

Uncertainties as of January 9, 2025



Uncertainties on September 15, 2025

the next pandemic
communicating uncertainty
political uncertainty federal funding
changes in auto use civil war my paycheck
societal stability
trumps decisions
human
the next generation
land use forecasts
political
world war iii
my family
democracy

climate change
funding

ai cav
federal policy

the dried beans hunting season
sustained human existence
supply chain disruptions ability to improve lives
upcoming sessions
autonomous vehicles

legislative
dried beans

Decision Making Under Deep Uncertainty

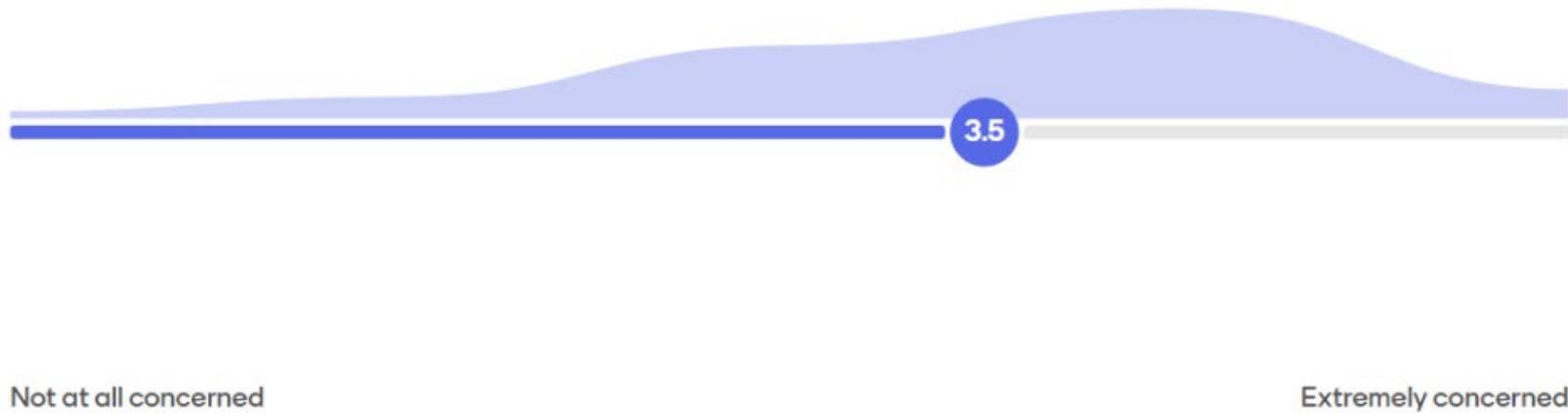
Marty Milkovits and Flavia Tsang

September 16, 2025

How do we handle uncertainties in transportation modeling?

- Model re-calibration / updates
- Sensitivity Testing
- Scenarios
- Eliminate them with more sophisticated models!

How Concerned are you that uncertainties not accounted for in your analysis could misdirect planning recommendations



