Balancing infrastructure investment in protection and resilience

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Infrastructure Risk Investment Must Balance Protection and Resilience

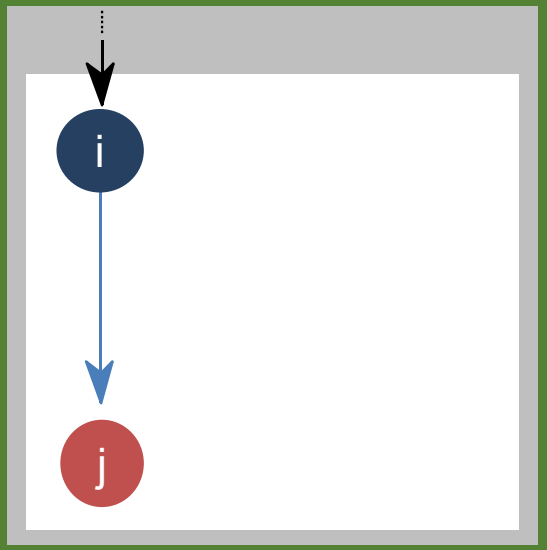
1 The cost of imbalance
2 How to balance
3 Next Steps

Protection

http://www.protectamerica.com/

Resilience

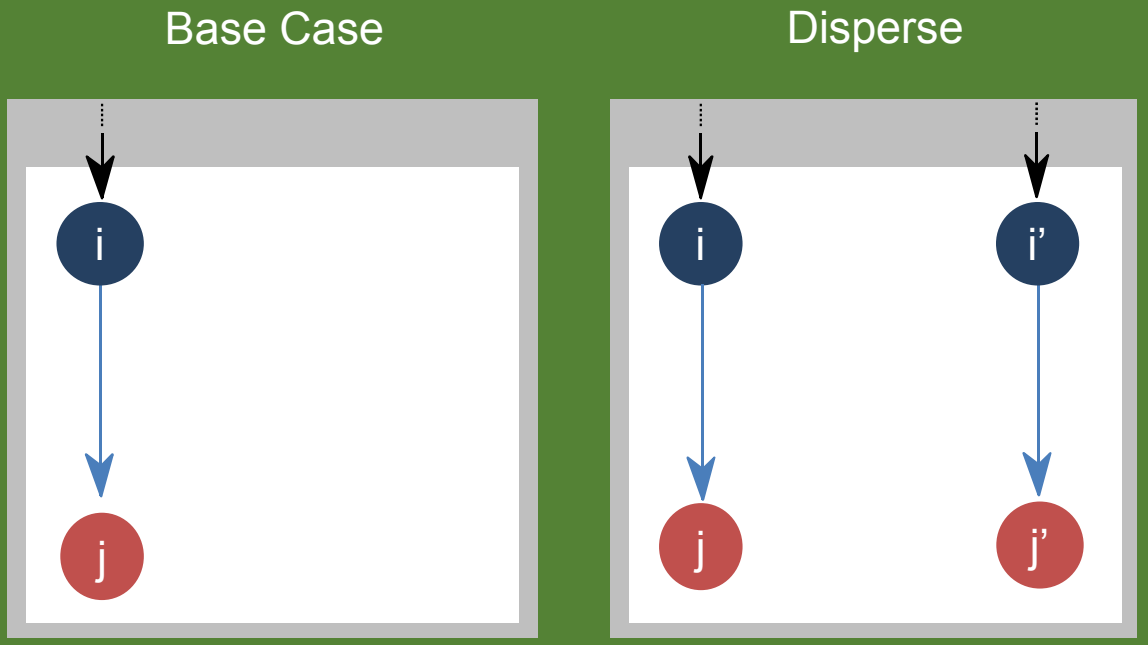
Resilience Tools



The idea:

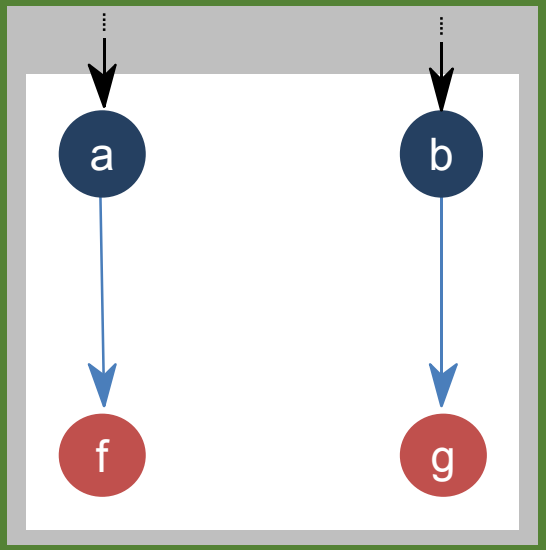
If j depends on i,

How can j function without i?

