

The image is a collage of three photographs. The top-left photo shows the Golden Gate Bridge in San Francisco, extending across a body of water under a clear blue sky. The top-right photo shows a large concrete dam with water cascading over its spillways, set against a backdrop of green hills and a blue sky with light clouds. The bottom-left photo shows two people, a man and a woman, in an office setting. The man is standing and pointing at a computer monitor, while the woman is seated at a desk with a large map or blueprint spread out in front of her. The text 'Infrastructure Planning and Management' is overlaid in large black font across the top two photos, and 'Risks and Risk Management in Infrastructure Projects' is overlaid in large black font across the bottom two photos.

Infrastructure Planning and Management

Risks and Risk Management in Infrastructure Projects



Agenda

1. Risks in Infrastructure
2. Quantitative Risk Analysis
3. Qualitative Risk Management
4. Risk Management Strategies



4 Major categories of risks in Infrastructure Projects

<p><u>Political Risks E.g.</u></p> <p>Risk of Expropriation Contract Reneging Cancellations Delays in Permits and Approvals</p>	<p><u>Economic Risks E.g.</u></p> <p>Currency Devaluations Inflation and lowering of purchasing power Demand Forecast Errors</p>
<p><u>Socio-Economic Risks E.g.</u></p> <p>Community Protests Unwillingness to Pay</p>	<p><u>Technological Risks E.g.</u></p> <p>Construction Delays Inefficiencies in Operations and Maintenance</p>



Two Risk Management Approaches

**Decisioneering
(Probabalistic)**


**Managerial
(Strategic)**



The Decisioneering Approach

- You are building a toll road
- H,M,L correspond to three different traffic volumes conditional on the state of the economy (According to your Expert)

State of the Economy	Probability
Good	0.25
OK	0.45
Bad	0.3



Pay-Offs

- Your Initial Investment = \$1,000,000

Traffic Volumes	Revenue
H(igh)	\$1,400,000
M(edium)	\$1,200,000
L(ow)	\$500,000



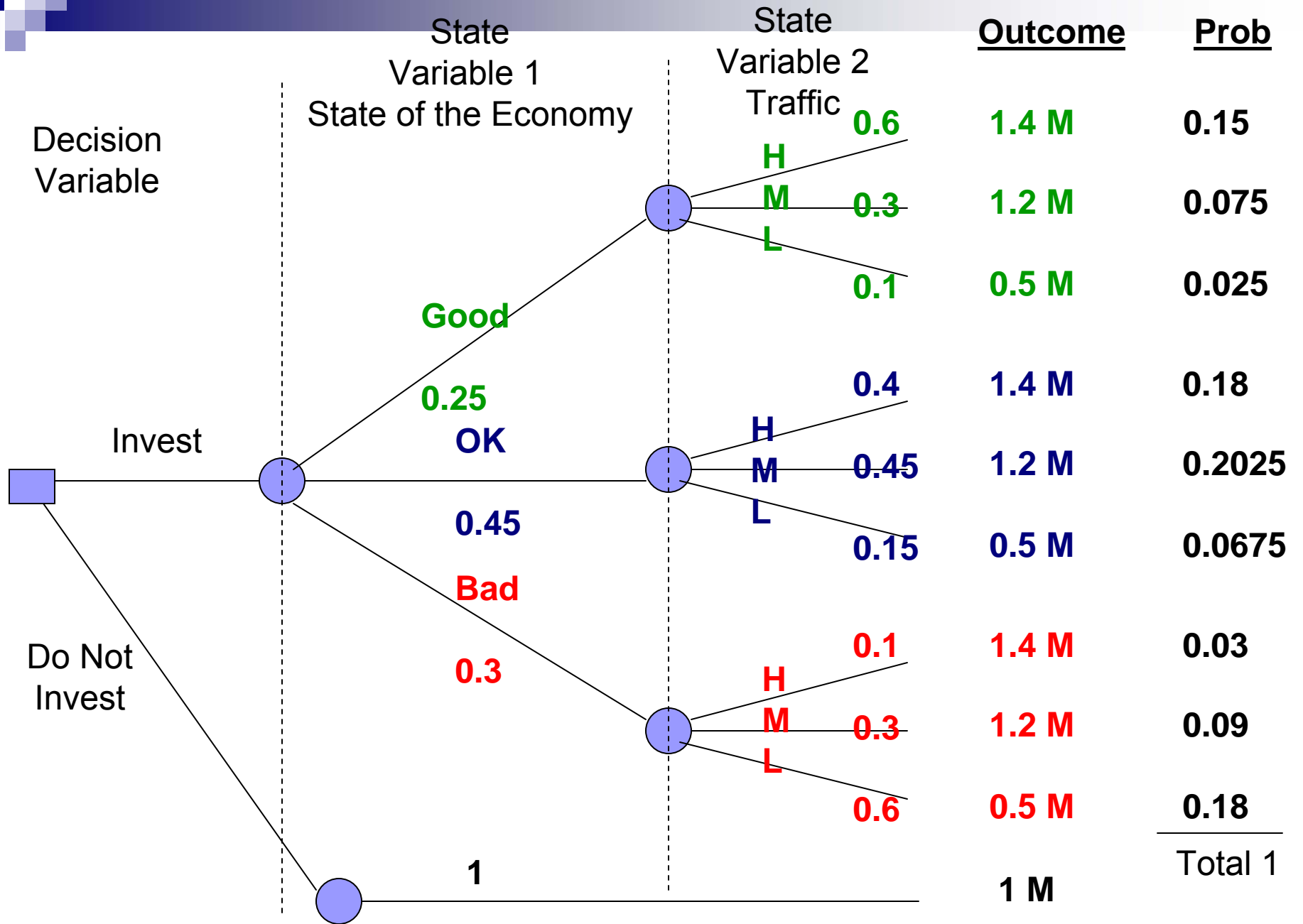
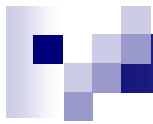
Expert's Conditional Probabilities

