



Environmental Risk and Uncertainty: Implications for policy

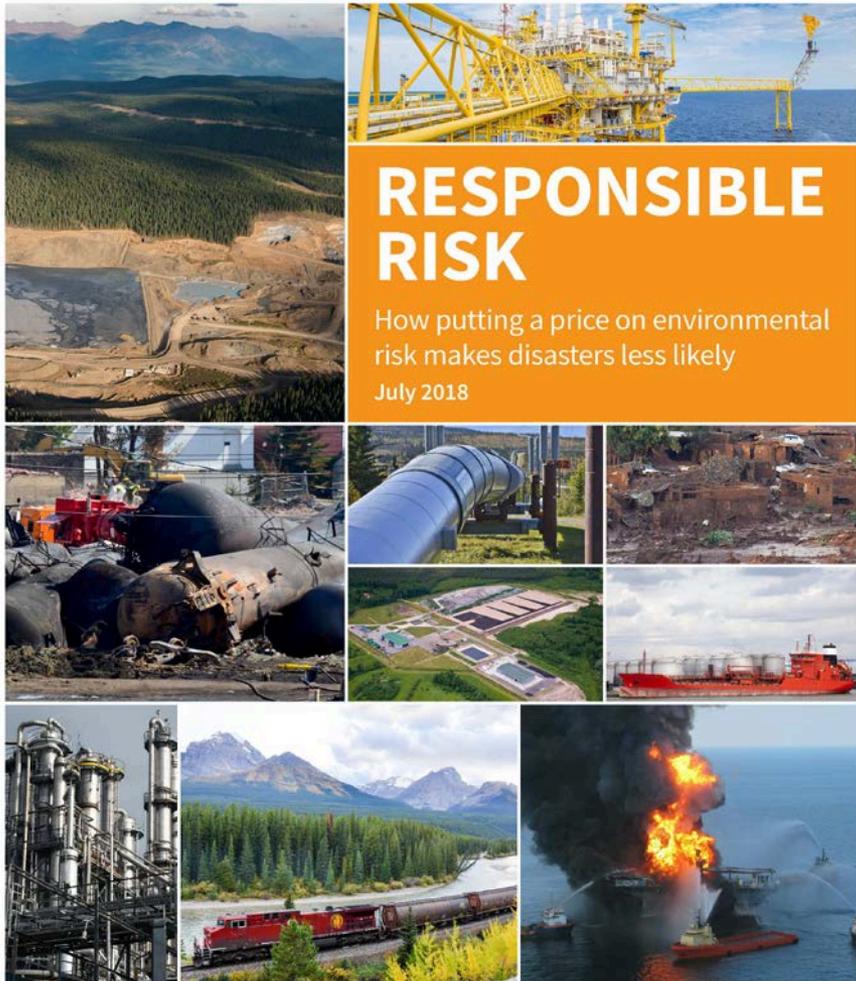
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Canada's Ecofiscal Commission
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Background



CANADA'S ECOFISCAL COMMISSION
Practical solutions for growing prosperity



Focus:

- Risks to the environment from economic activity
- Policy solutions, esp. “financial assurance”
- Analytical framework for environmental risk

Environmental risk: Oil by rail

Risk of environmental cost (EC)
(e.g., derailment leading to an oil spill)

No environmental cost (EC = \emptyset)

$P(\text{EC} = \emptyset) = 99\%$

Moderate environmental cost (EC = \$50M)

$P(\text{EC} = \$50\text{M}) = 0.99\%$

Severe environmental cost (EC = \$1B)

