Risk-informed Decision Making

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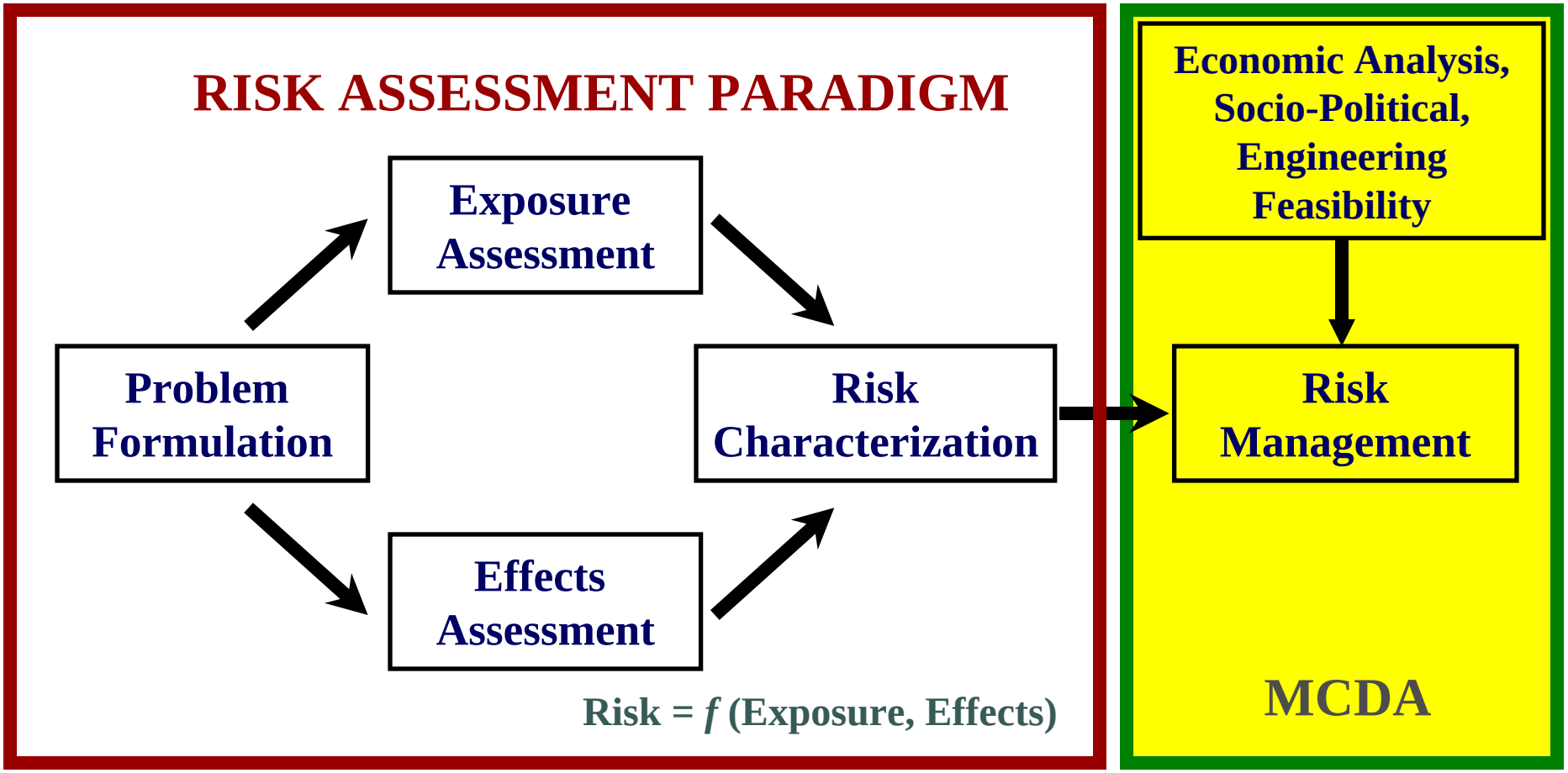
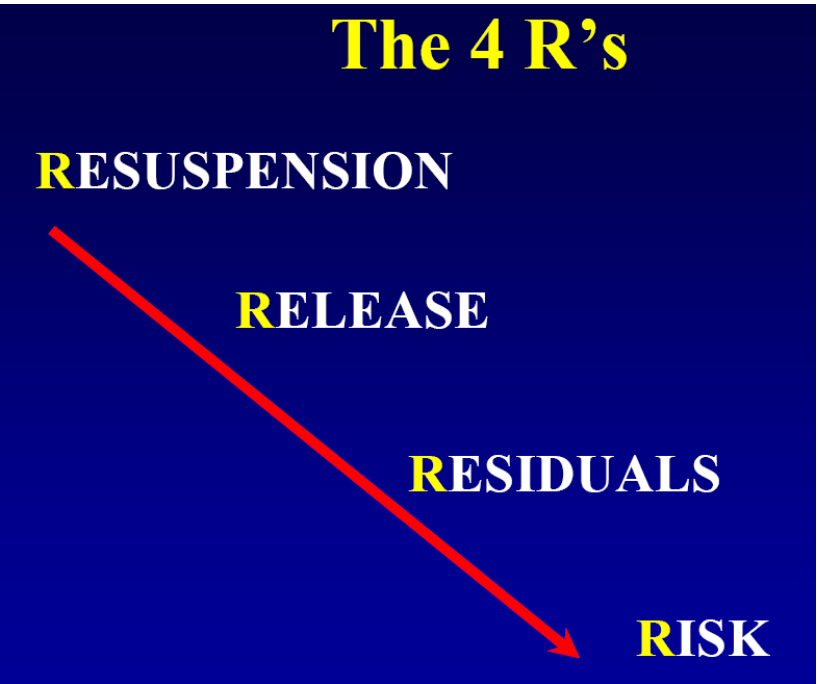
