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Risks, Resilience and Resource Management

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United Nations
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UNESCO Chair in
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Transboundary Water Governance



Australian
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FE²W
NETWORK

Overview

1. Responding to Risks

2. Risk Management with Derivatives

(a) Environmental derivatives

(b) Climate derivatives

3. Resilience Management Tools:

(a) MPAs and capacity & robustness resilience

(b) Groundwater depth & robustness resilience

(d) Networks, offsets & 'speed of recovery'
resilience

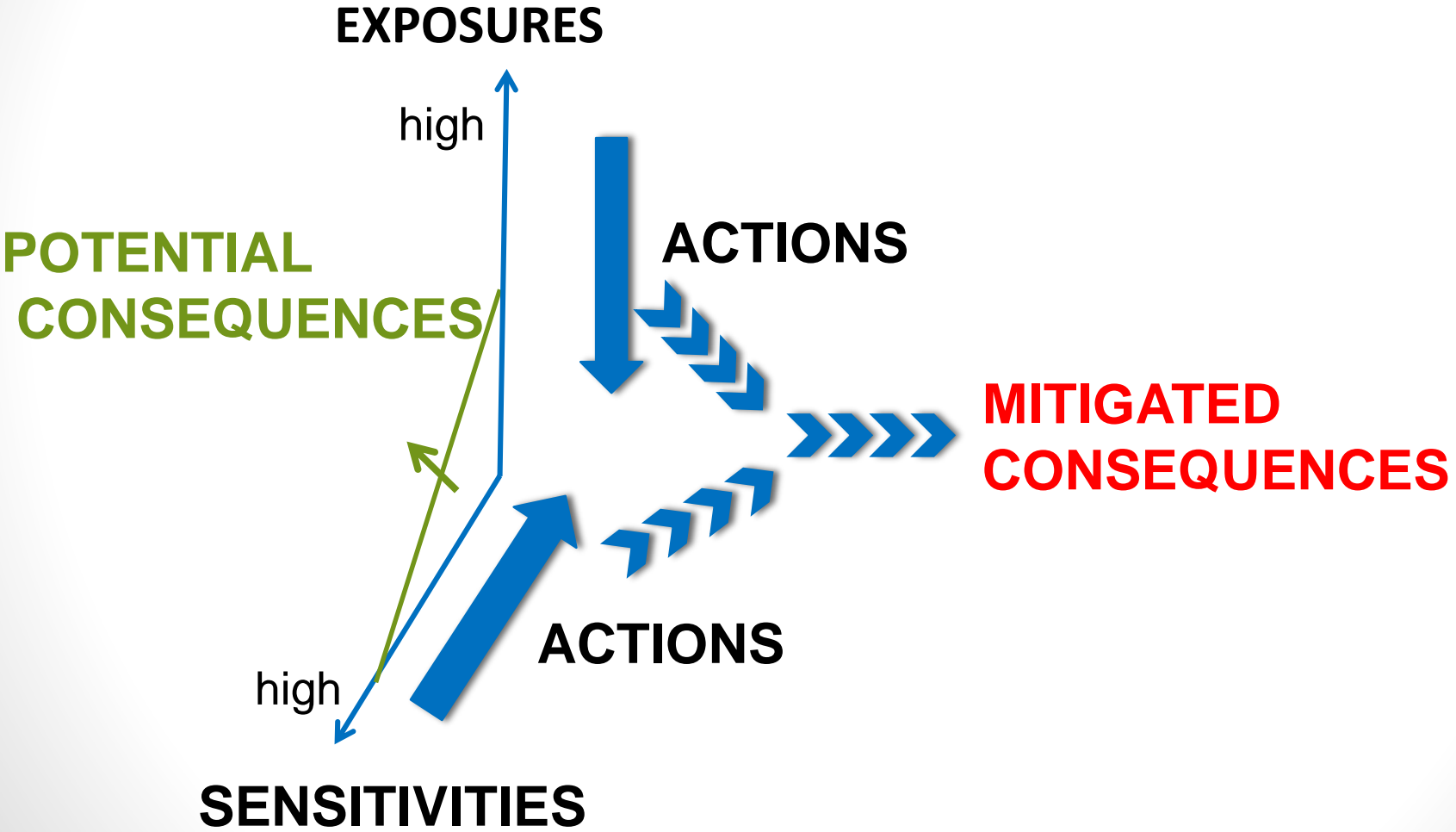
4. Conclusions

1. Responding to Risks

Risk: Probability X Consequences

Likelihood	Almost certain				HIGH	HIGH
	Likely				HIGH	HIGH
	Possible					
	Unlikely	MINIMAL	MINIMAL			
	Rare	MINIMAL	MINIMAL			
	Insignificant	Minor	Moderate	Major	Catastrophic	
Consequence Level						

