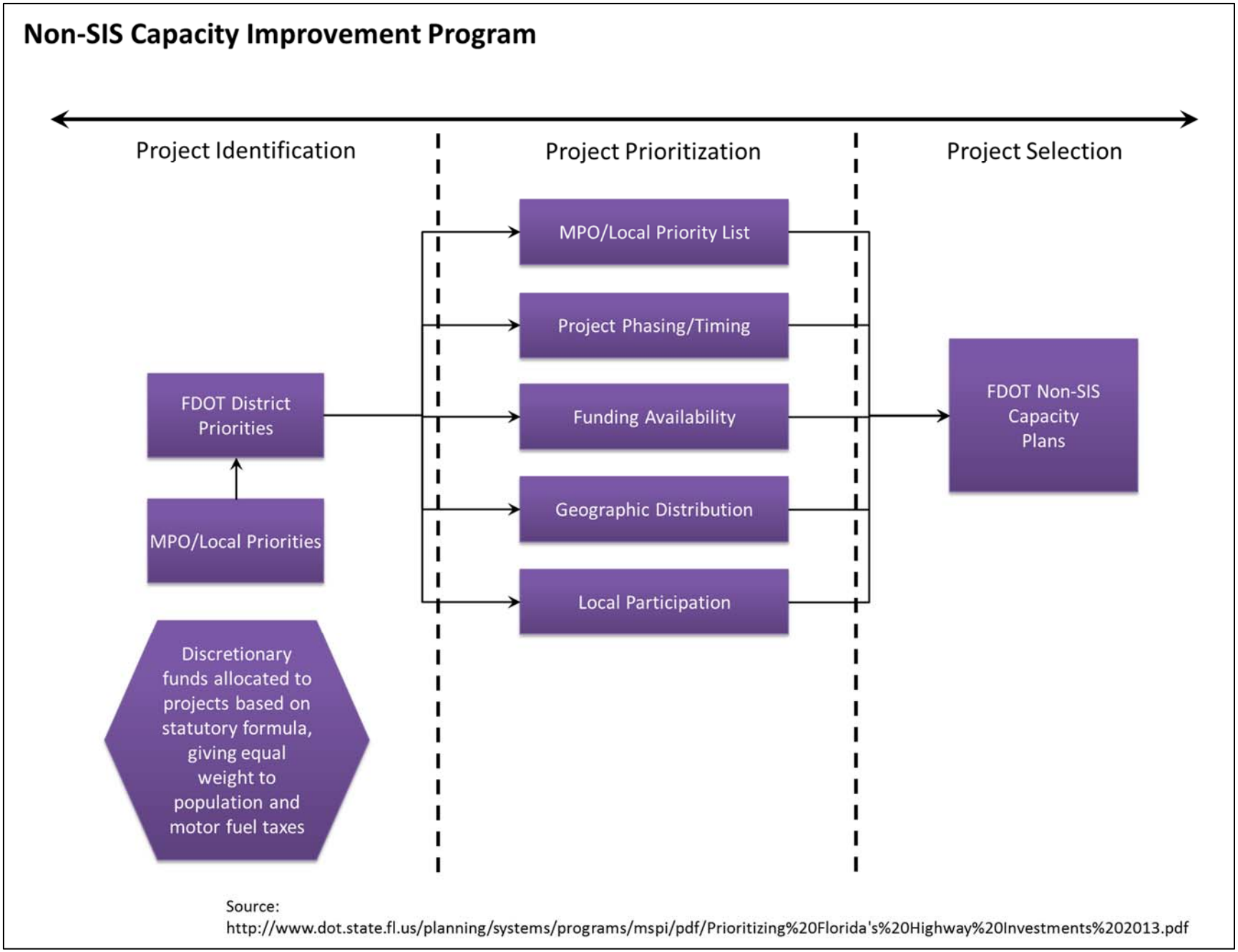

Figure 4: Capacity Improvement Process for Non-SIS Projects

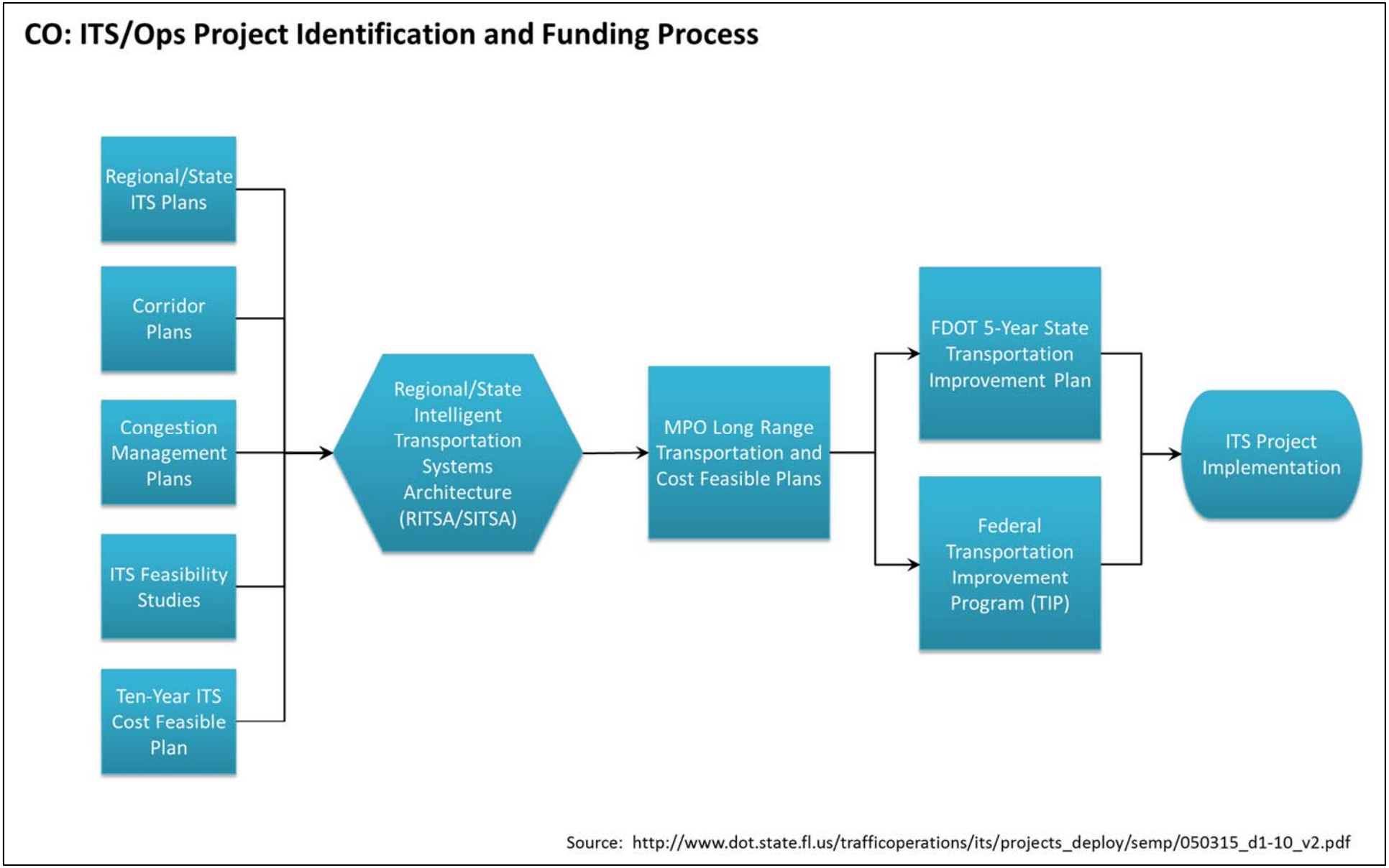

Figure 5: Traffic Operations/ITS Project Identification and Funding Process

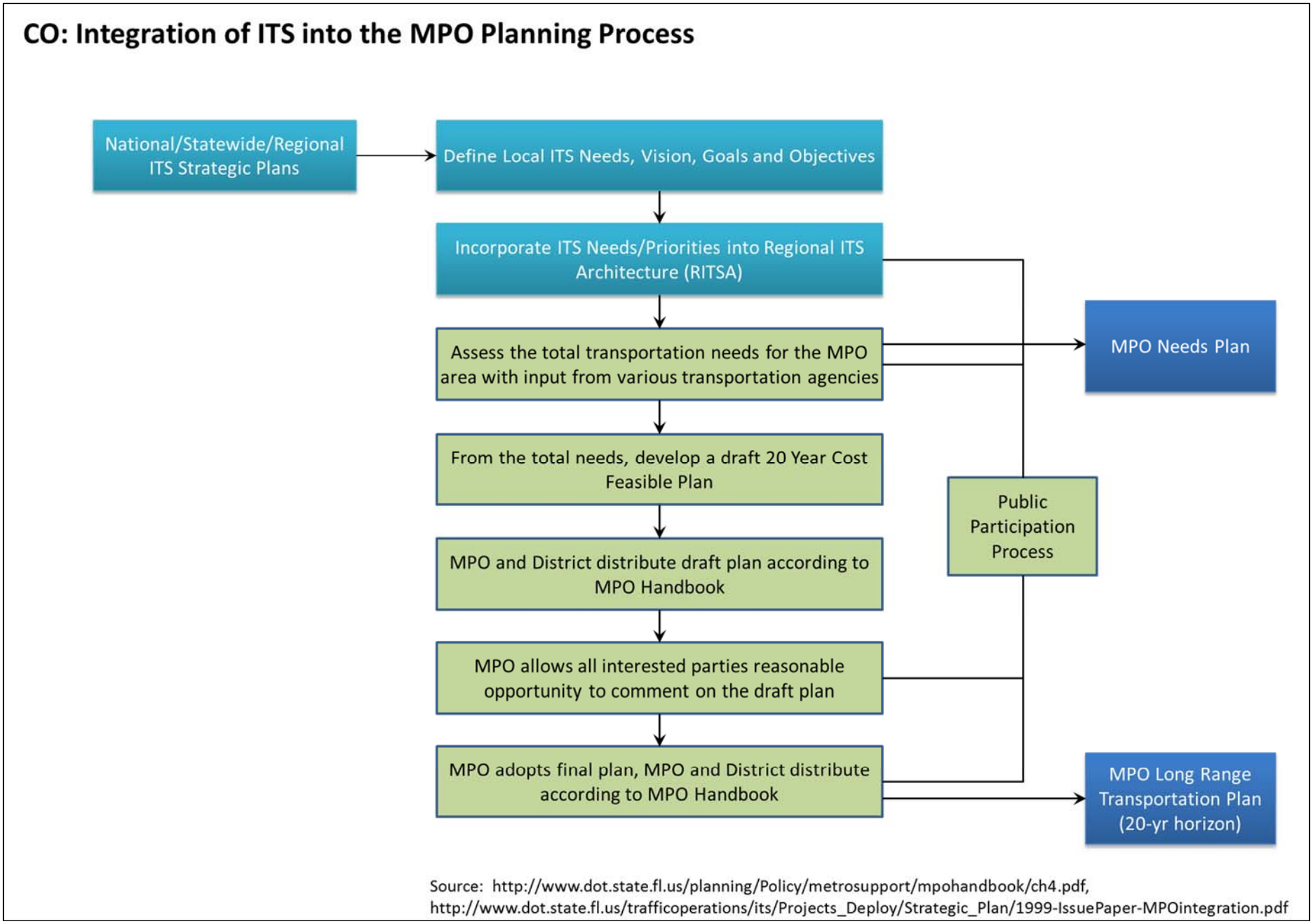

Figure 6: Integration of ITS into the MPO Planning Process

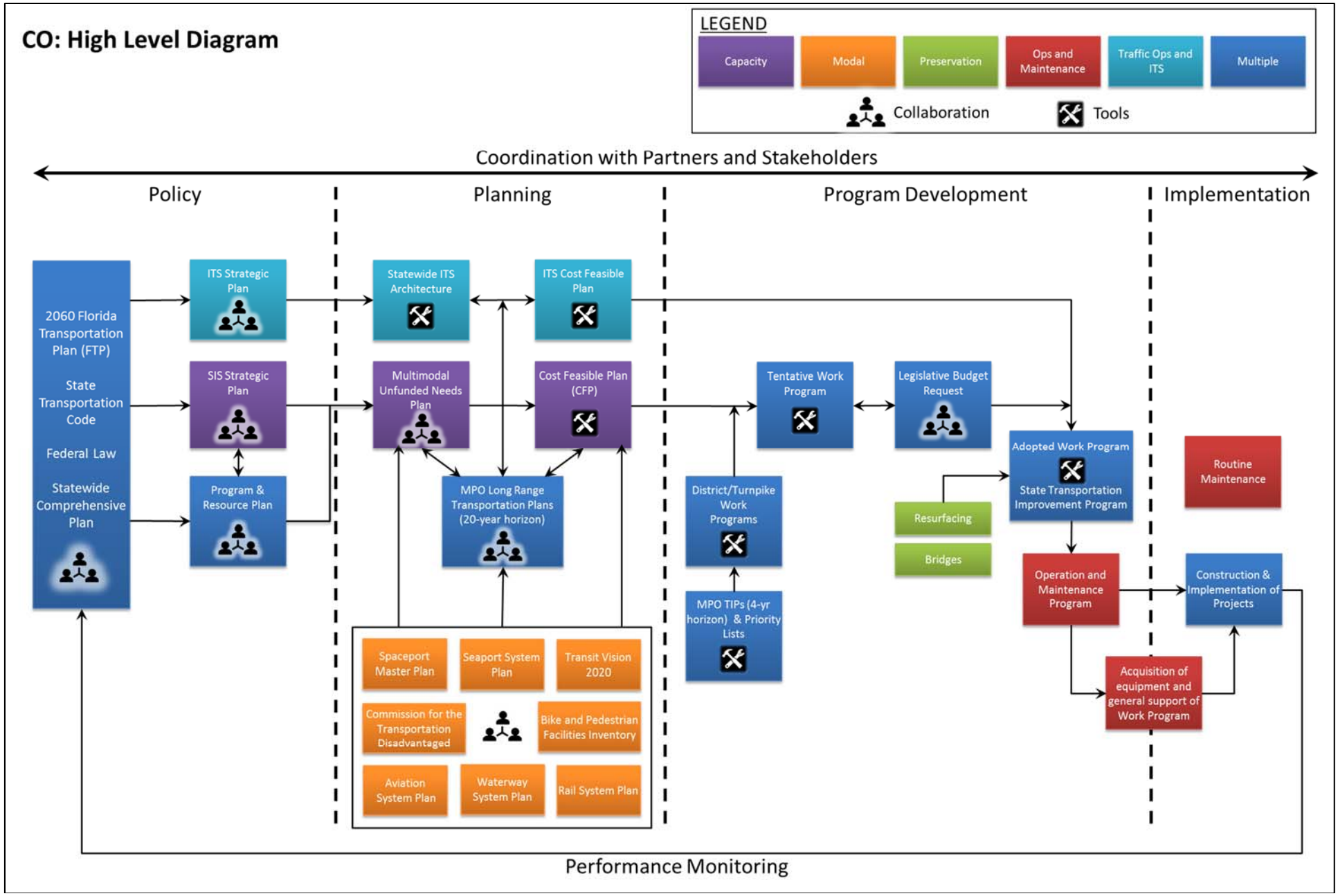

Figure 7. Recommendations for Collaboration and Tool Development to Incorporate Reliability into Central Office Planning and Programming Processes

Table 1: Assessment of FDOT's Maturity in Incorporating Reliability into Planning and Programming Processes

Key Step from SHRP 2 L05	Dimension of Capability	Strengths	Weaknesses	Assessment of Maturity	Recommendations to Advance to Next Level of Maturity