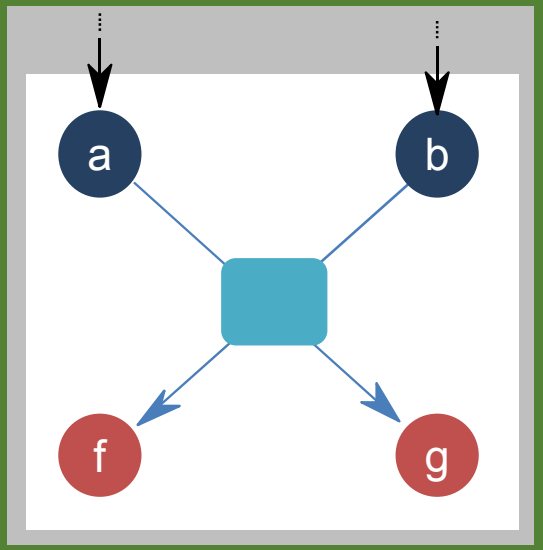


e.g., Create a second campus in another location

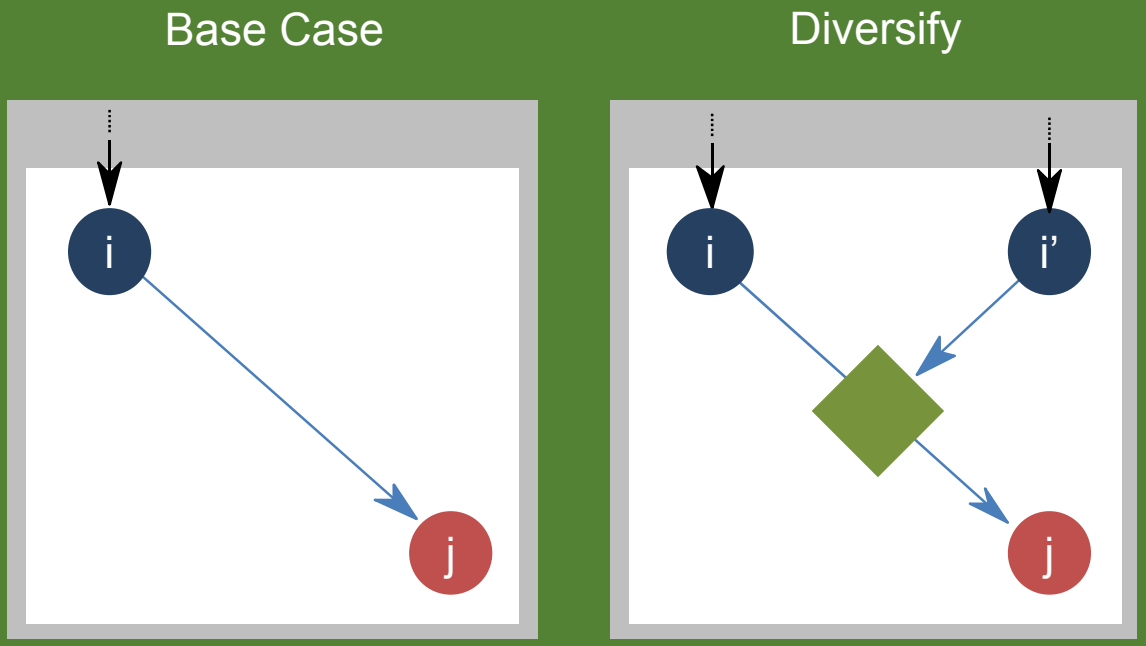
Base Case



Add Flexibility

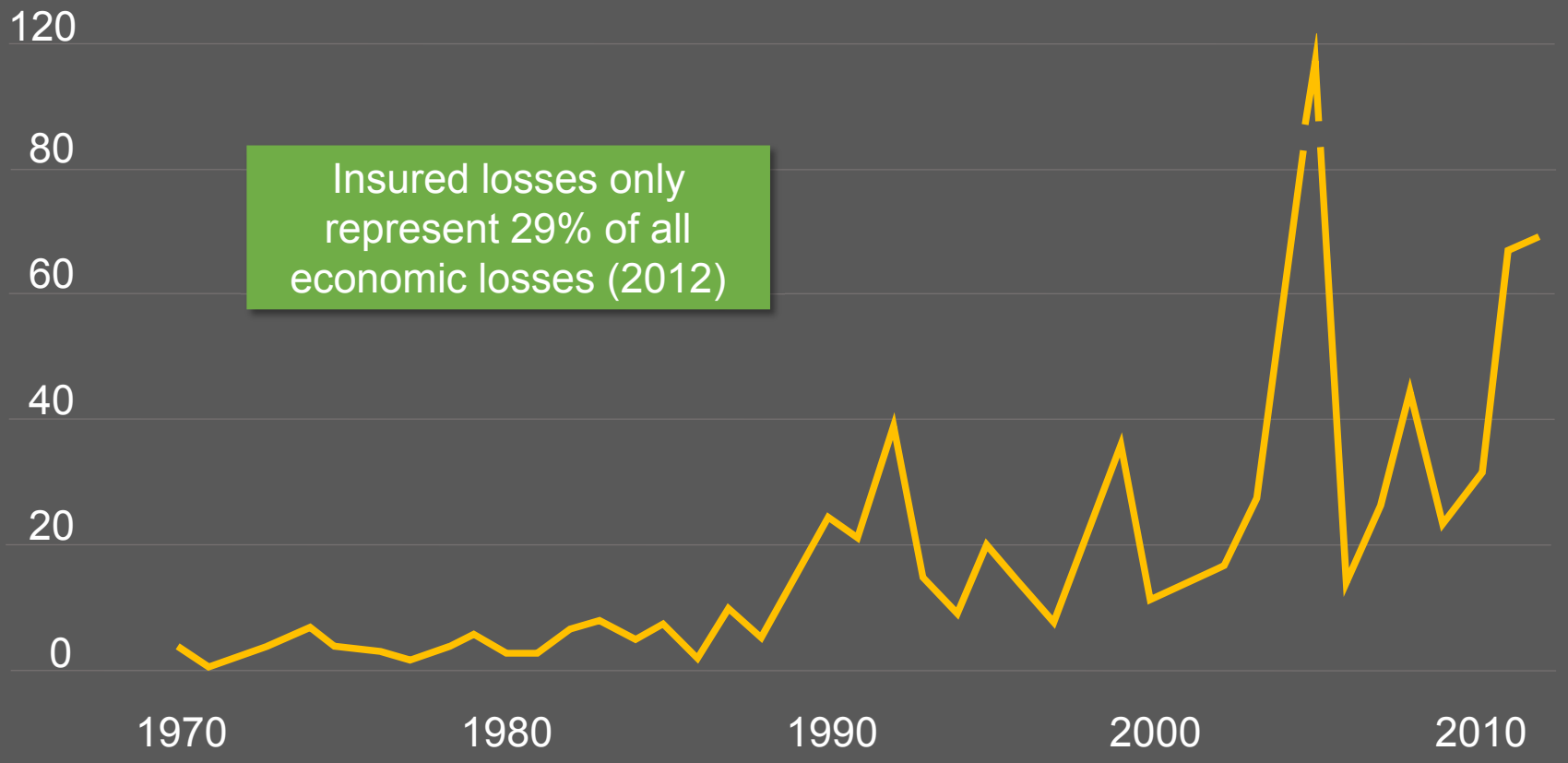


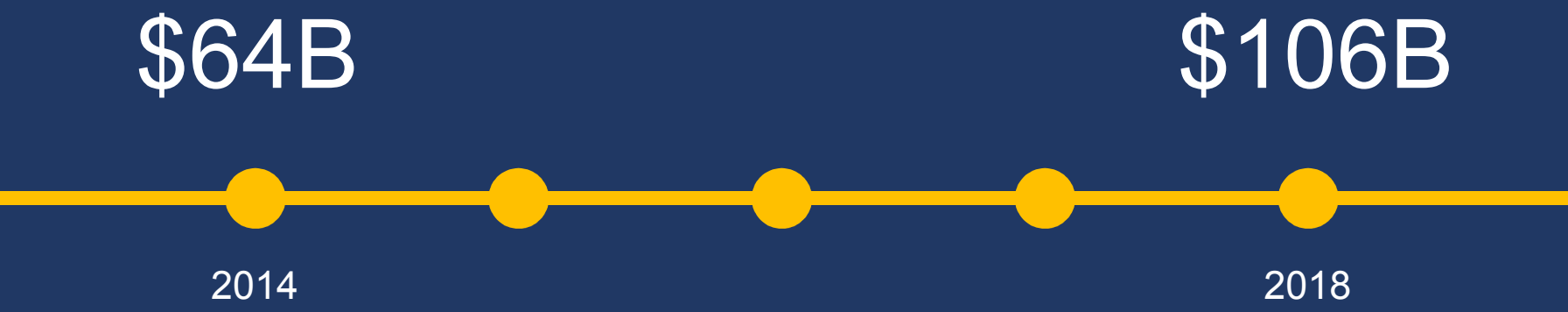
e.g., enable internet to serve telephony needs and enable telephony to serve critical internet needs



e.g., Add backup power from a different source

Insured catastrophe losses (in Billions 2012 USD)