$P(\text{EC} = \$1\text{B}) = 0.01\%$



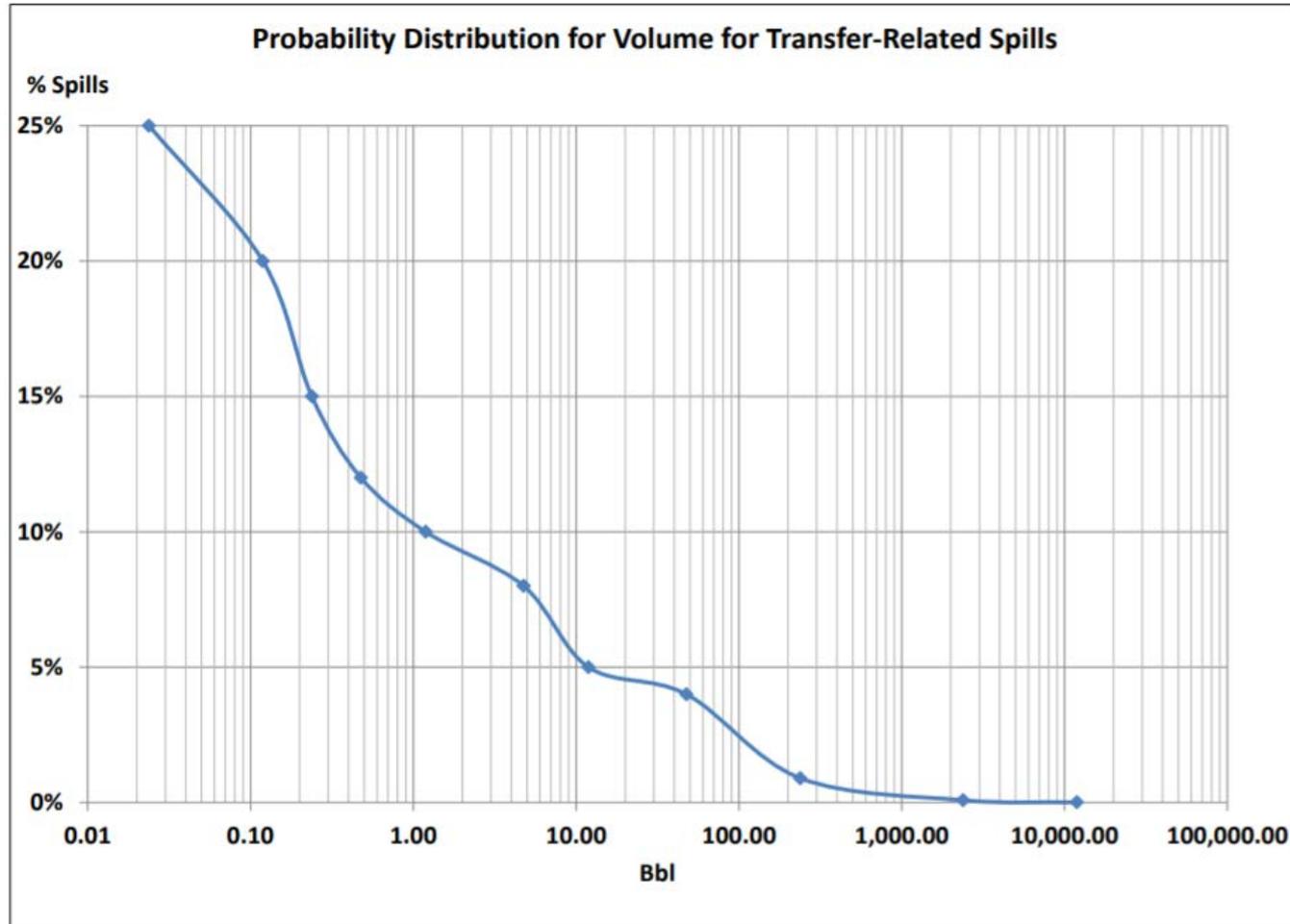
Oil by rail: Environmental risk

Reality:

- *Continuous* probability distribution
- Combination of *several* probability distributions:
 - Derailment
 - Spill size
 - Environmental sensitivity



Oil by rail: Environmental risk



Source: Environmental Research Consulting. (2018). Hudson River Oil Spill Risk Assessment: Oil Spill Probability Analysis.

Oil by rail: *A second risk*

Risk of public liability (PL)

(e.g., taxpayers paying for clean-up)