Exposures, Sensitivities, Actions and Consequences



Causal Risk

THREATS

Pre-trigger
Controls →



TRIGGERS



Controls →

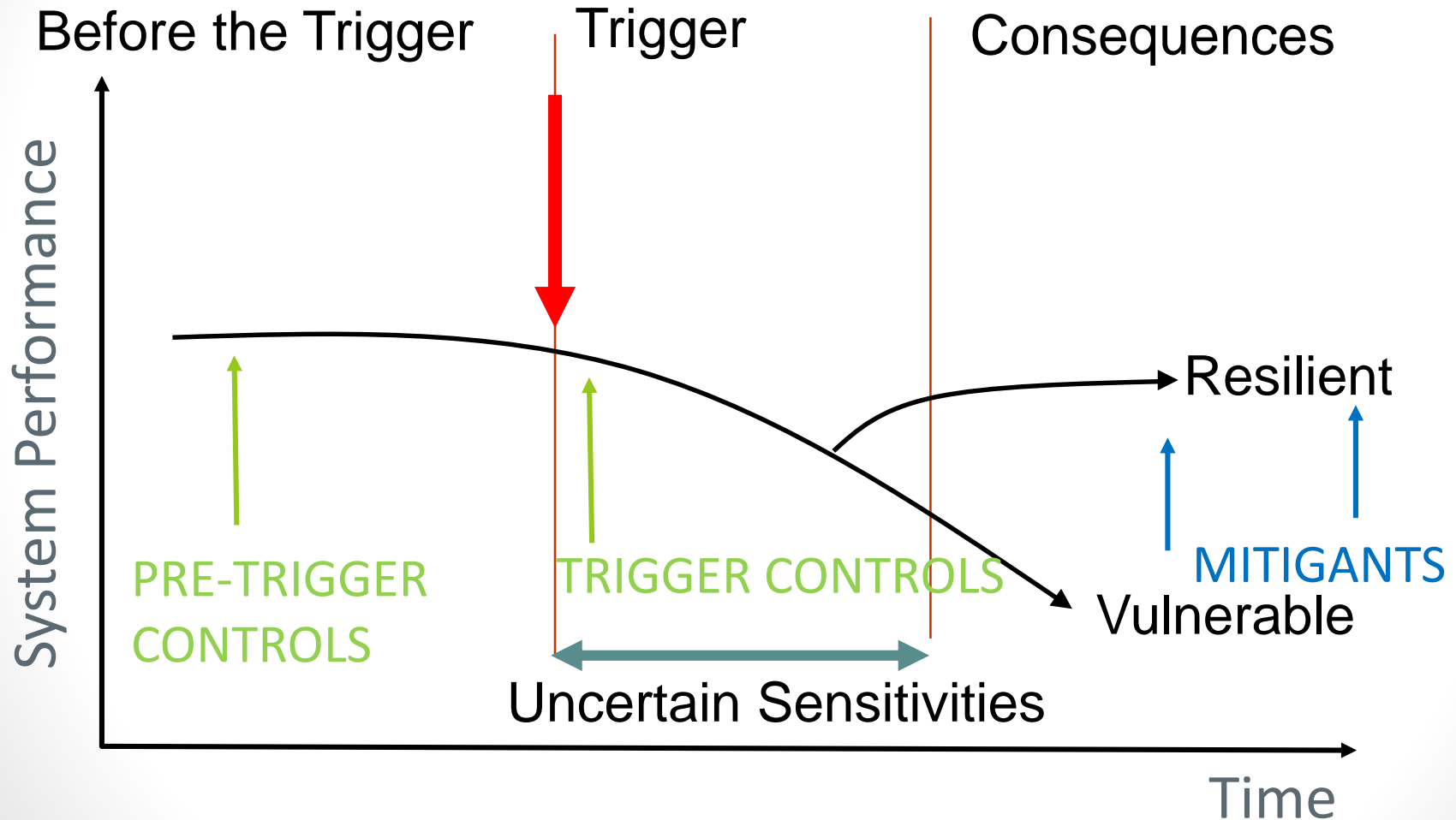
RISK EVENTS



Mitigants →

CONSEQUENCES

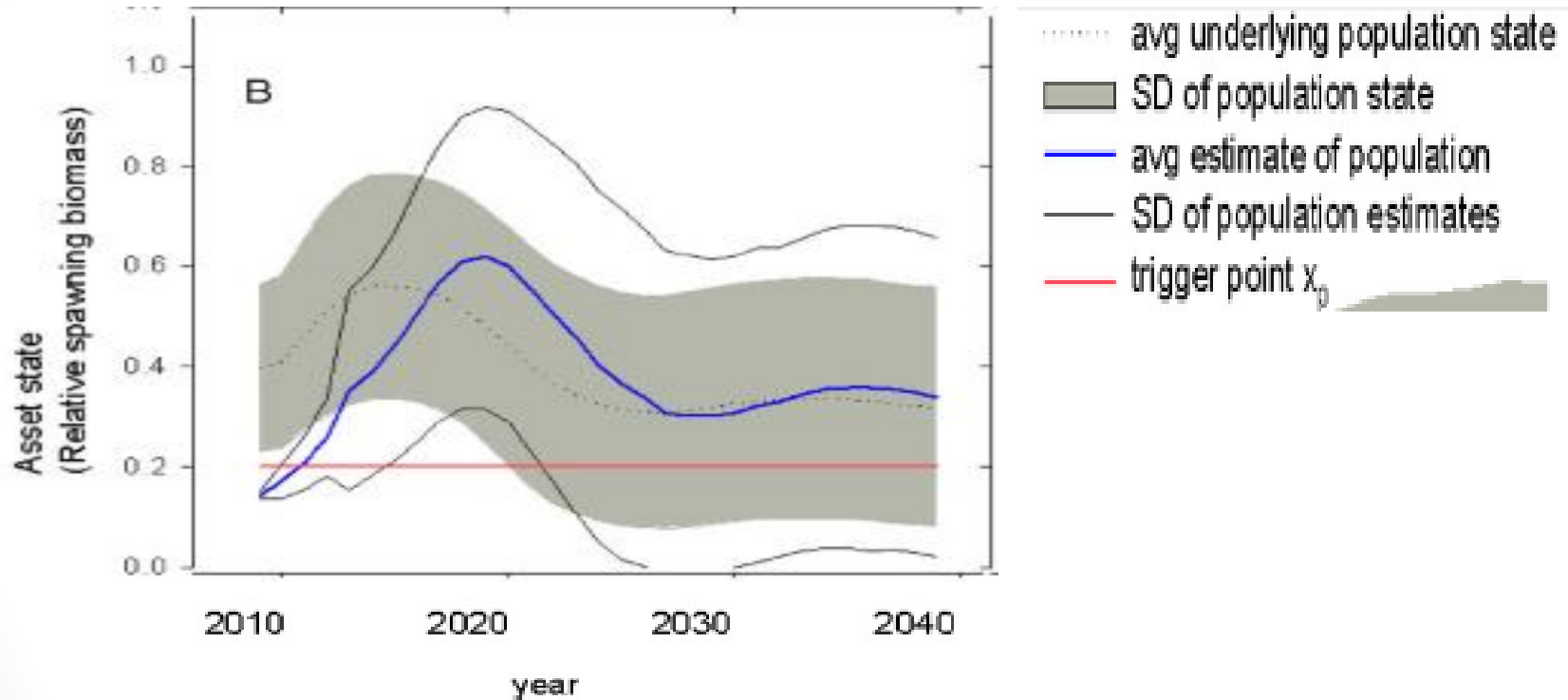
Causal Risk and Resilience



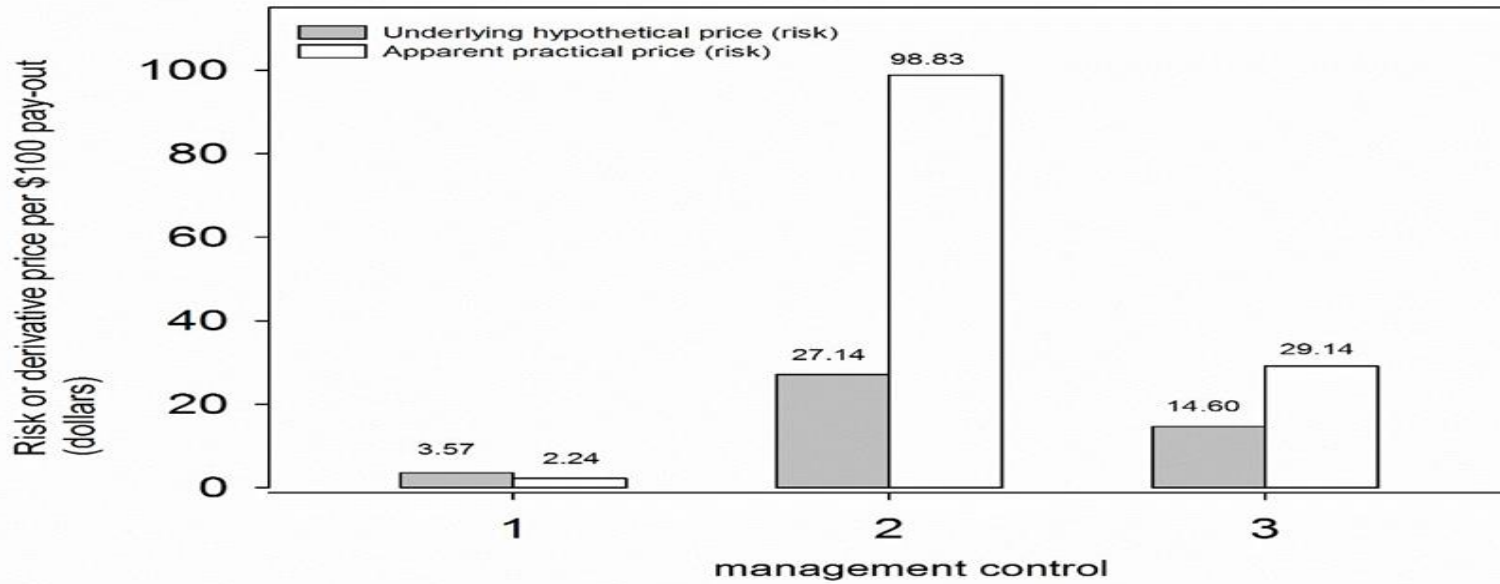
2. Risk Management with Derivatives

Environmental Derivatives

Spawning biomass trajectory



Pricing Risk



Climate Derivatives

FINANCED CLIMATE ADAPTATION



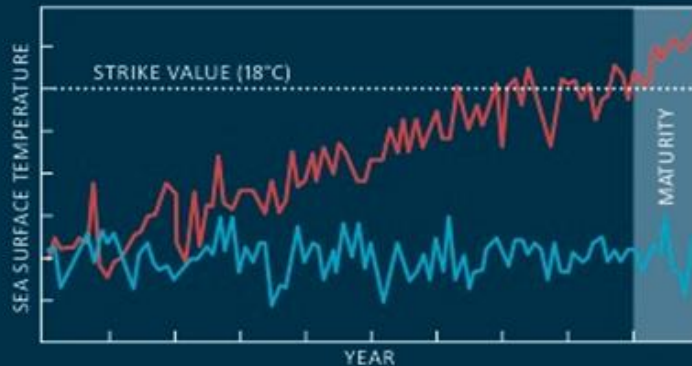
PRESENT TRANSACTION

LIFETIME OF CONTRACT

OUTCOMES AT MATURITY

Seller: receives payment from investor, which is used to invest in adaptation strategies to warmer temperature