Step 1: Developing and tracking travel time reliability measures	Reliability Performance Measurement	• Staff are experienced and have many years working with travel time reliability concepts • FDOT has a comprehensive, well developed matrix of mobility measures including people and freight and encompassing all modes • FDOT has developed travel time reliability model post-processing to calculate and predict reliability on all freeways; model considers recurring congestion, incidents, weather, and work zones • Reliability used for evaluating statewide reporting, ITS program, and system level project prioritization • For operations, reliability monitored using ITS instruments, including roadside detectors and vehicle probe data, to measure speed and travel time • Reliability results are reported annually in FTP Scorecard, which documents short-term objectives, strategies, and progress towards 2060 FTP goals/objectives	• In large part because of Florida's geographic diversity, performance measures that report on a statewide level may underestimate or obscure reliability problems • Reliability measures may not take into account differences in user perceptions of system performance. Communication of measures is somewhat confusing – several sources with different measures • No visual methods for reporting on travel time reliability	Level 2: Developing – Output data reported from monitoring and utilized in reliability strategy improvement	• Develop a plan for measuring/determining travel time and speed data on designated roadway networks (underway) • Establish data archive – coordinating between planning and operations • Ensure a consistent strategy for communicating performance measures across dashboards, Planning and ITS reporting • Develop travel time reliability performance measures to report in the Performance Dashboard on both a program and network level • Focus on a few key measures that best capture reliability and are meaningful to system users • Add performance description to measure results, such as "good", "fair", and "poor" • In addition to reporting reliability statewide, measures should capture areas which are representative of Florida's diverse transportation network and differences in user needs in order to provide a clear picture of reliability needs in the state • Apply performance measures for development/evaluation/ planning/programming of reliability improvements • Establish Source Book as sole source for TTR measures