Why? Liability gaps

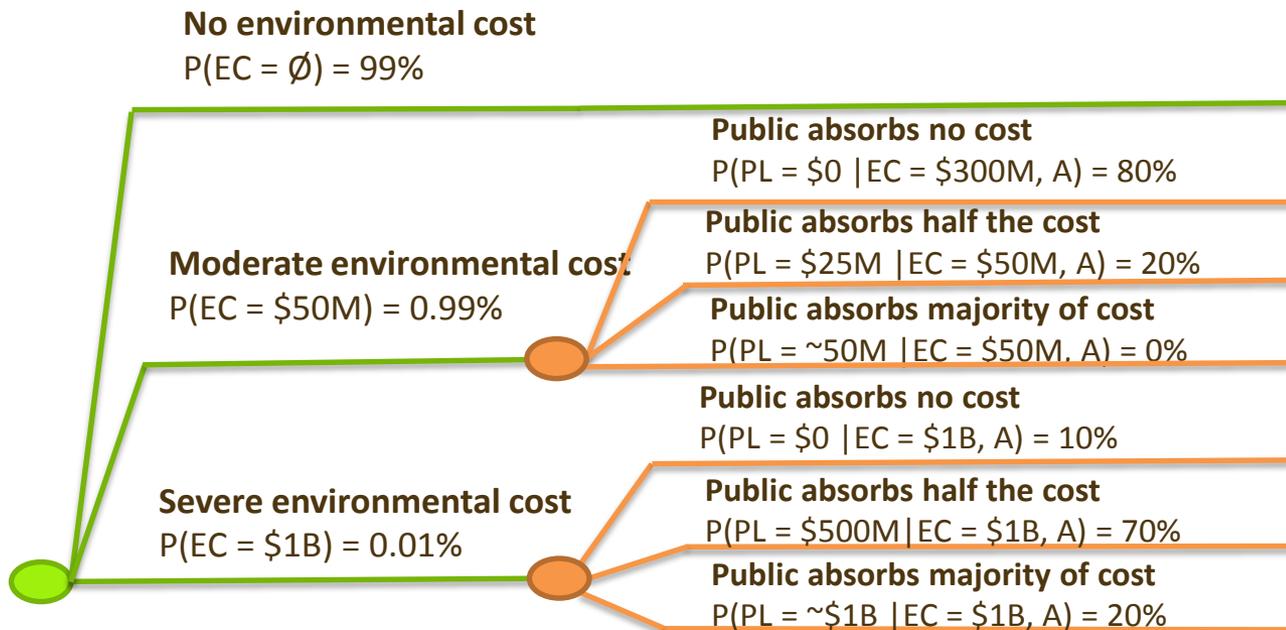
- Firms' liability for environmental damage might be defined, capped, or scoped in a way that makes it possible they won't be held fully accountable
- Or – even where a firm is fully liable – it may not be held accountable if it is bankrupt

...The risk of public liability is therefore a legal risk, a financial risk, or both



Oil by rail: A second, *conditional* risk

Risk of public liability (PL) (e.g., taxpayers paying for clean-up)