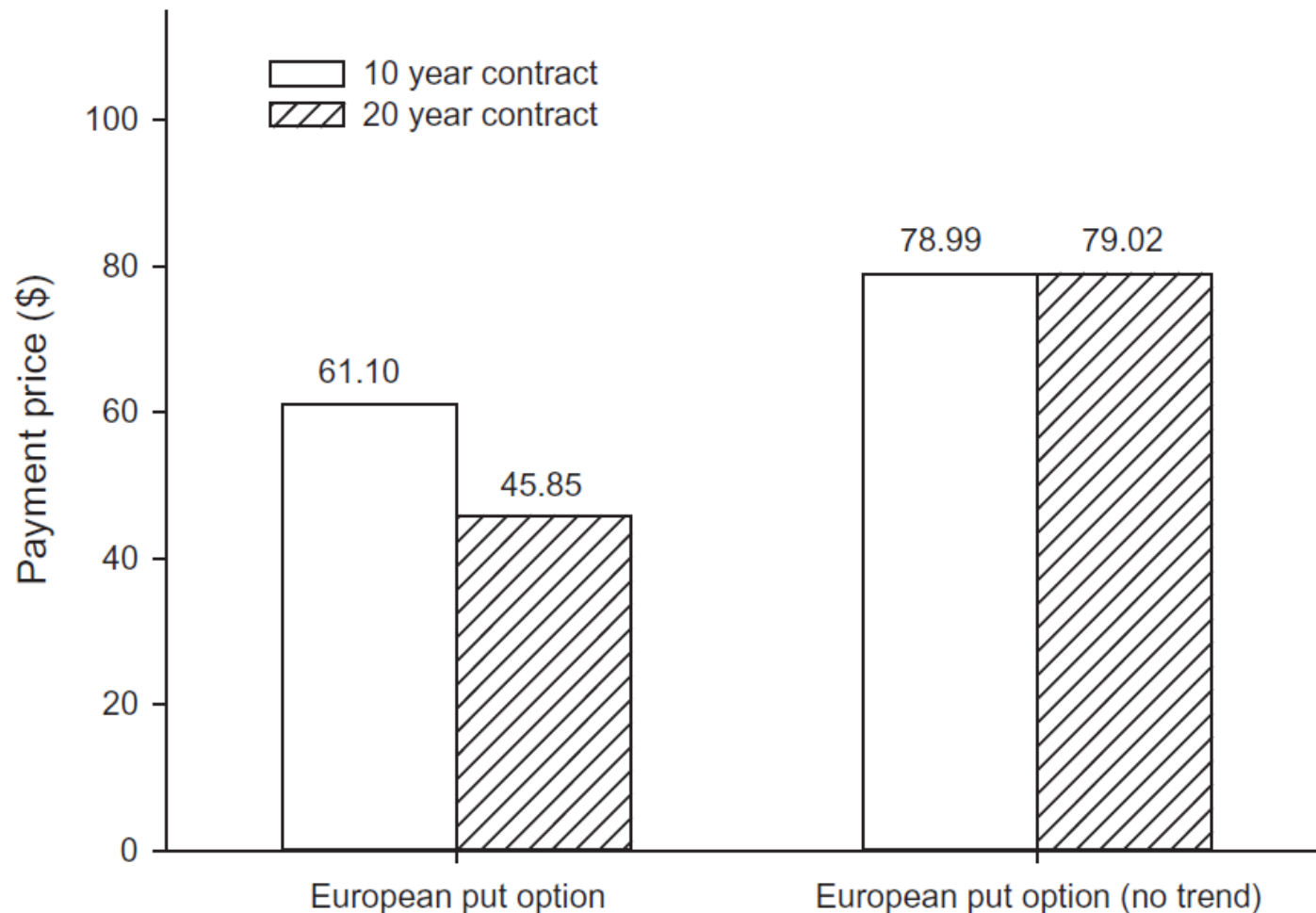
Investor: pays the seller, in the expectation of receiving a payoff if increasing temperatures fail to eventuate



Temperature Index > Strike Value
Seller: no payout is required, with original payments used to invest in adaptation strategies

