A Plan for the Future

The appropriate "Mix of Fixes" can maximize the serviceability of a roadway network while also minimizing agency costs

Asset Allocation Strategies

Traditionally, state departments of transportation (DOTs) have considered the construction and maintenance of a roadway as two separate operations, with separate funding levels assigned to each. Lately, many states have adopted a life cycle cost strategy, in which both the initial construction costs and long-term maintenance and operation costs are included as a way of comparing alternate pavement designs for a section. An asset management strategy, however, can only truly be reached when an agency applies this mindset both simultaneously across their roadway network and continuously throughout time. In doing so, the pavement network is viewed as an asset and a mix of different rehabilitation strategies (Mix of Fixes) are employed to maintain its value.

Strategic asset allocation is a well established theory that is most notably applied in personal portfolio management. This method adheres to the 'base policy mix' principle, in which a combination of asset classes exists and the combined return is based on a proportionate combination of each asset. For example, if someone's portfolio consists of 50% stocks yielding a 10% return per year and 50% bonds yielding a 5% return per year, the combined return is 7.5% per year (0.5*10% + 0.5*5% = 7.5%).

Application of strategic asset allocation to a pavement system allows the system to maintain the network in the highest overall condition possible at the lowest constant level of dollar flow into the pavement network. Such a system is inherently dynamic (Figure 1), so reallocation is necessary at regular intervals to deliver a continuously optimized system. Thus, **the asset allocation mix will reflect the strategic goals for the system at any given time**.

Pavements as Assets

The Federal Highway Administration (FHWA) publication "A Quick Check of Your Highway Network Health" says:

> "By viewing the network in this manner [with each pavement as an asset in a collected network], there is a certain comfort derived from the ability to match pavement actions with their physical/functional needs. However, by only focusing on projects, opportunities for strategically managing entire road networks and asset needs are overlooked." [1]

By way of this statement, the FHWA has advocated the implementation of asset allocation strategies in lieu of a traditional "bottom up" approach, in which the worst roadways receive attention first.

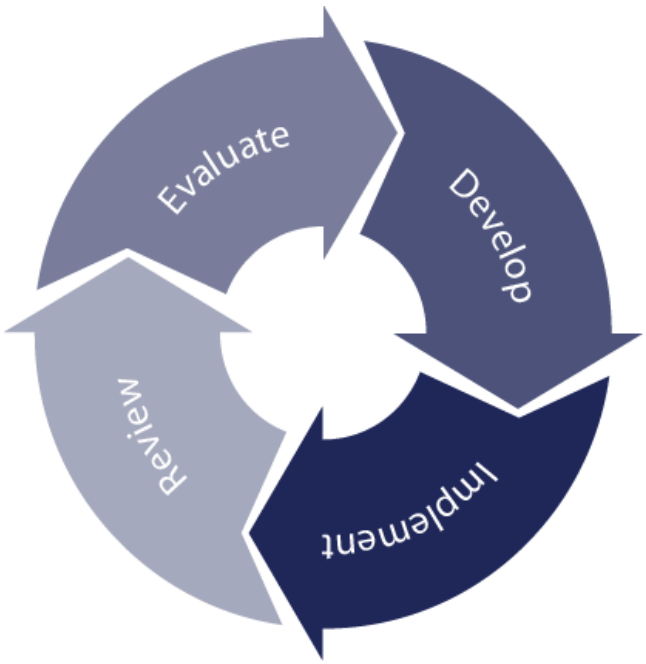

Figure 1. Inherent steps in a successful asset allocation strategy: (1) evaluate the existing system, (2) develop a plan of action, (3) implement the plan and (4) review the system's response, then repeat the process.

A Tale of Two Pavements

Consider a hypothetical network analysis of a 3,000-mile system. One-third (1,000 miles) of the system consists of a composite pavement with an asphalt wearing coarse that will require work in 5 years. Another one-third (1,000 miles) of the system consists of a concrete pavement that will require work in 10 years. The final one-third (1,000 miles) of the system is to be new construction, to be constructed of either asphalt or concrete. The anticipated service life of the asphalt pavement is 15 years, whereas the anticipated service life of the concrete pavement is 30 years. To easily see the effects of pavement choice, calculate the average remaining service life (RSL) for each mile of the network using the 'base policy mix' principle, as in Figure 2.

Miles in Segment of Highway System	Years to Next Fix		Years of Service in Segments
1000	5	*(1000 x 5)*	5000 yr-mi
1000	10		10000 yr-mi
1000	15		15000 yr-mi
		Total =	30000 yr-mi

Average Remaining Service Life for each mile = 30000/3000 = 10 yr.

Miles in Segment of Highway System	Years to Next Fix		Years of Service in Segments
1000	5	*(1000 x 5)*	5000 yr-mi
1000	10		10000 yr-mi
1000	30		30000 yr-mi
		Total =	45000 yr-mi

Average Remaining Service Life for each mile = 45000/3000 = 15 yr.

Figure 2. Average remaining service life (RSL) for a network composed of a 1,000 mile section with 5 years of service remaining, a 1,000 mile section with 10 years of service remaining, and either (top) 1,000 miles with 15 years of service remaining or (bottom) 30 years of service remaining. See Source 1 for a more detailed example of this application.

Deciding What, When, Where

Though evaluating a current pavement network and alternative construction options involves relatively simple calculations, making a decision based on what pavement preservation technique is most applicable on which pavement section and at what time is much more significant to a pavement allocation program. Regardless of the pavement preservation method chosen for a road, timeliness is of utmost importance because of its implications on available funding and the future of the pavement system. Luckily, "**a palette of pavement preservation treatments, or Mix of Fixes, is available to address the network needs at a much lower cost than traditional methods**." [1]

> **"'Remaining Service Life' (RSL) is the tool we need to apply."**
> - FHWA [1]

Some states currently collect International Roughness Index (IRI) data to quantify "ride" as a means of determining overall health of the pavement system, but this measure does not include many types of pavement distress. A more abstract means of quantifying network health, such as the remaining service life (RSL), can include all pavement distress modes and serviceability issues. Once the method of quantifying the health of the network is determined, a computer-based pavement management system (PMS) must be implemented to guide the decision-making process. A PMS does not make the decisions, but rather provides valuable insight on applicable preservation options. Only with a **fully-evaluated network and the aid of a PMS** can the DOT decision-makers make the best decisions – decisions that will optimize their pavement network and **save taxpayers money!**

Sources

1. FHWA-IF-07-006 "A Quick Check of Your Highway Network Health".
2. http://www.tfhrc.gov/pubrds/julaug98/pavement.htm

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