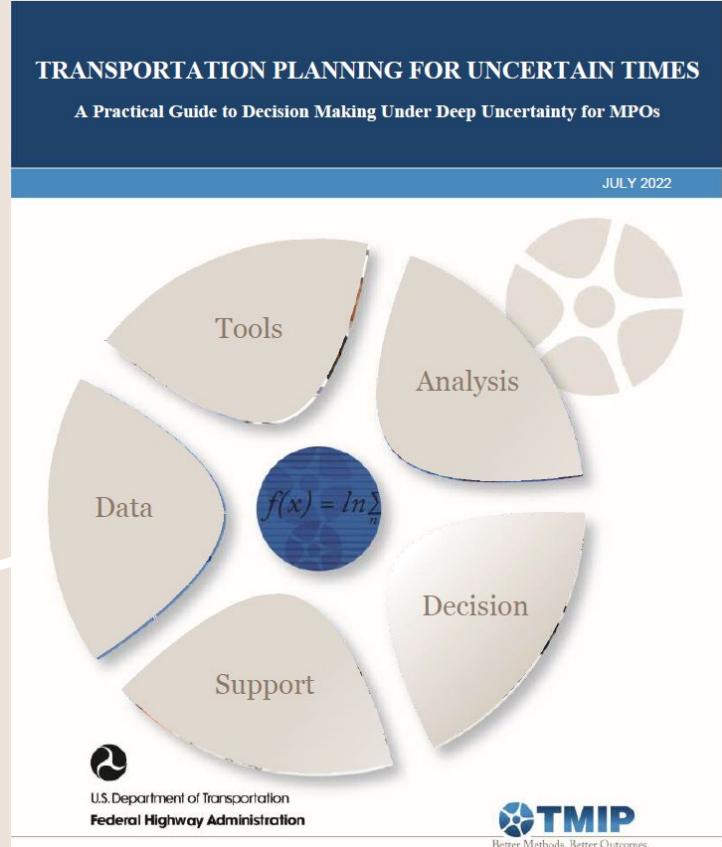
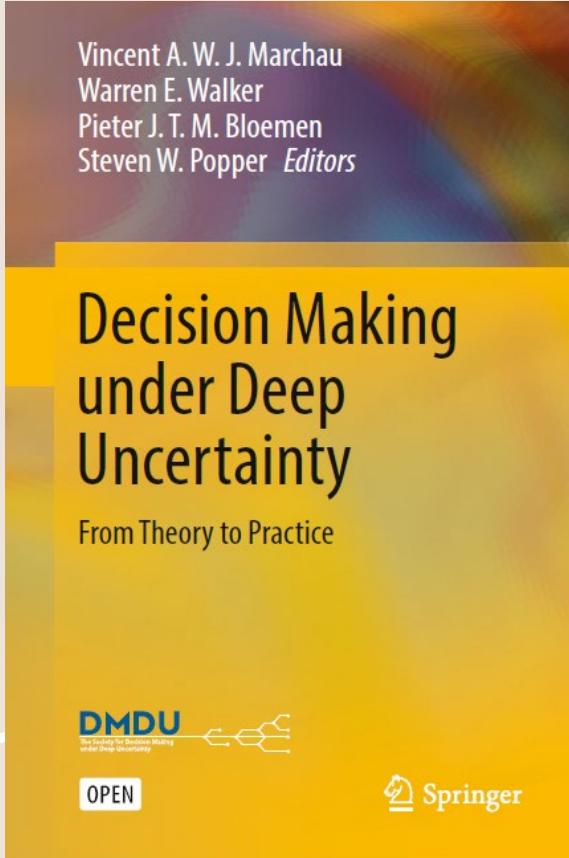
Think of a recent plan or study...

1. What key unknowns do you believe could influence its success in meeting its goals?
2. Could recognizing uncertainty have led to different decisions?

Decisions for the Decade



Can we do better with DMDU?



trbtravelforecasting.org/dmdu

Uncertainty to Deep Uncertainty

	Level 1 (Determinism)	Level 2 (Probability)	Level 3 (Plausibility)	Level 4 (Plausibility+++)
Scenario	Pretty Clear Future / Conditions	Ranges and Probabilities	Few Alternatives	Many Alternatives
Model	Single Deterministic Model	Single Stochastic Model	Few Models	Many Models
Metrics	One number per output	Confidence intervals on outputs	Range of outputs	Wide range of outputs
Values	Single set of values	Several sets, with probability	Several sets	Many sets

Adapted from Marchau, V.A.W.J., Walker, W.E., Bloemen, P.J.T.M., Popper, S.W. (2019). *Introduction*. In: Marchau, V., Walker, W., Bloemen, P., Popper, S. (eds) *Decision Making under Deep Uncertainty*. Springer, Cham. https://doi.org/10.1007/978-3-030-05252-2_1

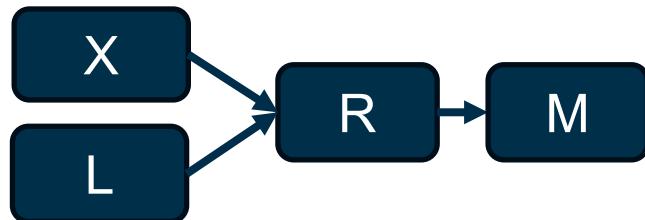
Risk Analysis vs. Exploratory Analysis

	Level 1 (Determinism)	Level 2 (Probability)	Level 3 (Plausibility)	Level 4 (Plausibility+++)
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DMDU Key Aspects