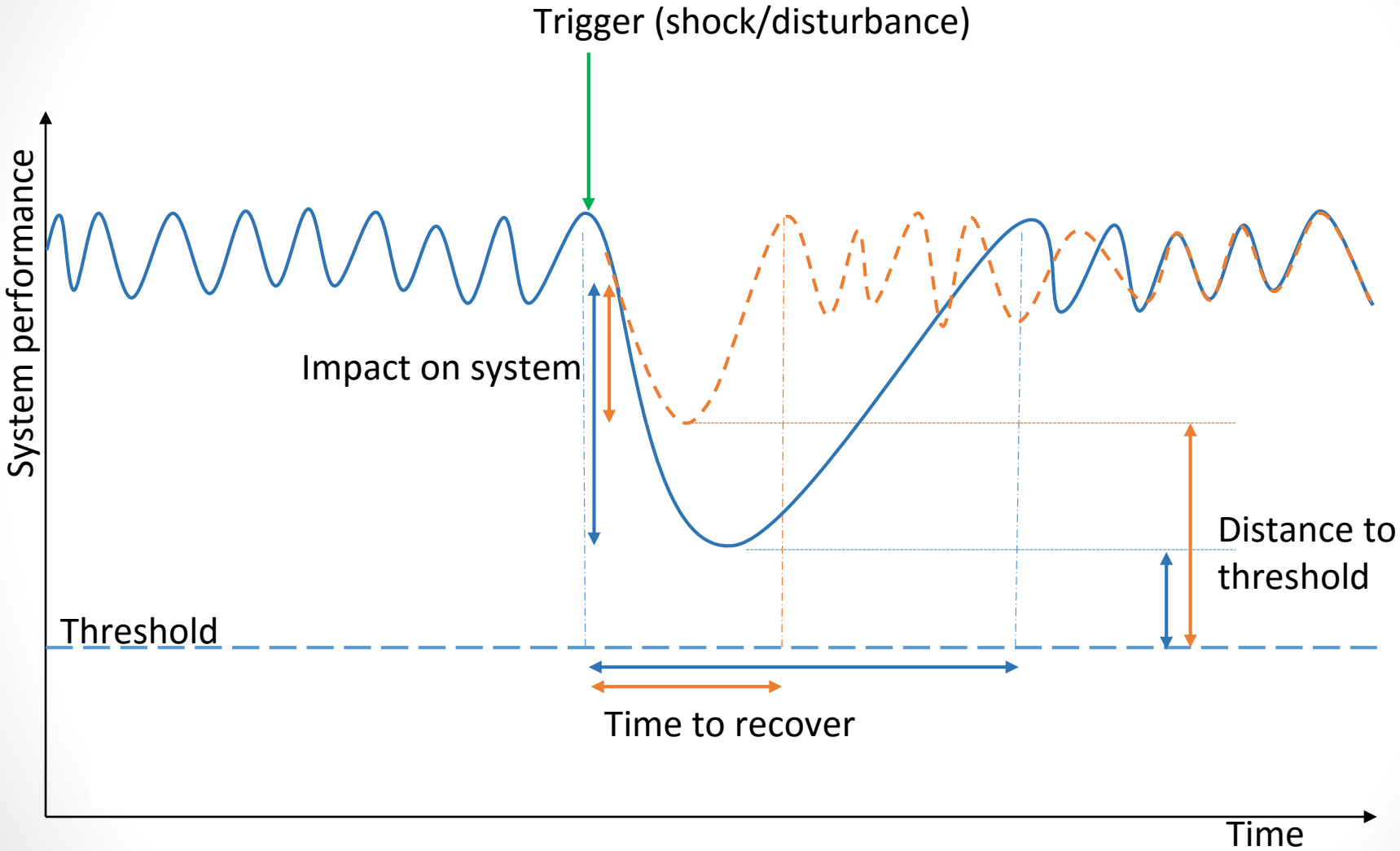
Temperature Index < Strike Value
Seller: pays out to **Investor**, but the cost is offset by the benefit of a temperature below the strike value