$64B
$106B
2014
2018

Extreme Weather

Connectivity

Violence & Accidents

Wind & Ice

Flooding

Hail

Economic Pressures

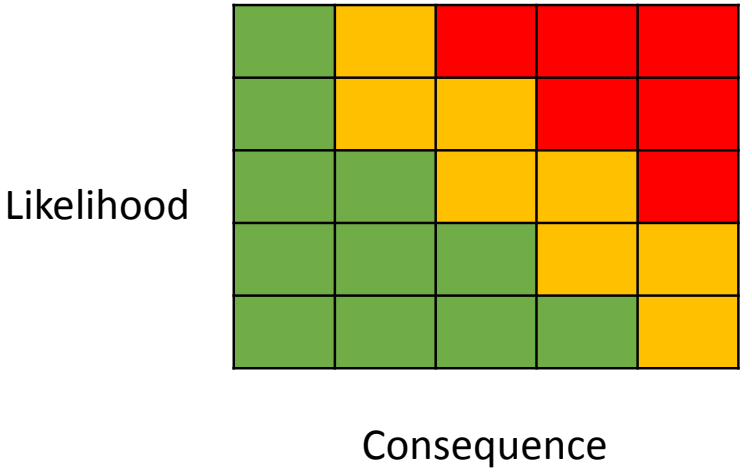
Congestion

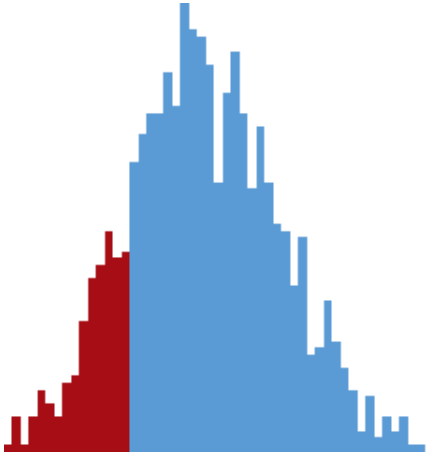
http://careers.queensu.ca

http://mwtl.blogspot.ca/