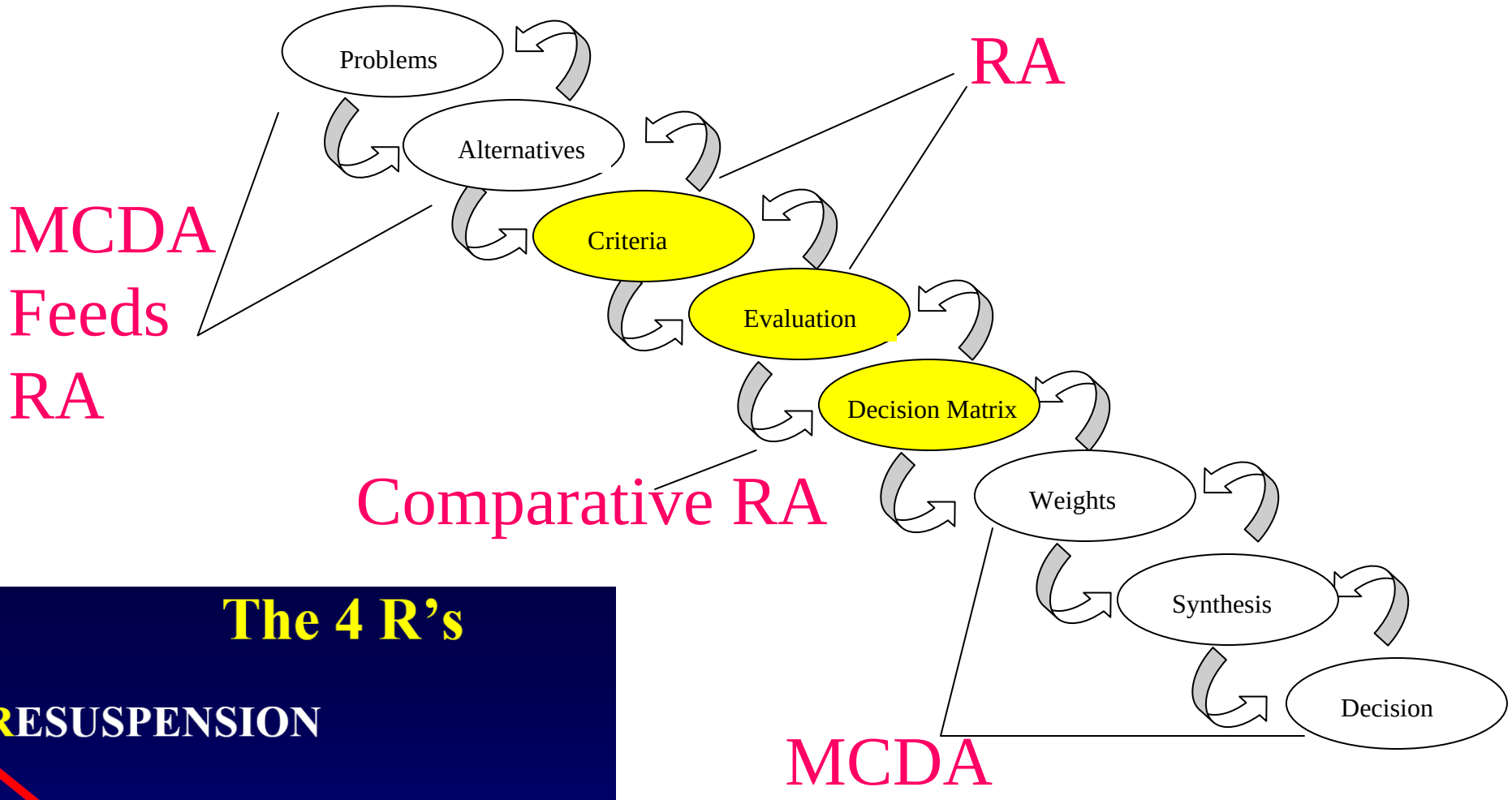
RISK FRAMEWORK