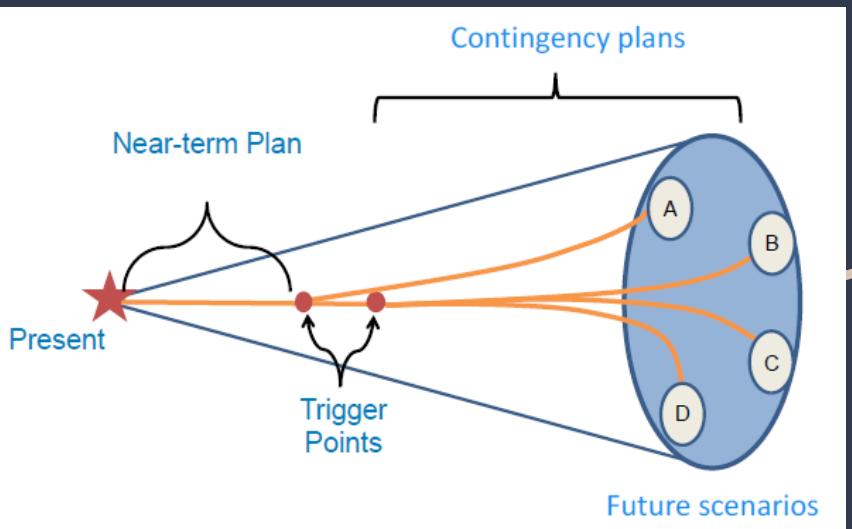
1. Exploratory Modeling
2. Adaptive Planning
3. Decision Support

Exploratory Modeling



X – Exogenous Uncertainties	Factors influencing goals outside control <i>Scenarios</i>
L – Policy Levers	Actions to influence goals <i>Scenarios</i>
R – Relationships (Models)	How the uncertainties and levers influence goals <i>Models</i>
M – Performance Measures	The goals <i>Metrics & Values</i>

Adaptive Planning

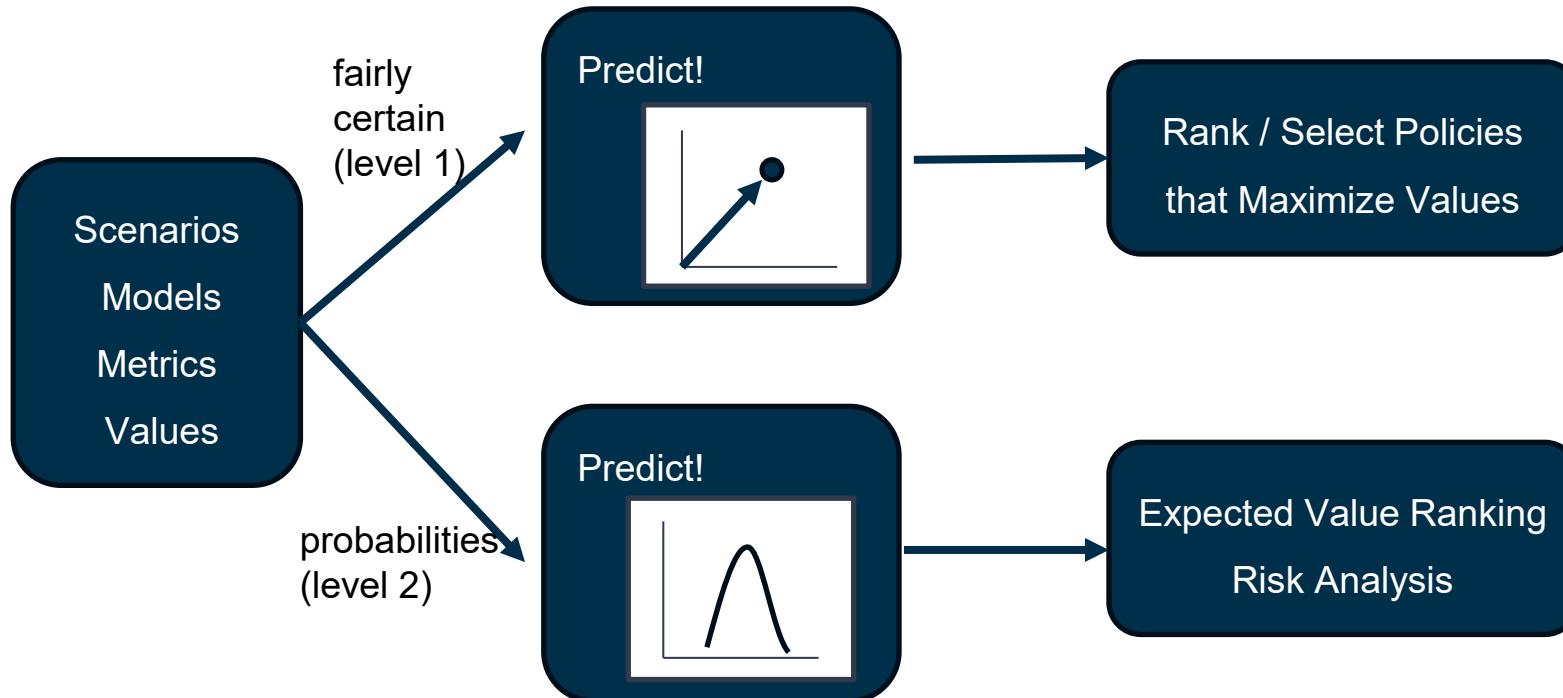


- Planning to Adapt – “our plans may change, we’ll see”
- Adaptive Planning – “this is our plan for now, what we are looking for, and how it will change”
- Humility in planning
- Does not ignore uncertainties

Source: RAND, adapted from Kaatz, L. (2015).