Key Step from SHRP 2 L05	Dimension of Capability	Strengths	Weaknesses	Assessment of Maturity	Recommendations to Advance to Next Level of Maturity
Step 2: Addressing reliability in policy statements	Reliability Goals and Objectives	• Reliability emphasized within the Florida Transportation Plan at multiple levels, including its vision, goals, objectives, and strategies • Long term agency objectives in regards to reliability are broadly defined. For example, one of the long range objectives included in the 2060 Florida Transportation Plan (FTP) is to "increase the efficiency and reliability of travel for people and freight" • Operational improvements are emphasized in 2060 FTP; system maintenance and operations one of the goals of the FTP • 2060 FTP includes the following implementation strategy: "emphasize transportation systems management and operations strategies to optimize performance of existing facilities"	• While reliability is recognized in key policy statements, neither specific performance measures nor how reliability will be used to assess system performance are addressed • While reliability performance measures are well-defined by the Department, these measures are not specifically reflected in policy language • Policy statements and implementation strategies regarding reliability are generalized and do not consider factors specific to the state of Florida or the different needs of regions within Florida	Level 2: Developing – Reliability and related objectives understood/ incorporated as agency policy objective	• Specifically address how FDOT will monitor reliability in key policy statements • Develop Florida-specific "causes of congestion" pie chart tool and models • Incorporate specific performance measures in the pending updates to the FTP and SIS Strategic Plan; outline how the preferred measures will be tracked to assess whether the transportation system is reliable • Tailor language regarding performance measures in the FTP and SIS Strategic Plan to address the causes of poor reliability and reliability issues specific to Florida • Address the specific freight/people reliability concerns of regional partners/stakeholders during the update cycle of the FTP and SIS Strategic Plan by creating a focus group consisting of individuals from partner agencies with reliability expertise
	Planning Cooperation/ Collaboration for Reliability	• The Florida Transportation Plan and SIS Strategic Plan emphasize the importance of regional and statewide coordination between FDOT and other state agencies, local governments, and stakeholders	• No policies currently address how the reliability needs of a particular partner/stakeholder will impact planning or budgeting of projected system needs •	Level 1: Ad Hoc – No formal planning or programming for reliability	• Establish reliability outreach and education program through periodic presentations to FDOT at all levels • Create policy goals that outline how FDOT and other key stakeholders will coordinate and gain consensus on preferred key performance measures which adequately address both local and statewide needs • Define how to measure reliability performance to address the specific needs of local/regional partners and stakeholders • Clearly define, document, and