Risk externalities

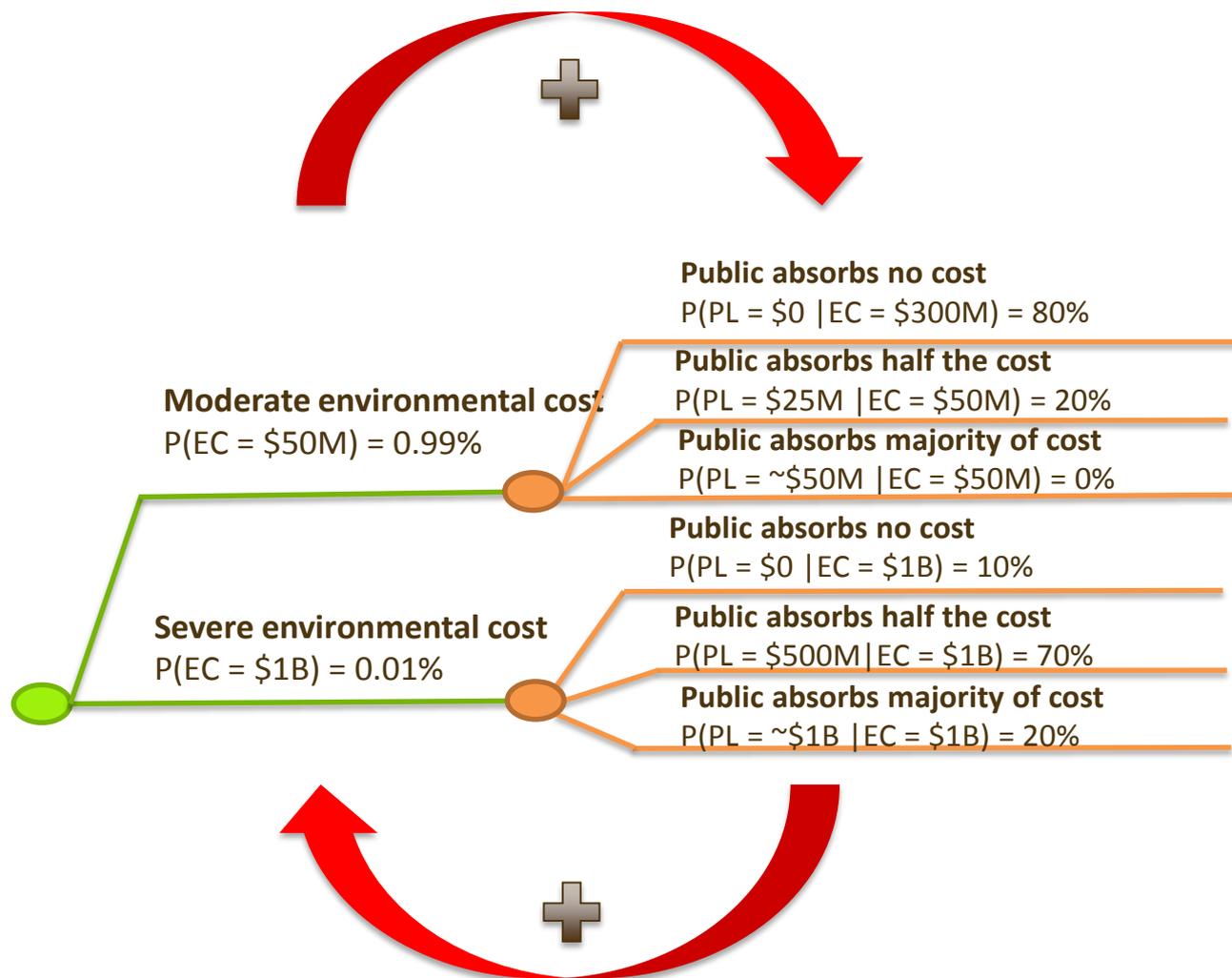
A “risk externality” exists when *two* risks are present:

- ✓ Risk of environmental harm occurring
- ✓ Risk that – should harm occur – at least some of its costs will be borne by the public

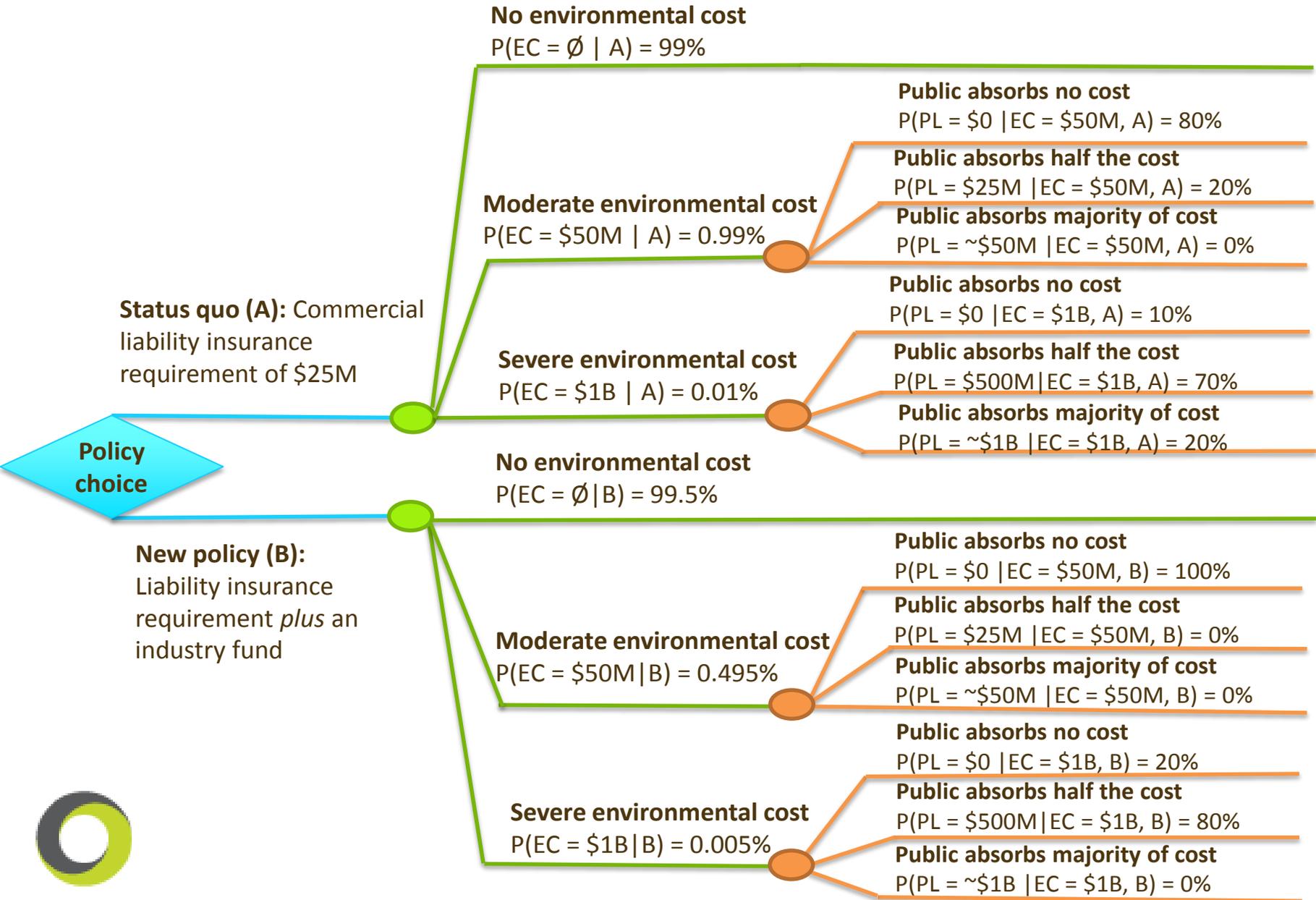
...So what?