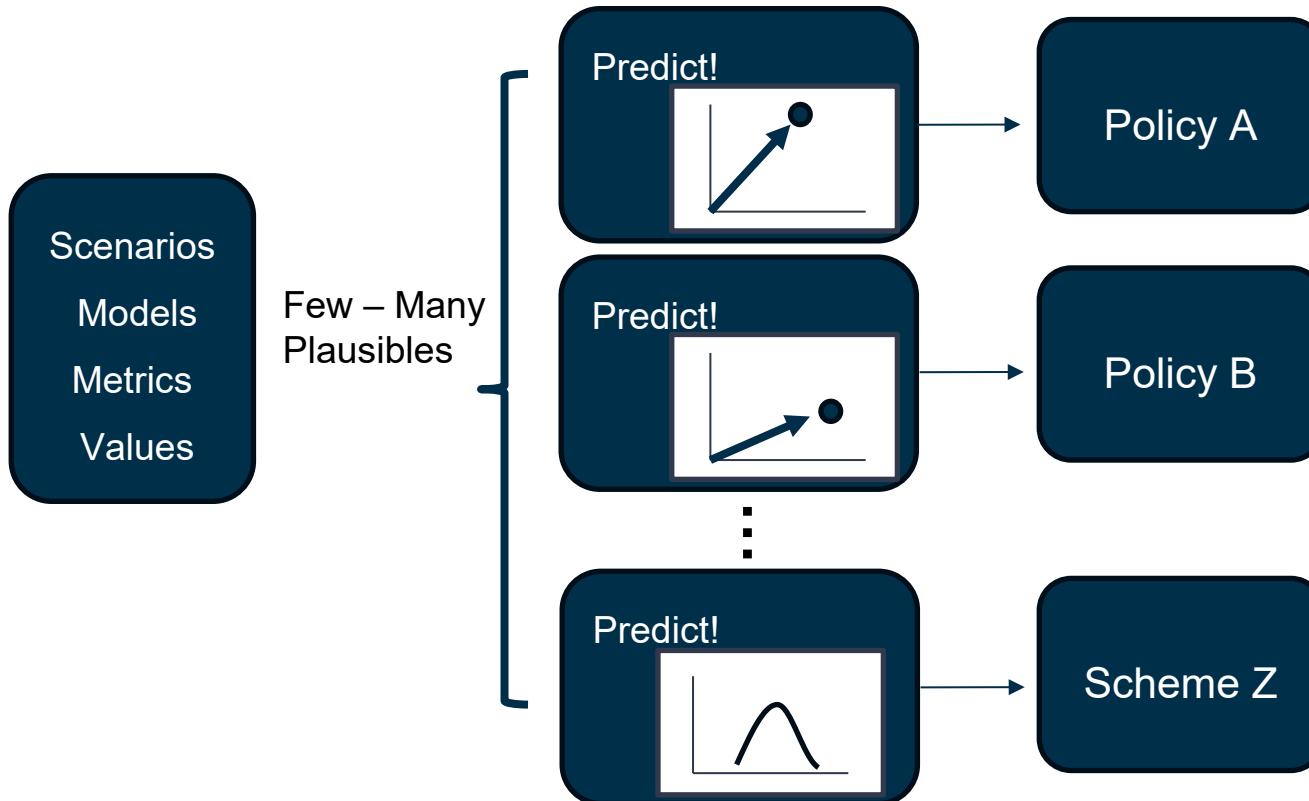
Decision Support

I know what you need

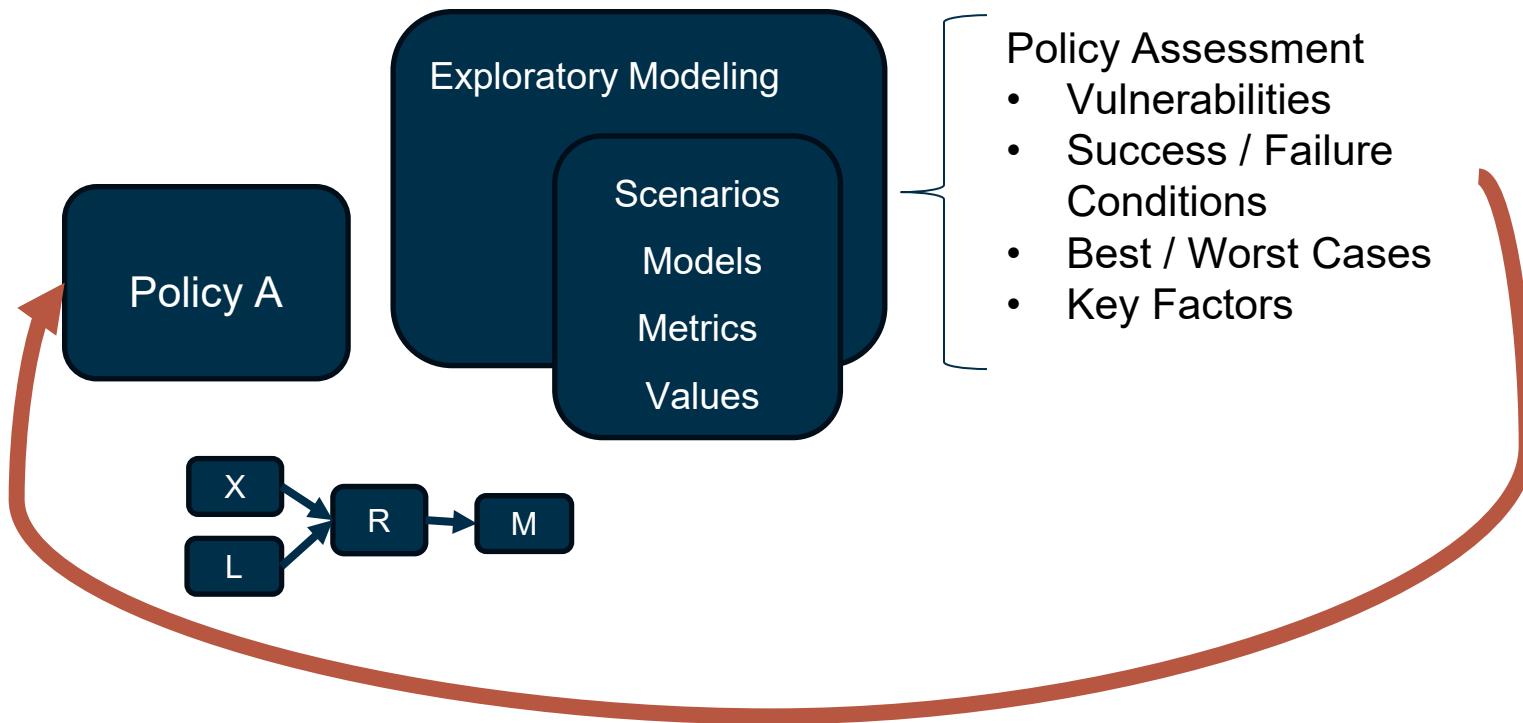


Decision Support

If I only knew then what I know now...

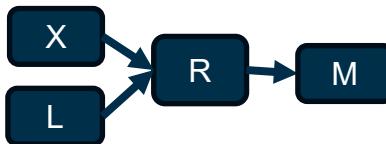


DMDU Approach