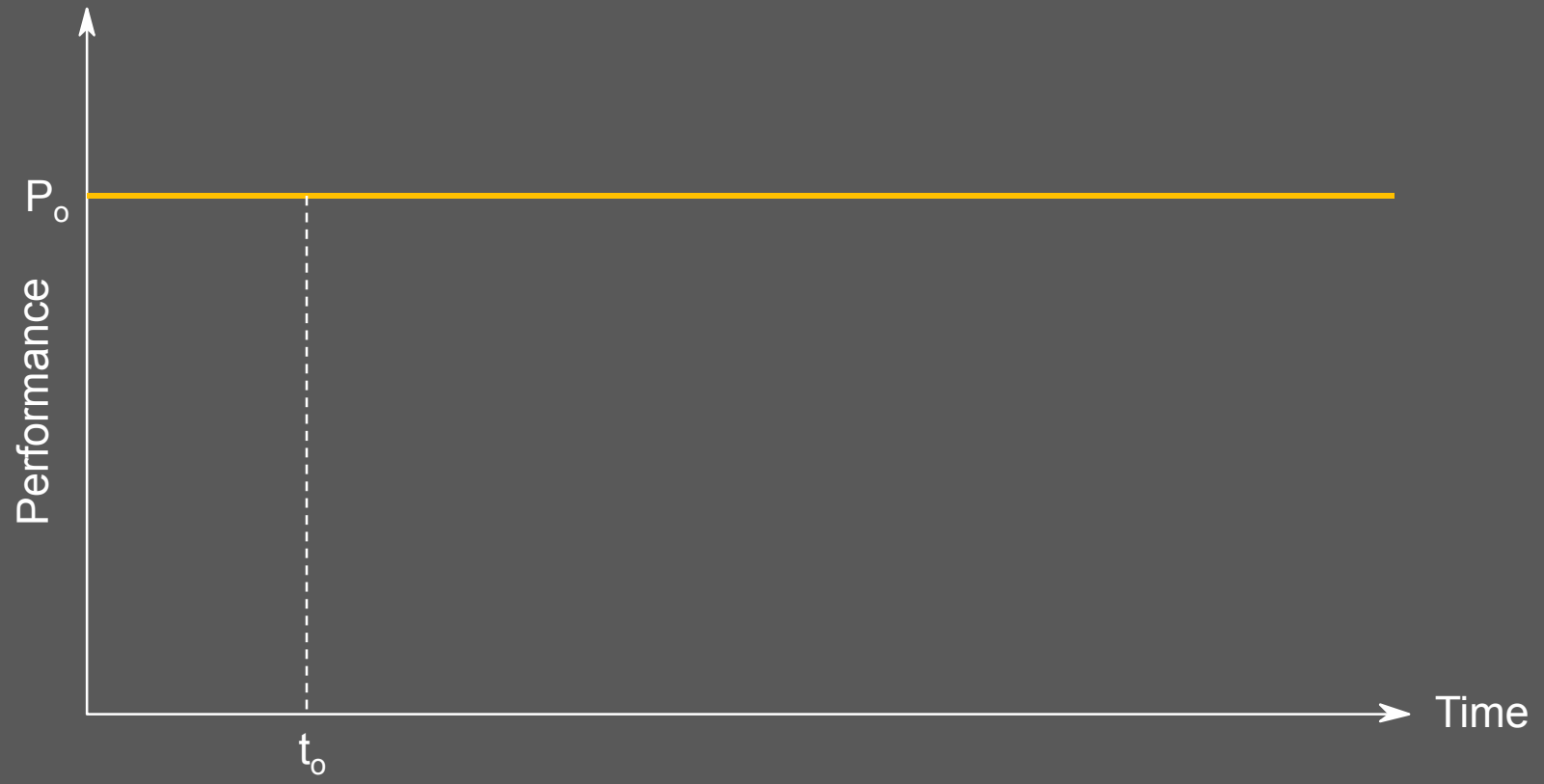
http://www.sterlinginsurancecoinc.com/

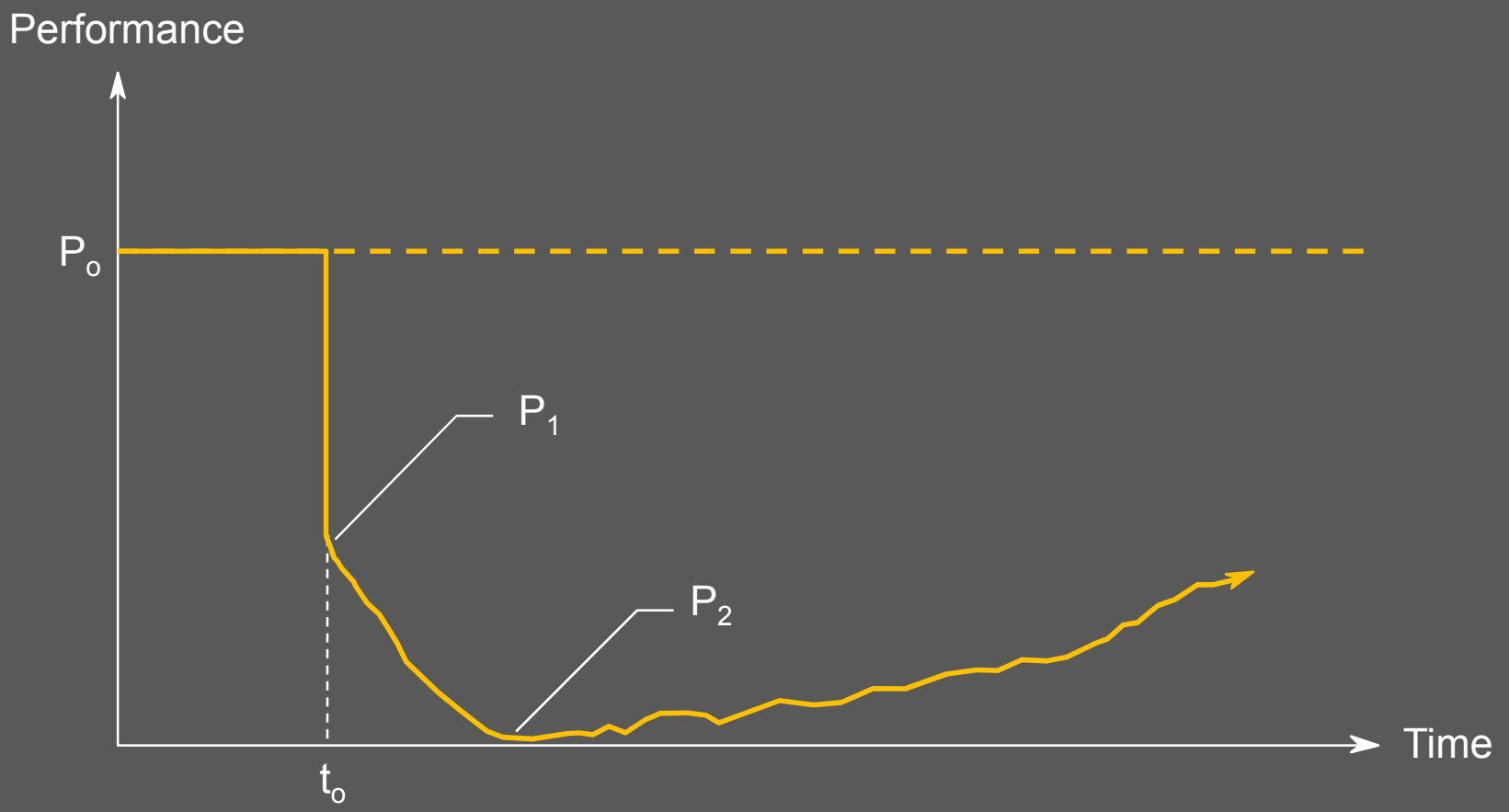
Formal Risk Analysis



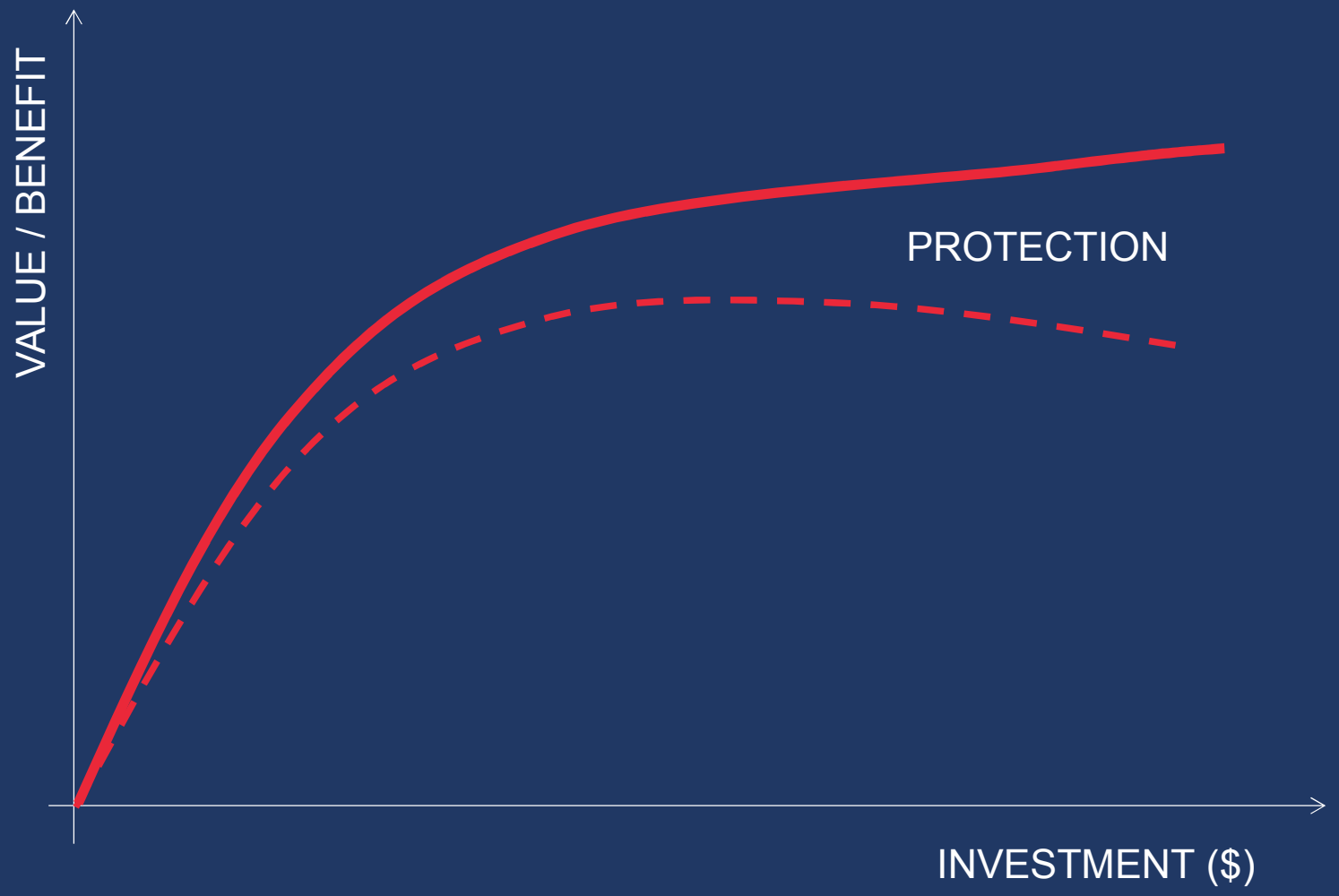


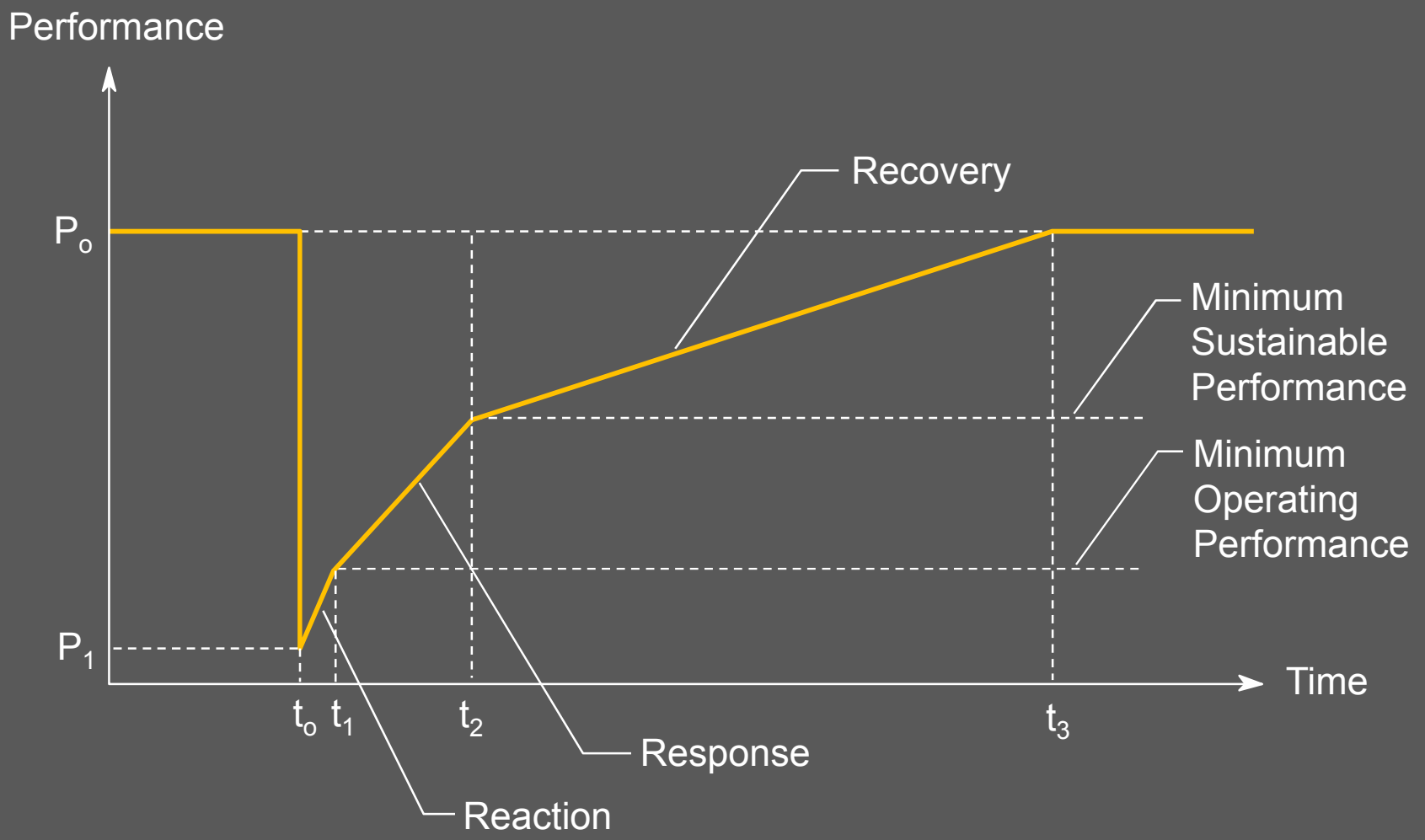
Protection

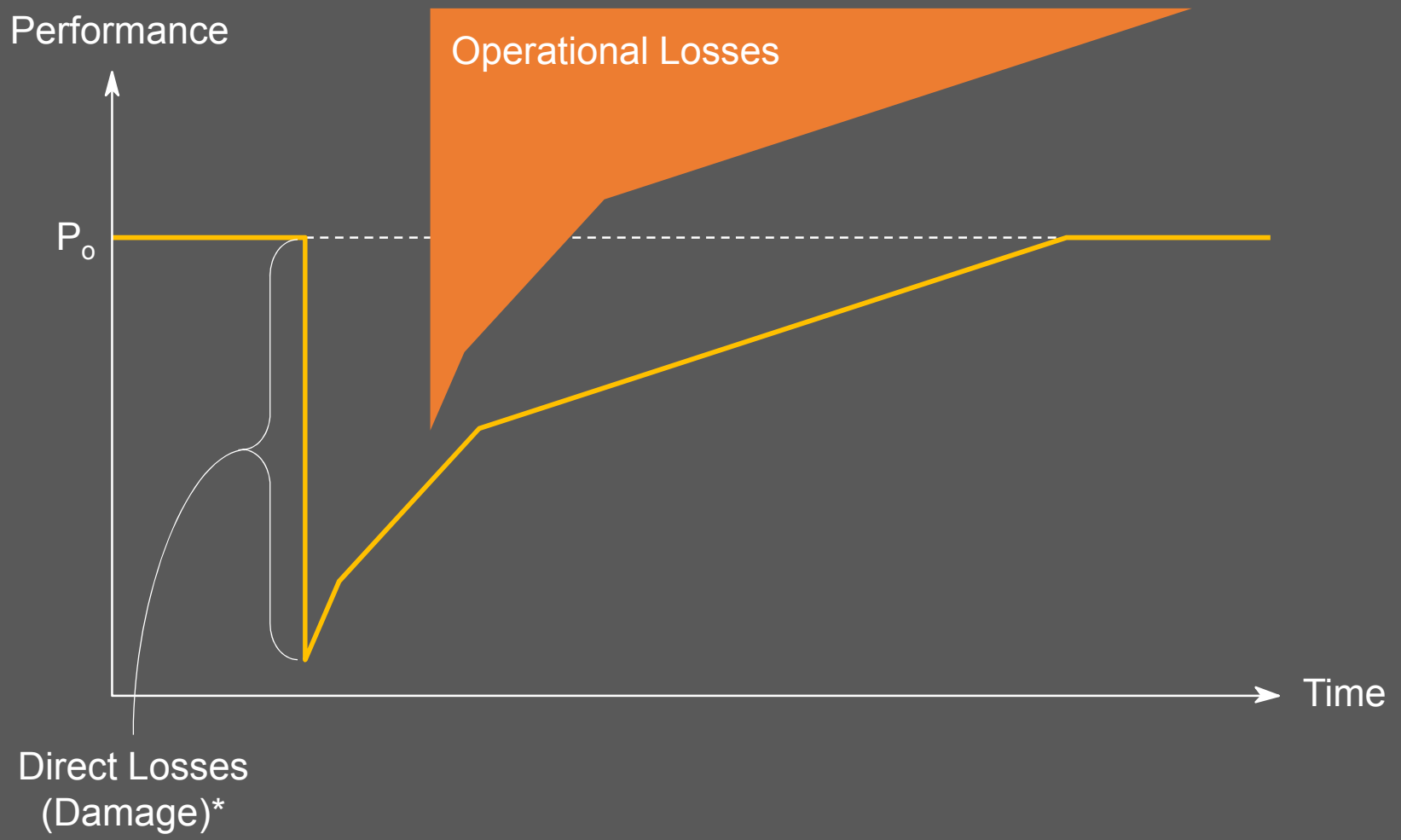



Performance
P_o
P_1