Economy vs Traffic	Good	OK	Bad
High	0.6	0.4	0.1
Medium	0.3	0.45	0.3
Low	0.1	0.15	0.6



Will You Invest?

Why or Why Not?





Expected Value of the Investment

- $EV = \Sigma(\text{Outcome} * \text{Probability})$

- $= 1.4 (0.15 + 0.18 + 0.03) + 1.2 (0.075 + 0.2025 + 0.09) + 0.5(0.025 + 0.0675 + 0.18)$

$$= \mathbf{\$1,081,250}$$

Since this value is greater than the initial Investment of \$1,000,000 a risk neutral investor will invest



Risk Management

- The probabilistic approach is useful to estimate and quantify risks and make decisions on whether or not to go ahead.
- However to manage the more “fuzzy” political and socioeconomic risks, the “Managerial Model” depicted in the next two slides (taken from “The Strategic Management of Large Engineering Projects” by Miller and Lessard, can be more useful.

The Managerial Approach

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Lessard and Miller

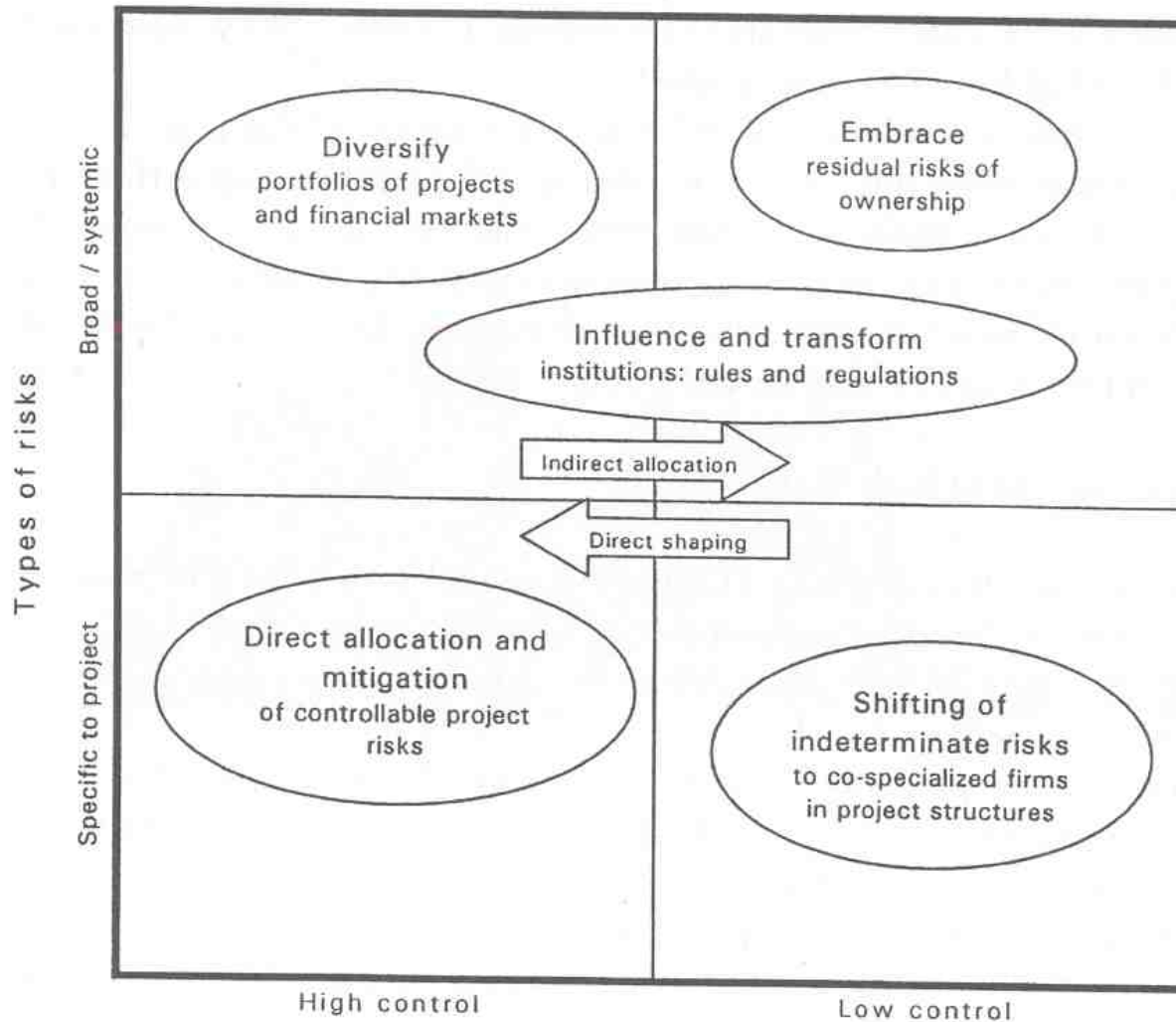


Figure 3.4

The Layering Model

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Lessard and Miller

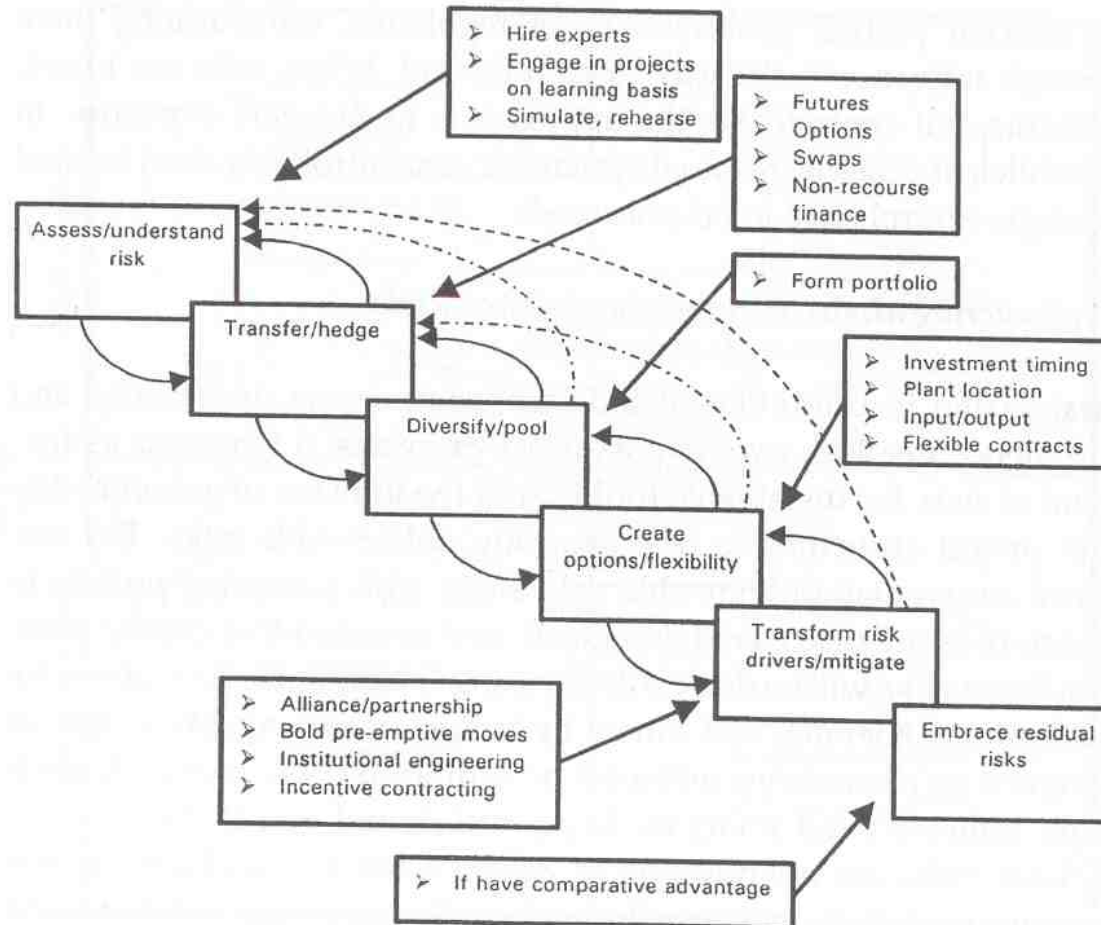


Figure 3.5
The layering model: strategizing to face risks



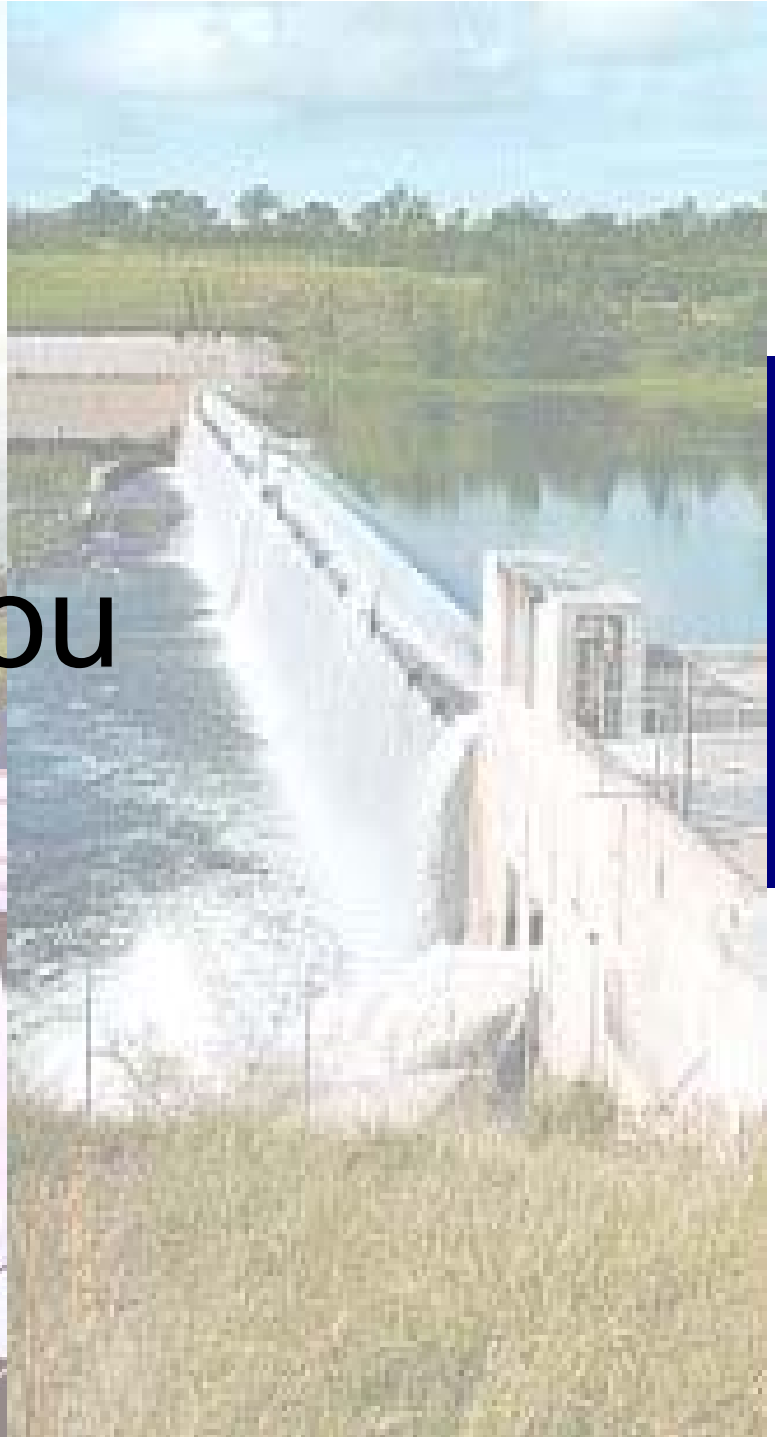
The Managerial Model explained

- In this model, all the various project risks are assessed and understood
- Risks that can be mitigated are mitigated. For instance, Construction Delays risks are mitigated by using a sophisticated schedule
- The residual risks are then first allocated to the party best able to bear those risks. E.g. Construction delay risk is allocated to the EPC contractor, demand risk may be allocated to the government if there are widespread economic fluctuations. This is usually done through the contract but can also be done relationally.



The Managerial Model explained

- If risks cannot be assigned to parties, the project organization can come up with a diversification strategy across many projects
- Risks not addressed by diversification can be addressed by lobbying and institutional transformation of the rules of the game.
- Any remaining risks will just have to be embraced.
- In this manner, an infrastructure project organization can effectively deal with risks that arise on an infrastructure project



Thank You