Decision Framework

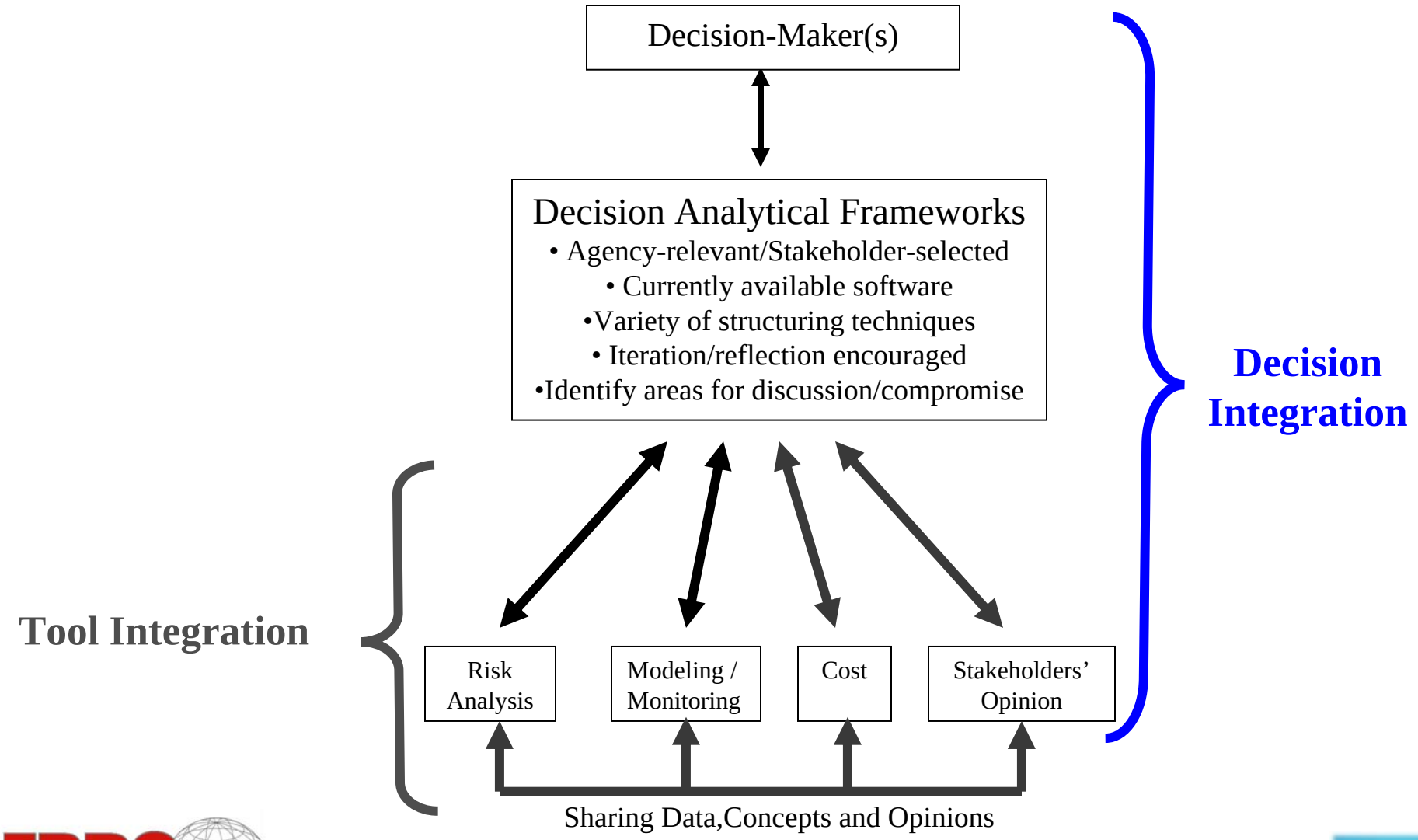
Presentation -- Overview

- **Using Risk Assessment in Decisions**
  - MCDA Approach
  - Application to Toddistan
- **Conclusions**