Key Step from SHRP 2 L05	Dimension of Capability	Strengths	Weaknesses	Assessment of Maturity	Recommendations to Advance to Next Level of Maturity
					communicate preferred measures of system performance and the importance of reliability both internally and externally • In cooperation/ coordination with MPOs and planning offices, identify ongoing planning-related activities as framework for integration of reliability (local, regional, statewide) • Establish reliability improvement strategies as viable alternative in PD&E studies
	Organizational Structure and Staffing for Reliability	• Strong technical capabilities among Central Office staff	• No accountability mechanisms (dashboard) for reliability • Lack of District champions	Level 2: Developing – Needed staff capabilities for planning identified and specified	• Identify logical functional coordination and accountability relationships • Train key Central Office and District staff on using the SIT for analyzing operational improvements • Investigate opportunities to integrate key Central Office and District reliability staff into the project selection process • Create a reliability training program/training opportunities • Assign a reliability champion in each District
Step 3: Evaluating reliability needs and/or deficiencies	Reliability Needs/ Deficiency Analysis and Forecasting	• FDOT is currently in the process of linking TTR measures into the Strategic Investment Tool (SIT), which will allow testing of projects support system reliability and the degree to which they support the goals and objectives of the 2060 FTP • The FTP scorecard clearly illustrates mobility and connectivity measures in a manner which is easily accessible • The Map-21 Performance Report	• The FTP Scorecard includes neither the travel time or planning index, the two performance measures officially used FDOT's definition of travel time reliability • While reported, currently reliability performance is not tied to a way to translate deficiency into tangible need • No tool currently exists that evaluates the potential impact of operational versus capacity improvements; the SIT may develop this ability in time • The SIT can only evaluate and	Level 2: Developing – Rules of thumb used to identify remediable reliability-related deficiencies	• Develop tool to assess and compare the positive impact of addressing system needs through operational vs. capacity improvements • Integrate tools that analyze operational improvements into all aspects of the planning and programming process • Develop and apply analyses and related mechanisms needed for trade-off analysis (modes, capacity/ operations, demand management) • Develop approach for benefit/cost or

Key Step from SHRP 2 L05	Dimension of Capability	Strengths	Weaknesses	Assessment of Maturity	Recommendations to Advance to Next Level of Maturity
		assesses and reports upon annual reliability performance • FDOT is currently exploring ways to set performance targets that will be used to report upon annual system performance • When TTR measures are fully integrated into the SIT, projects can be weighted to provide greater weight to the Maintenance and Operations goal of the FTP	prioritize projects located on existing roadways • There is not a clear connection to the causes of unreliability		net percent value assessment and adopt on all projects • Tie the results of the annual reliability report into specific areas of the planning and programming process; ensure annual results have a specific consequence on project funding and prioritization • Amend the FTP scorecard to use officially adopted performance measures, consistent with the Map 21 Performance Report • Instead of a simple report of system performance, set annual reliability performance targets
Step 4: Incorporating reliability into planning and programming decisions	Inform agency investment decisions	• There are significant indicators that system reliability is receiving increasing emphasis as a means to improve performance in a more economical manner (e.g. the incorporation of TTR into the SIT) • The Office of Policy Planning is developing a benefit/cost tool which, when complete, provide a means to calculate return on investment for projects • The versatility of the SIT and the ability to tweak the weight given to certain factors allows for the possibility to prioritize projects supporting reliability	• SIS funds, which account for approximately 75% of all project funding, are designated for capacity improvements only and cover what? • FDOT does not have a means to directly compare the operational and capacity improvements and their impact on reliability given a fixed budget • FDOT has not fully incorporated reliability performance measures and operations investments into a benefit/cost analysis tool • Operational improvements will likely prove difficult to incorporate into the current methodological framework of the B/C tool • FDOT currently lacks a specific mechanism to assess how much an operations budget would contribute to reliability	Level 1: Ad Hoc – Reliability improvements committed on opportunistic basis	• Pursue a policy change regarding the use of SIS funds for non-capacity projects and continue to find ways to incorporate operational improvements into broader capacity projects • Tweak language of certain operational projects to fall under FDOT definition of capacity improvements • Investigate methods for diverting "off the top" funding from other program areas into operational improvements • Continue to explore mechanisms for applying reliability into the SIT • Incorporate PD&E processes for incorporating reliability • Identify and change policies or statutory obligations regarding SIS project and program funding • Work closely with developers of B/C tool and advocate the importance of operational investments; provide support and guidance on how operations can be integrated into the

Key Step from SHRP 2 L05	Dimension of Capability	Strengths	Weaknesses	Assessment of Maturity	Recommendations to Advance to Next Level of Maturity
					tool • Advocate use of Bluetooth or other real time data collection methods as a means to estimate the cost of an operations program budget and the degree to which program would improve system performance
	Reliability Implementation and Feedback		• FDOT has no means to track how project investment has impacted reliability performance	Level 2: Developing – Performance reviewed on regular basis and applications adjusted	• Identify processes and resources required to achieve appropriate level of effectiveness for state of the practice for each reliability strategy • Investigate methods to chart system performance and use to better model how operational improvements can impact reliability performance