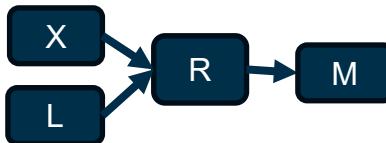


DMDU Approach

Policy A

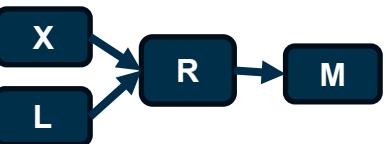


Policy B



⋮

Scheme Z

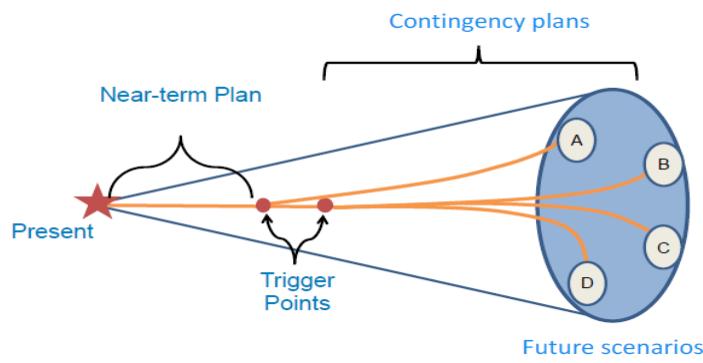


Policy A'

Policy AB

Policy A

Policy B



Let's discuss