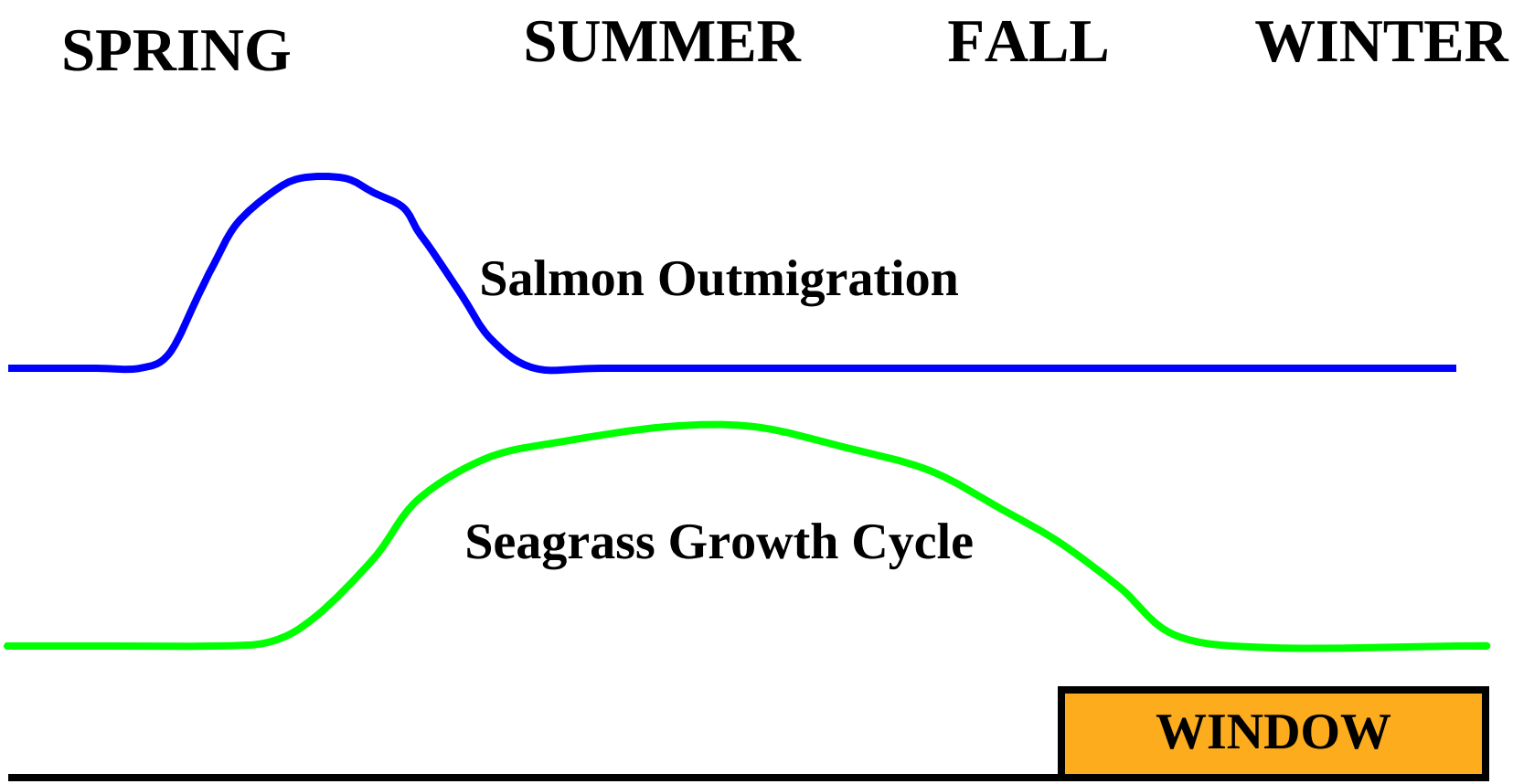
Main Points

- **Risks and benefits associated with alternative resuspension management strategies can be quantified using MCDA.**
- **Model, Parameters and Scenario uncertainty and variability associated with predicting efficiency of dredging alternatives as well as stakeholder value judgment are important to consider**
- **Challenges of risk assessment and planning require coupling traditional risk assessment and planning with MCDA to support dredging decisions**

Evolving Decision-Making Processes



Toddistan Environmental Window



Environmental Window

- Provides protection for juvenile salmon by eliminating TSS during migration
- Provides protection from light attenuation by eliminating TSS during SAV growing season
- Provides protection from rate of deposition by eliminating TSS during SAV growing season
- Does not provide protection from burial by anoxic deposition; therefore, overflow is restricted to 15 minutes to provide this protection

Toddistan Scenario Info

Dredging Scenario	Production (m^3/day)	Dredging Duration (days)*	Dredging Costs**
No Overflow	32,000	219	$13,100,000
15 Minutes Overflow	48,000	146	$8,800,000
30 Minutes Overflow	58,000	122	$7,300,000
Environmental Window w/ 15 Minutes Overflow	48,000	146 over two dredging seasons	$9,900,000***