Climate Derivative Prices

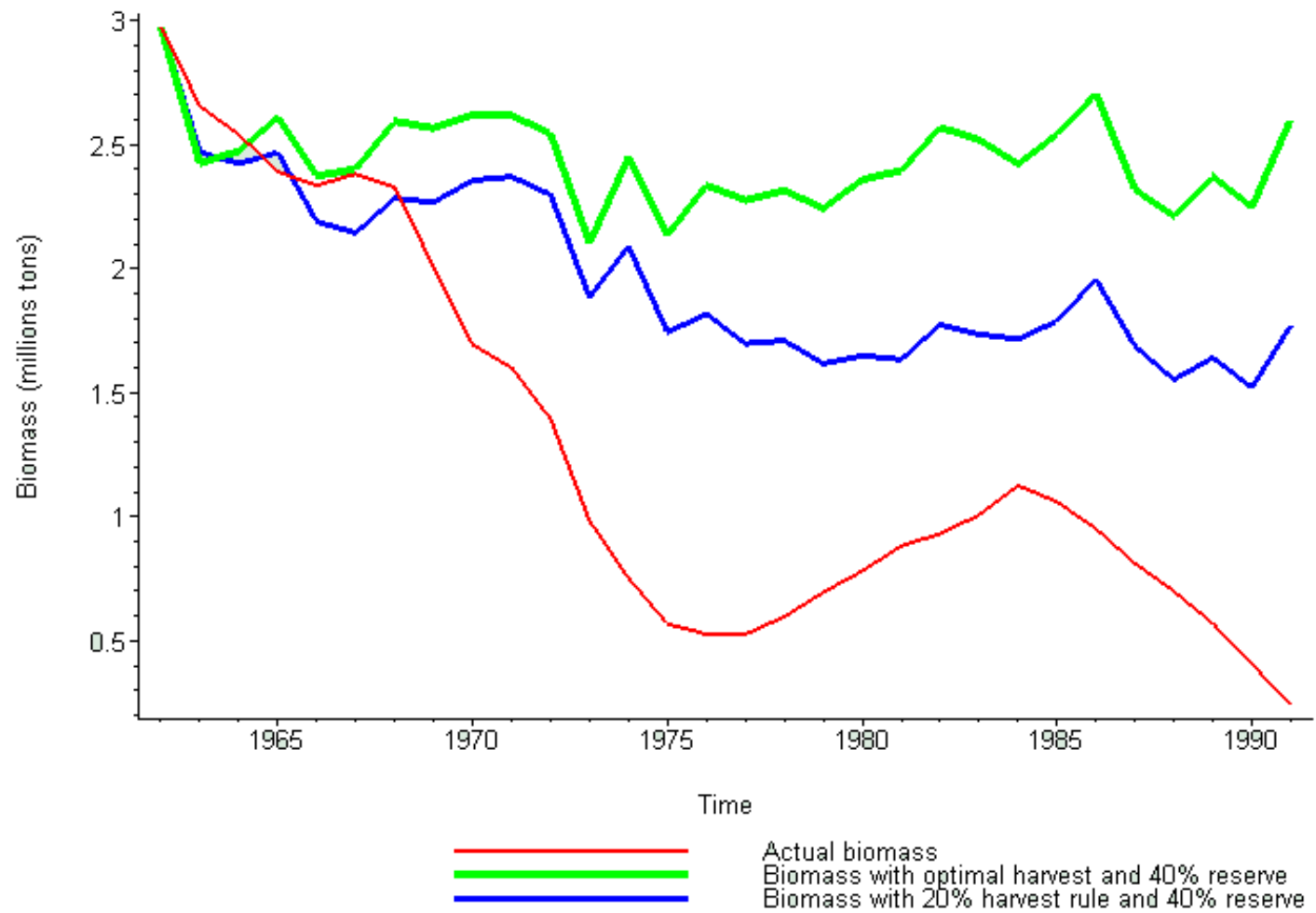


3. Resilience & Resource Management

Capacity, Robustness & Rapidity Resilience

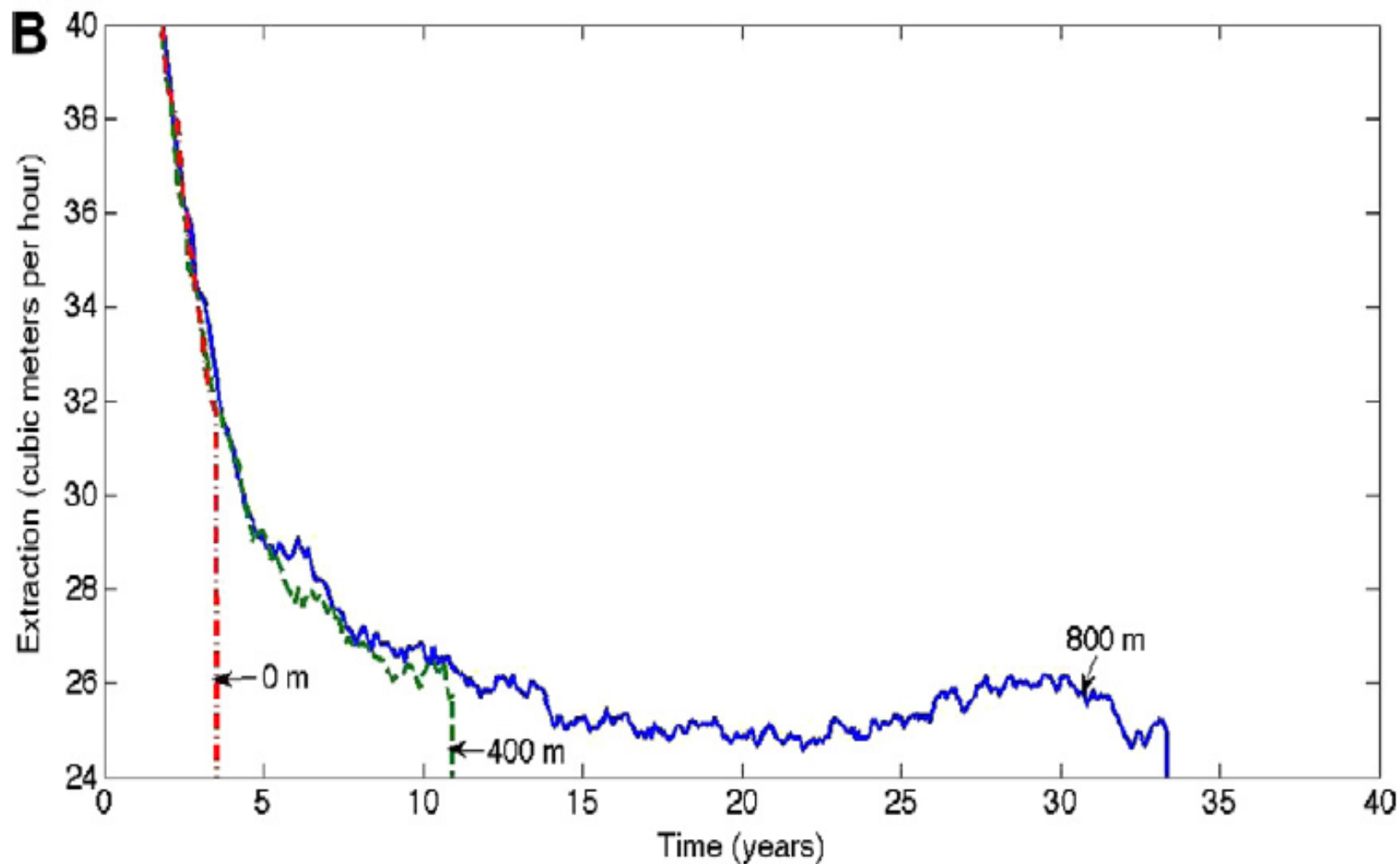


(1) MPAs: Capacity & Robustness Resilience