P_2
Time
t_o


densitykatrina.files.wordpress.com/2009/03/flooding1.jpg

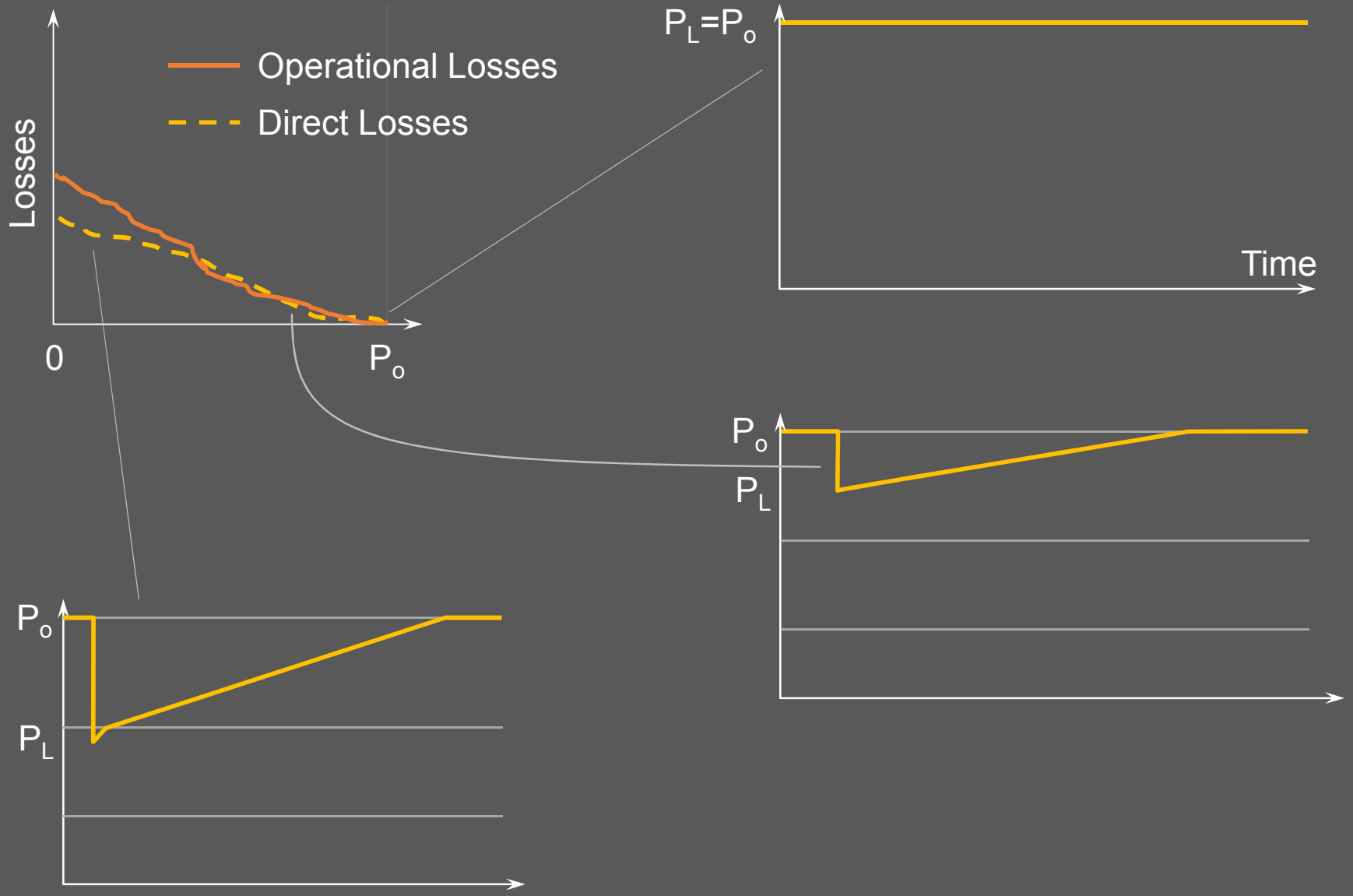

VALUE / BENEFIT
PROTECTION
INVESTMENT ($)


Performance
P_o
P_1
Recovery
Minimum
Sustainable
Performance
Minimum
Operating
Performance
Time
t_o
t_1
t_2
t_3
Response
Reaction