* Days without downtime

** Without mob-demob cost of about $700,000

*** Plus an additional mob-demob cost of $700,000

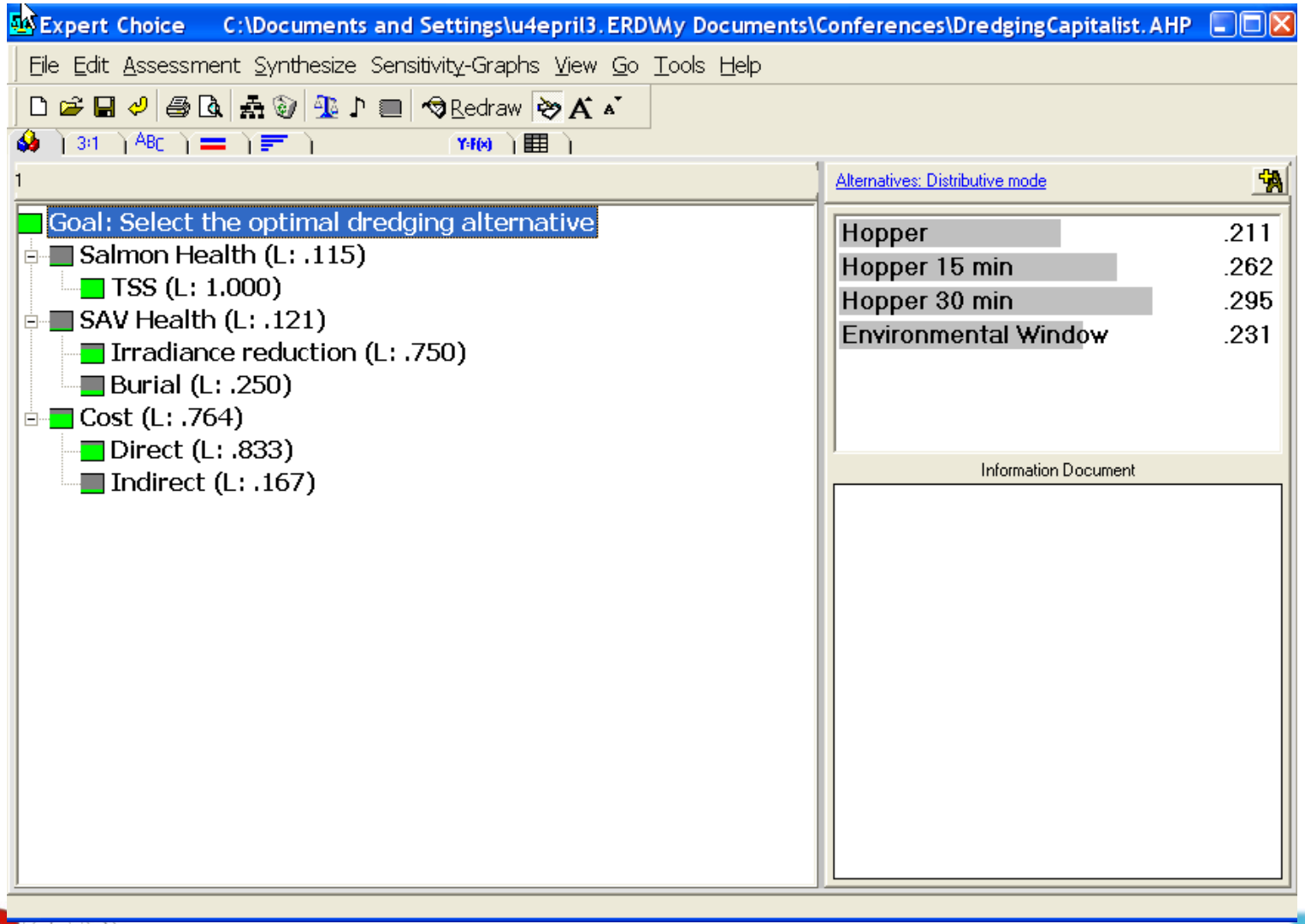
Metrics

Alternative	Direct and Indirect Costs	Survivability of Juvenile Salmonids, %	Survivability of SAV %
Hopper - No Overflow	100	95	95
Hopper – 15 Min. Overflow	70	80	70
Hopper – 30 Min. Overflow	60	70	30
Env. Window w/ 15 Min. OF	80	100	80