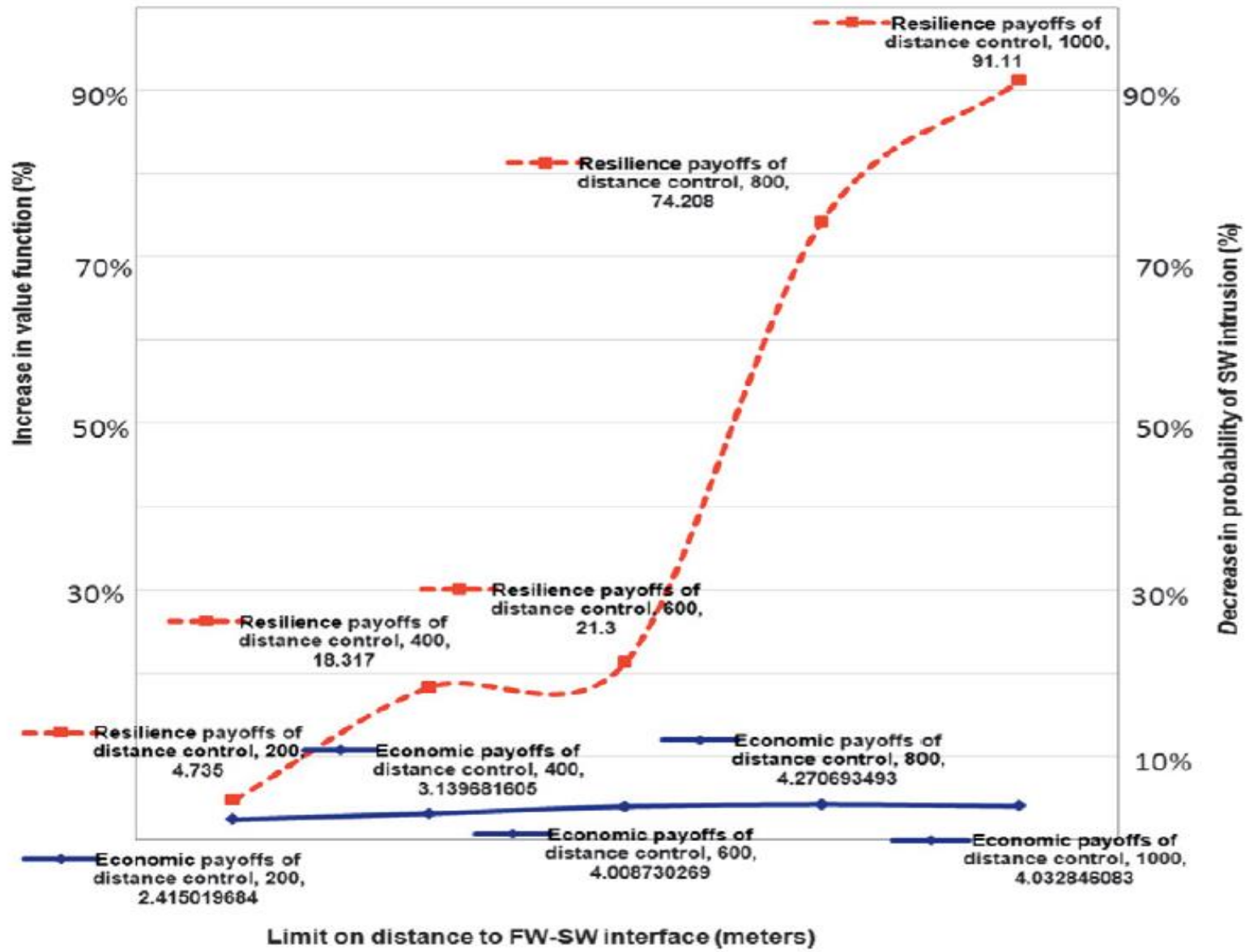
Source: Grafton et al. (2009)

(2) Groundwater Depth: Robustness Resilience



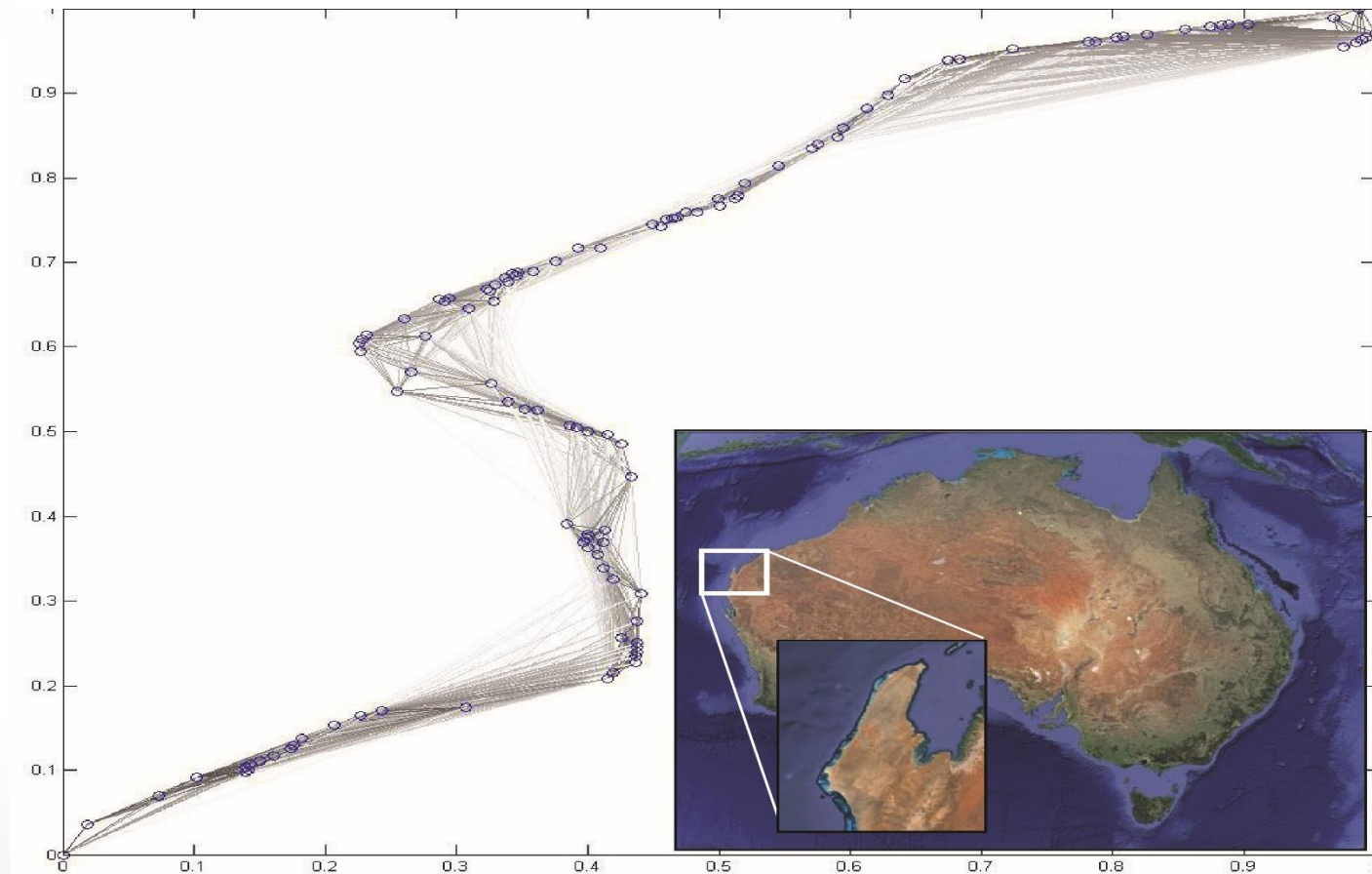
Source: Katic and Grafton (2011)