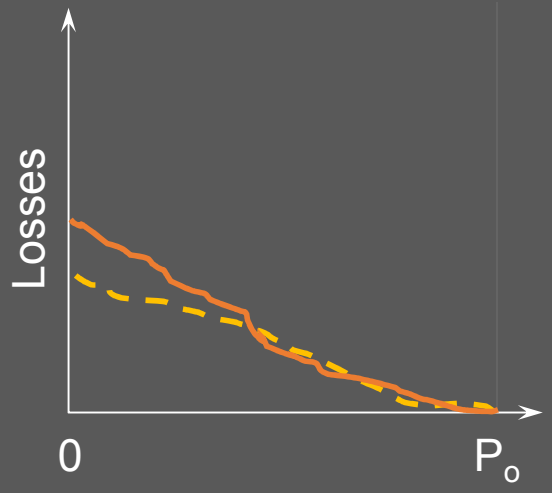


*Includes Losses to damaged treatments

Low Severity Risk

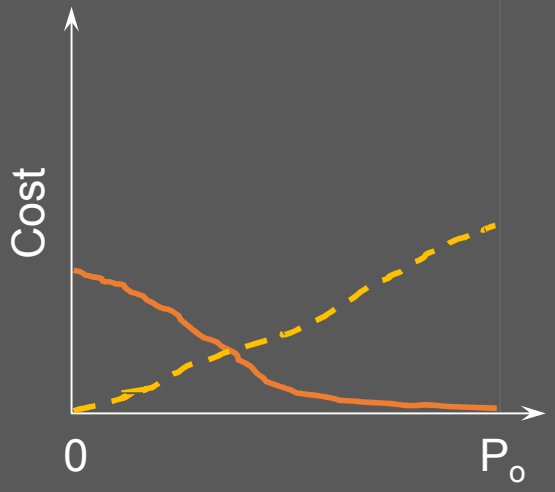


Low Severity Risk



Operational Losses

Direct Losses

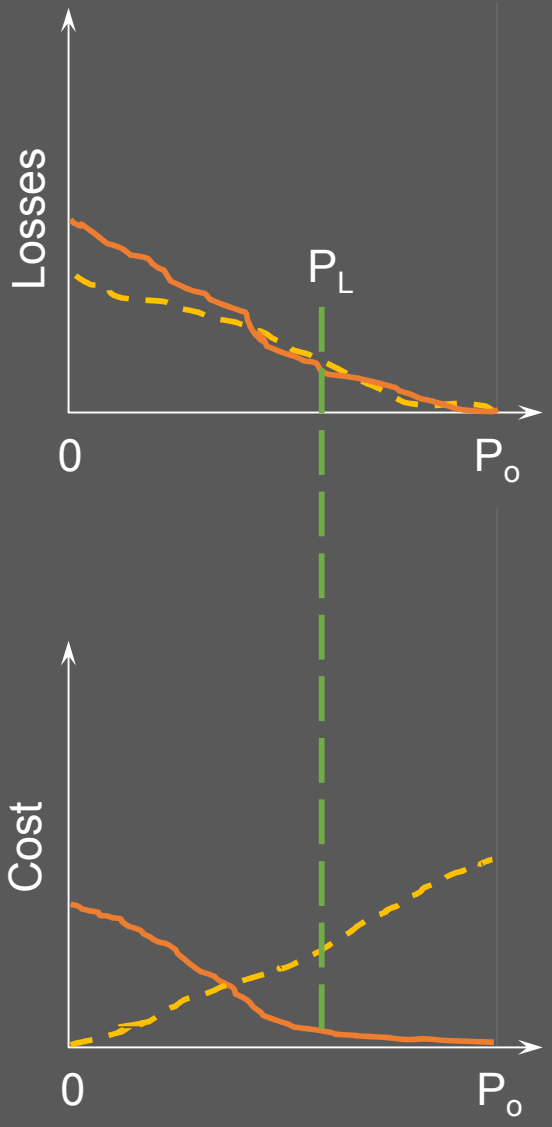


Resilience Cost

Protection Cost

Design Performance Drop

Low Severity Risk



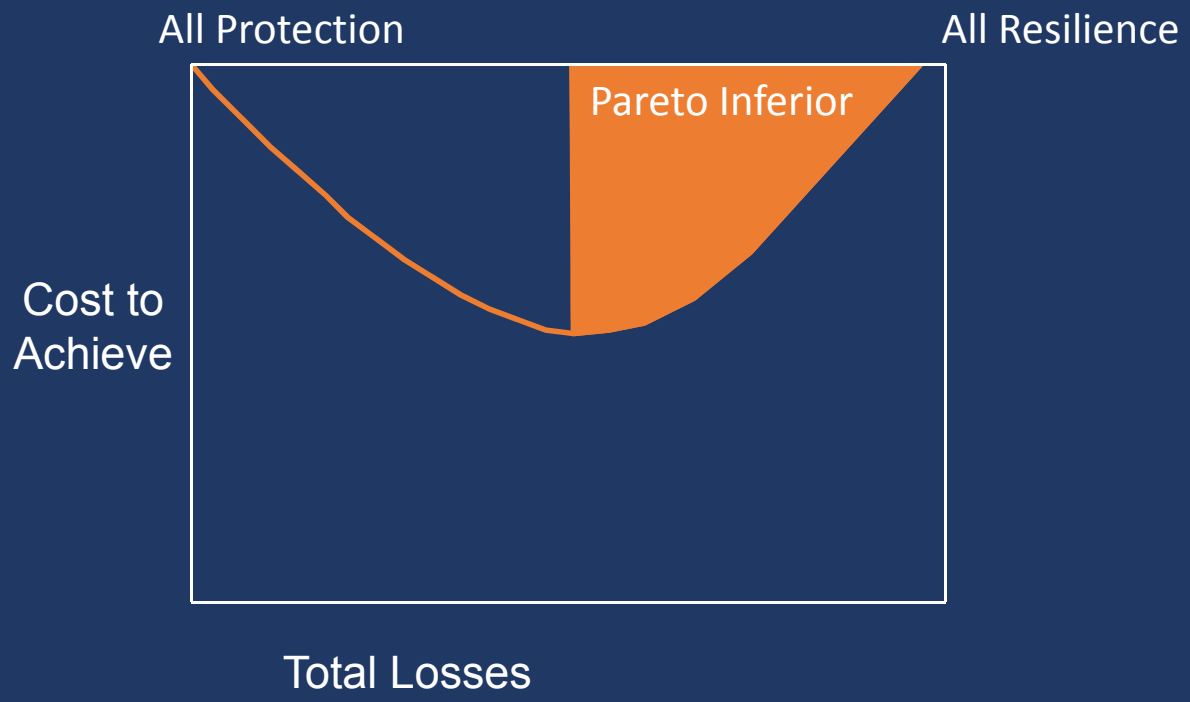
Design Performance Drop

Operational Losses

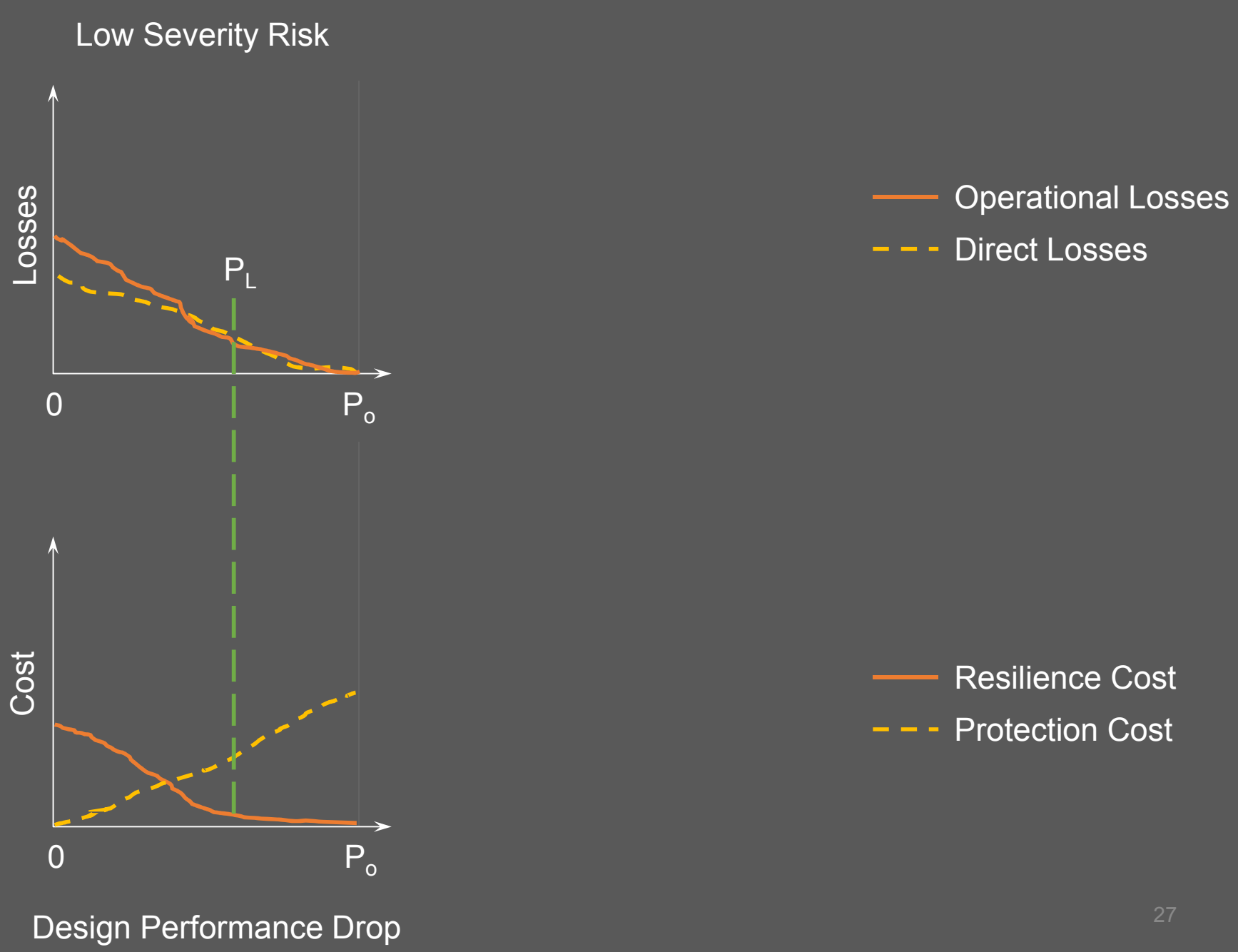
Direct Losses

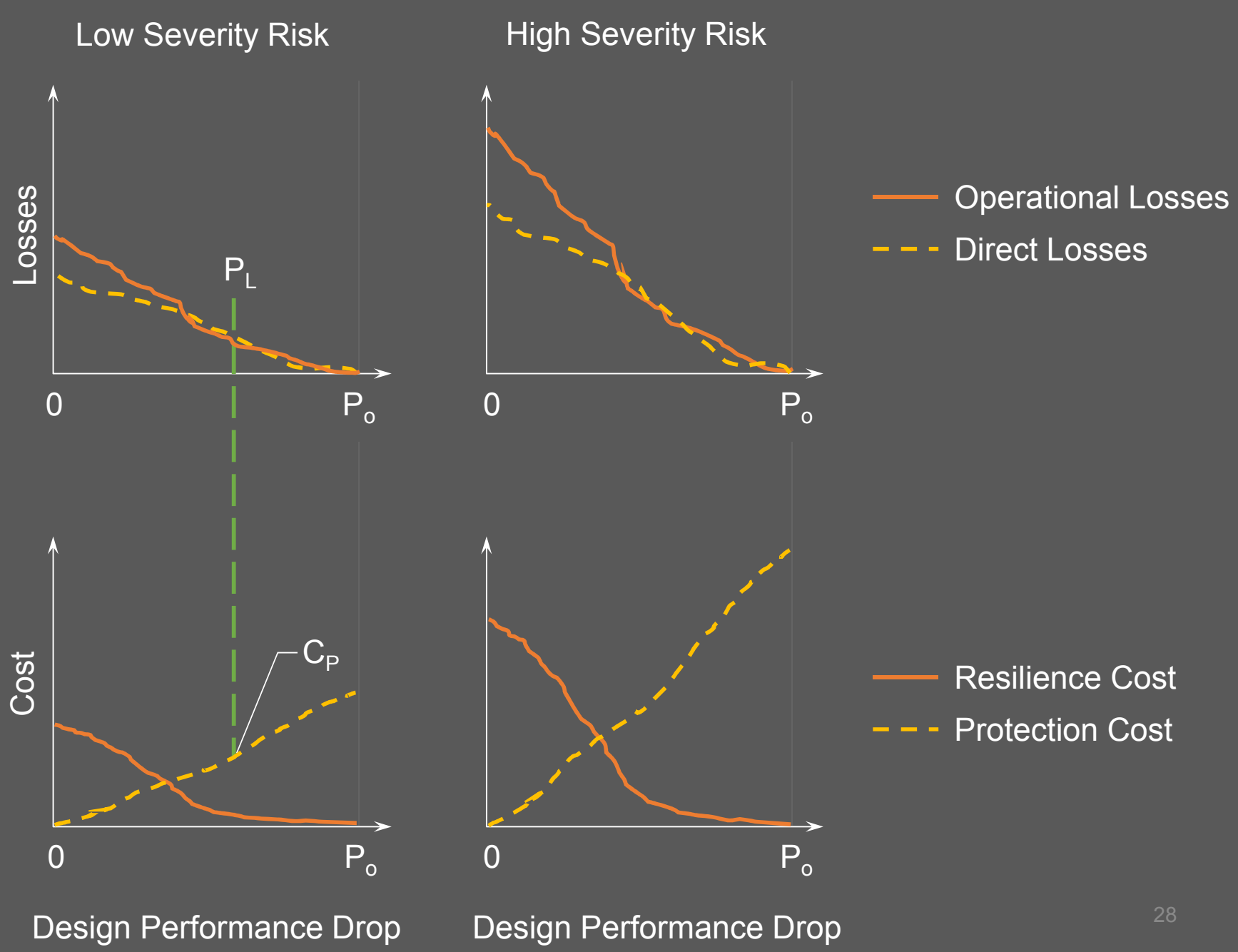
Resilience Cost

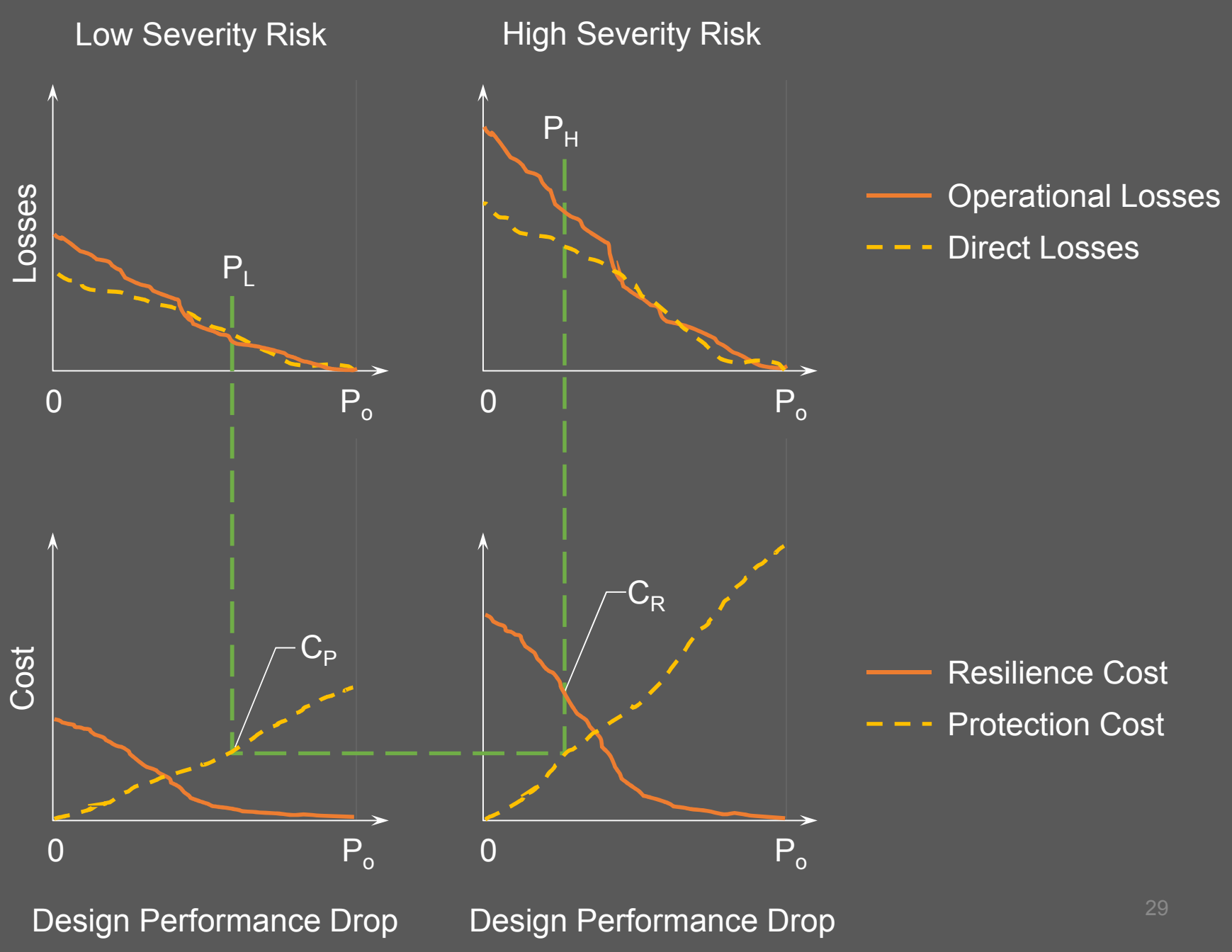
Protection Cost

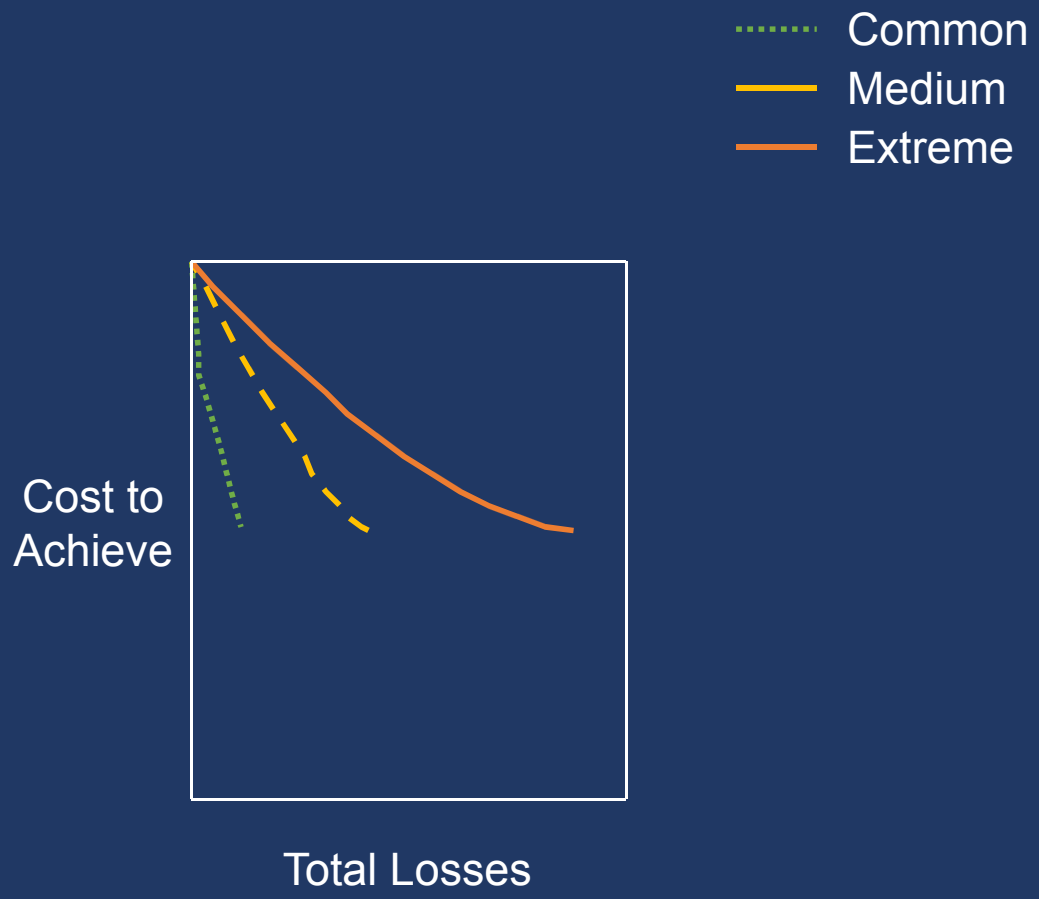

All Protection