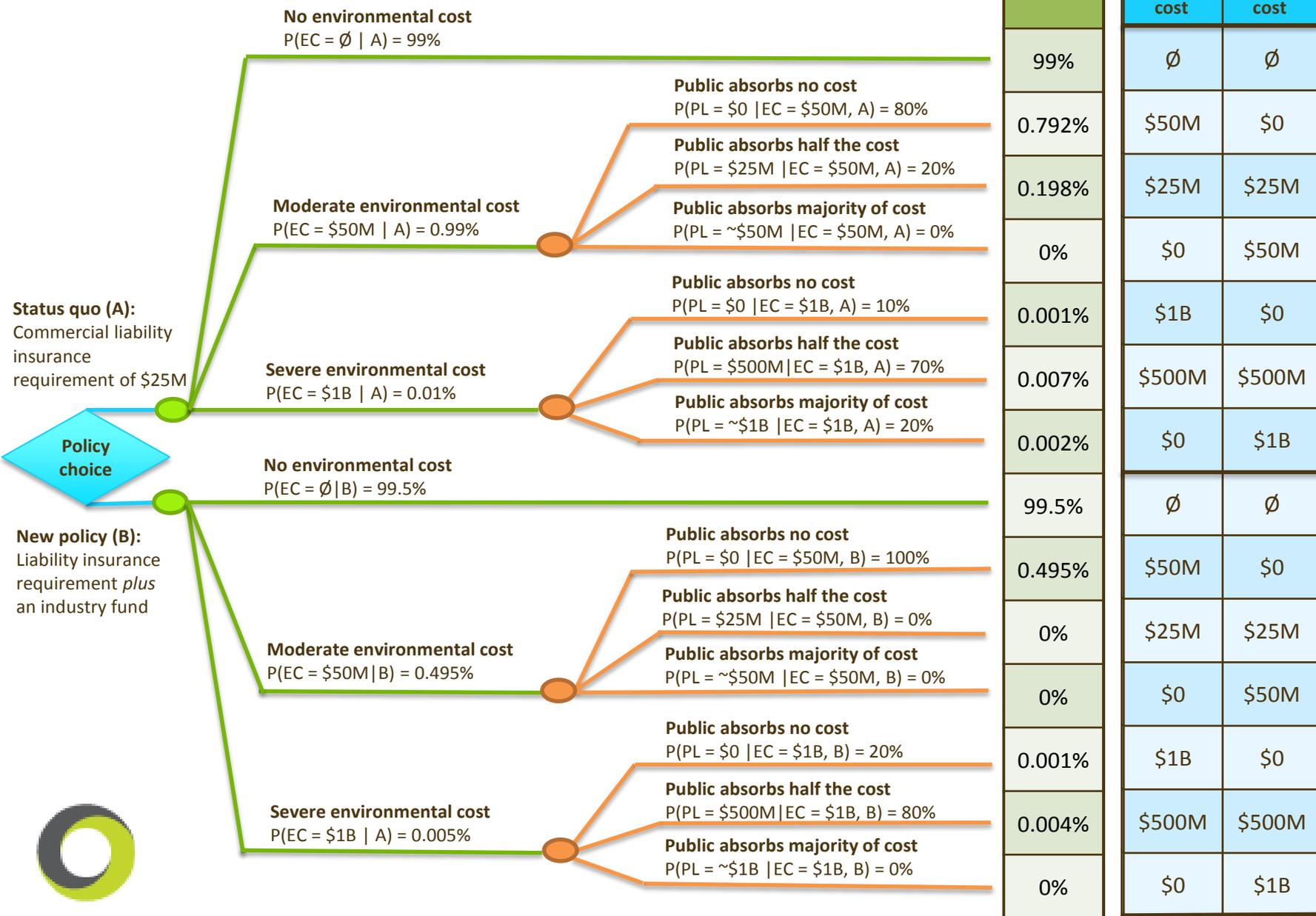
The problem with risk externalities: moral hazard