Speed of Recovery Resilience-Return Tradeoffs



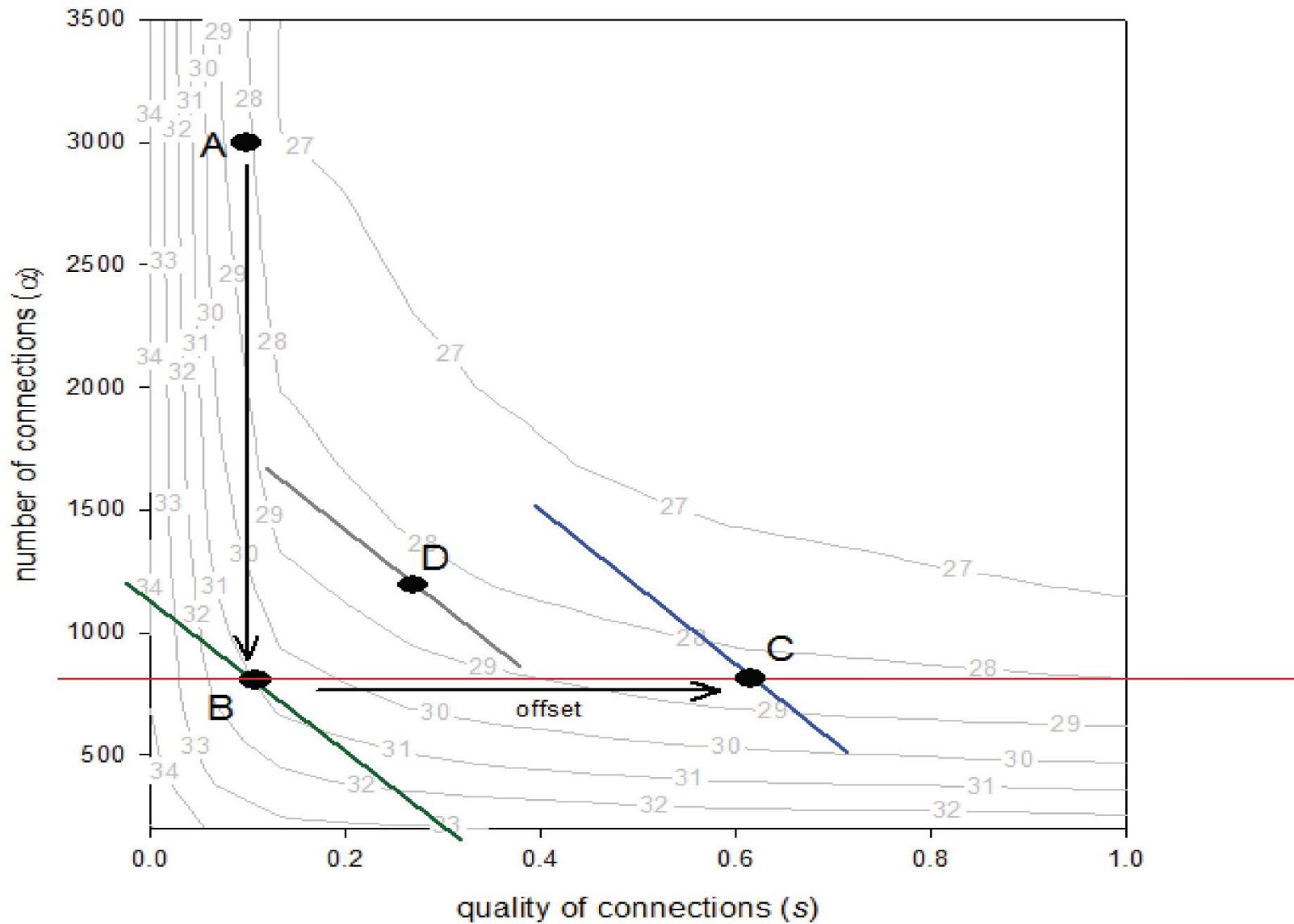
Source: Katic and Grafton (2011)

(3) Metapopulations, Networks & Offsets



Source: Little and Grafton (2015)

Iso-resilience and Conservation Offsets



Source: Little and Grafton (2015)

4. Conclusions

1. Risk analysis (likelihood X consequences) has serious weaknesses. Causal risk analysis offers a valuable alternative with focus on threats triggers and actions.
2. Derivatives (for environment & climate) offer new approaches for managers and resource users to transfer risk. Option prices give valuable information about risk and changes in risk.
3. Multiple management tools can be used to support specified resilience (robustness, capacity & speed of recovery) resilience. Different approaches (MPAs, well-groundwater depth control, offsets) offer potentially win-win outcomes (greater resilience and higher net returns to resource users).

References and Sources

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