All Resilience
Pareto Inferior
Cost to Achieve
Total Losses

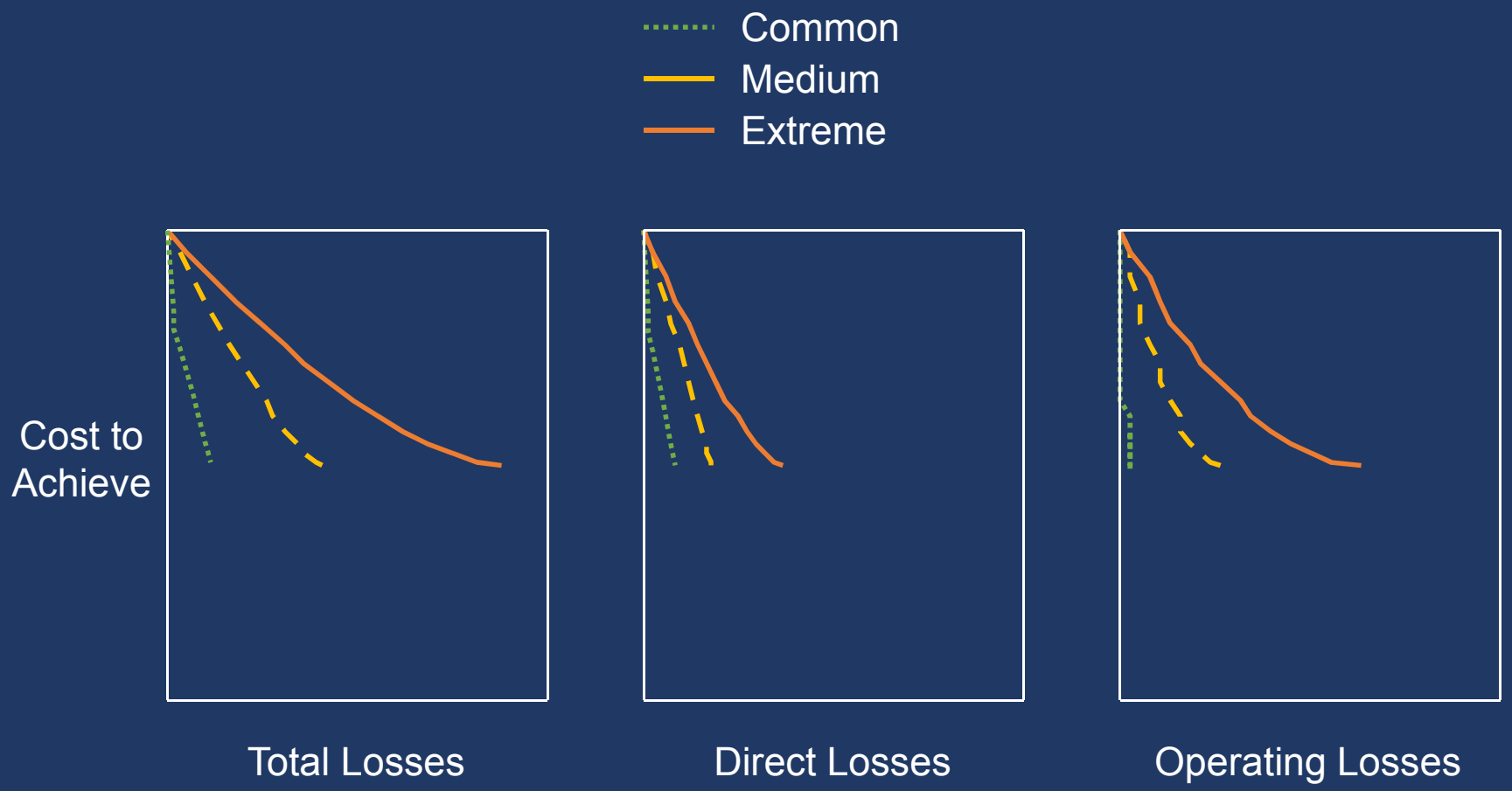

Cost to Achieve
Total Losses


Low Severity Risk
Losses
P_L
0
P_o
Operational Losses
Direct Losses
Cost
0
P_o
Resilience Cost
Protection Cost
Design Performance Drop


Low Severity Risk
High Severity Risk
Losses
P_L
0
P_o
0
P_o
Operational Losses
Direct Losses
Cost
C_P
0
P_o
0
P_o
Resilience Cost
Protection Cost
Design Performance Drop
Design Performance Drop


Low Severity Risk
High Severity Risk
Losses
P_L
P_H
0
P_o
0
P_o
Operational Losses
Direct Losses
Cost
C_P
C_R
0
P_o
0
P_o
Resilience Cost
Protection Cost
Design Performance Drop
Design Performance Drop


Common
Medium
Extreme
Cost to Achieve
Total Losses


Common
Medium
Extreme
Cost to Achieve
Total Losses
Direct Losses
Operating Losses

		BAU	Alt 1	Alt 2	Alt 3	Weight
	Cost					
Losses (Common)	Direct					
	Operations					
	“Qualitative”					
Losses (Medium)	Direct					
	Ops					
	“Qualitative”					
Losses (Extreme)	Direct					
	Operations					
	“Qualitative”					
	Total Score					

Moving Forward

1. Community Risk Criteria
2. Vertical Communities
3. Food Deserts

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Thank-you

Questions?

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