Addressing risks with policy



Linking to outcomes



Three (competing) goals

- You might ask: why not go even harder with policy?
(e.g., requiring liability insurance of \$1B or *closing* all liability gaps)
- Because policy-makers have *three* goals
 - Deterrence
 - Compensation
 - Economic activity
- These goals can be in competition
 - Deterrence and compensation can be at odds
 - And *both* can affect economic activity
- Policy-makers have to strike a balance



Goals in the framework

EV for total costs (A): \$1.7M

EV for total costs (B): \$1.82M

There is no objective way to weight goals;
must be based on local context & priorities

Jurisdictions will vary in the balance that
makes sense for them

Probability	Cost of environmental harm		Policy costs	
	Private cost	Social cost		
99%	∅	∅	\$1M	
0.792%	\$50M	\$0		
0.198%	\$25M	\$25M		
0%	\$0	\$50M		
0.001%	\$1B	\$0		
0.007%	\$500M	\$500M		
0.002%	\$0	\$1B		
99.5%	∅	∅		\$1.5M
0.495%	\$50M	\$0		
0%	\$25M	\$25M		
0%	\$0	\$50M		
0.001%	\$1B	\$0		
0.004%	\$500M	\$500M		
0%	\$0	\$1B		

Other policy options

- Regulations

- Require more frequent monitoring or inspection
- Require adoption of certain technologies
- Bar high-risk activities or tech.'s (e.g., rail cars)

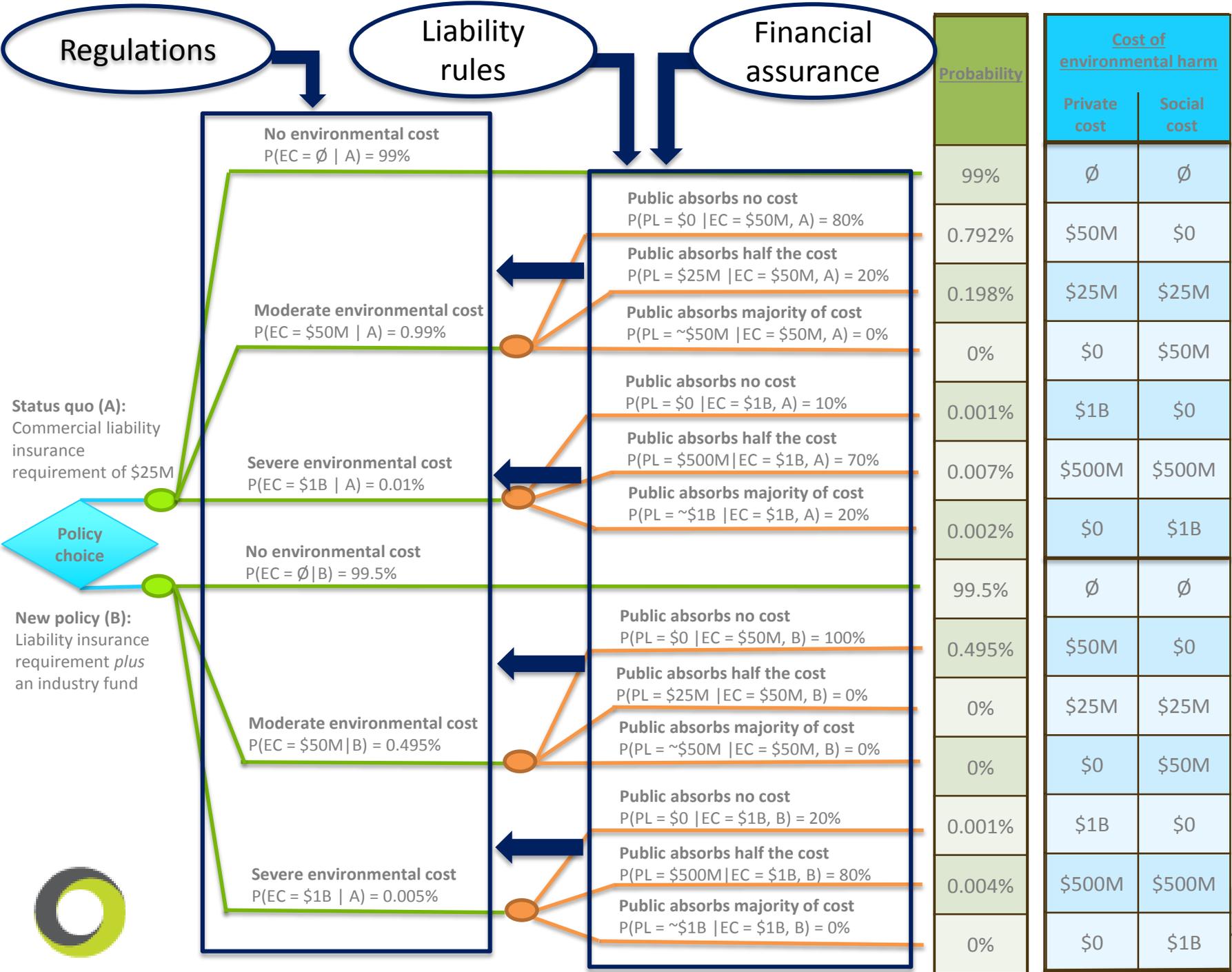
- Liability rules

- Clarify or broaden firms' legal liability for env. damages

- Financial assurance

- Require firms to commit funds against their env. risks





Putting the tools into action

- Policy-makers can calibrate the policy tools to strike their desired balance across policy goals
- Balance they achieve will depend on:
 - The types of tools put into action
 - The specific instruments used
 - How they are implemented
 - Their stringency



A focus on financial assurance

- A powerful tool:

1. *Reinforces* liability rules, to narrow or plug liability gaps like bankruptcy (and thereby, addresses moral hazard)
2. *Flexible* : can emphasize different goals, depending on priorities (e.g., “soft” vs. “hard” assurance)
3. *Market-based* : puts a price on imposing risk to the environment (e.g., paying a regular premium for a surety bond)

- Low-risk operations get a competitive advantage

- Screening function

- Useful information for investors



Zooming out

- Multiple policy options, multiple decision

...By pricing risk using FA, we could better reconcile them

The final piece

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- Probability of environmental harm
- Potential magnitude
- Risk of harm leading to public costs

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How can we deal with uncertainty?

- Risk that cannot be reliably estimated
- Could be legal, financial, environmental, or technological
- Often, uncertainty is the rule, not the exception

- Solutions:
 - Pursue desired balance across policy goals (as before)
(some will focus on economic activity, others on risk reduction)
 - Greater reliance on scenario analysis
 - Assess risk qualitatively (e.g., L/M/H)
 - Solicit input from the public and from experts

- Uncertainty is not cause to ignore risk (the opposite, in fact)
- Policy makers ignore *fat tailed* uncertain risks at their



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