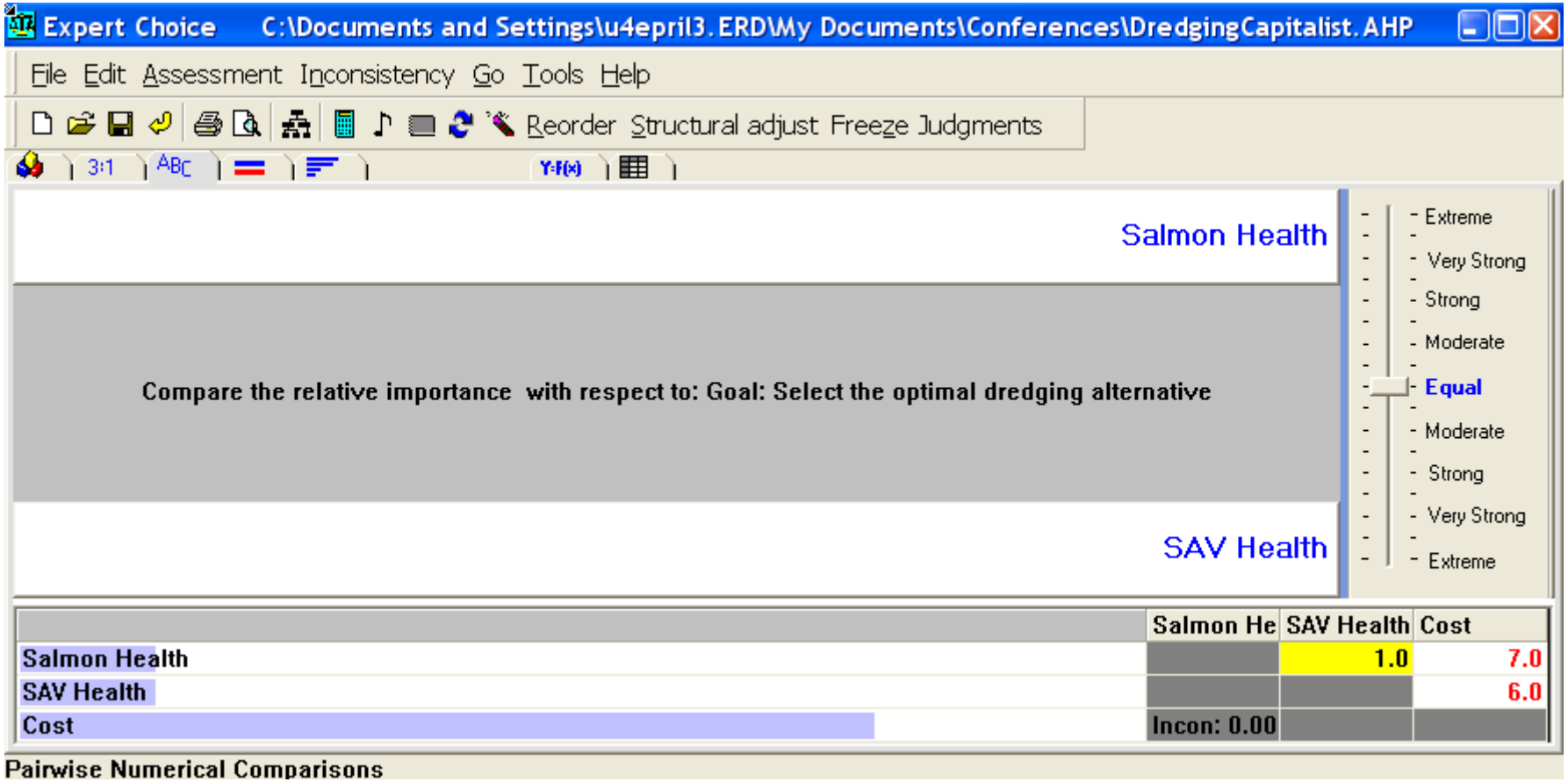
Risk Concerns / Recovery

Eco-Risk	Recovery Time		Weight of Concern
	Sublethal Effect	Lethal Effect	
Salmonids	Rapid, weeks to months	Rapid, 1 year	Low
SAVs	Moderate, 1 year	Slow, decade	High
Corals	Very Slow, decade	Very Slow. decades	Very High

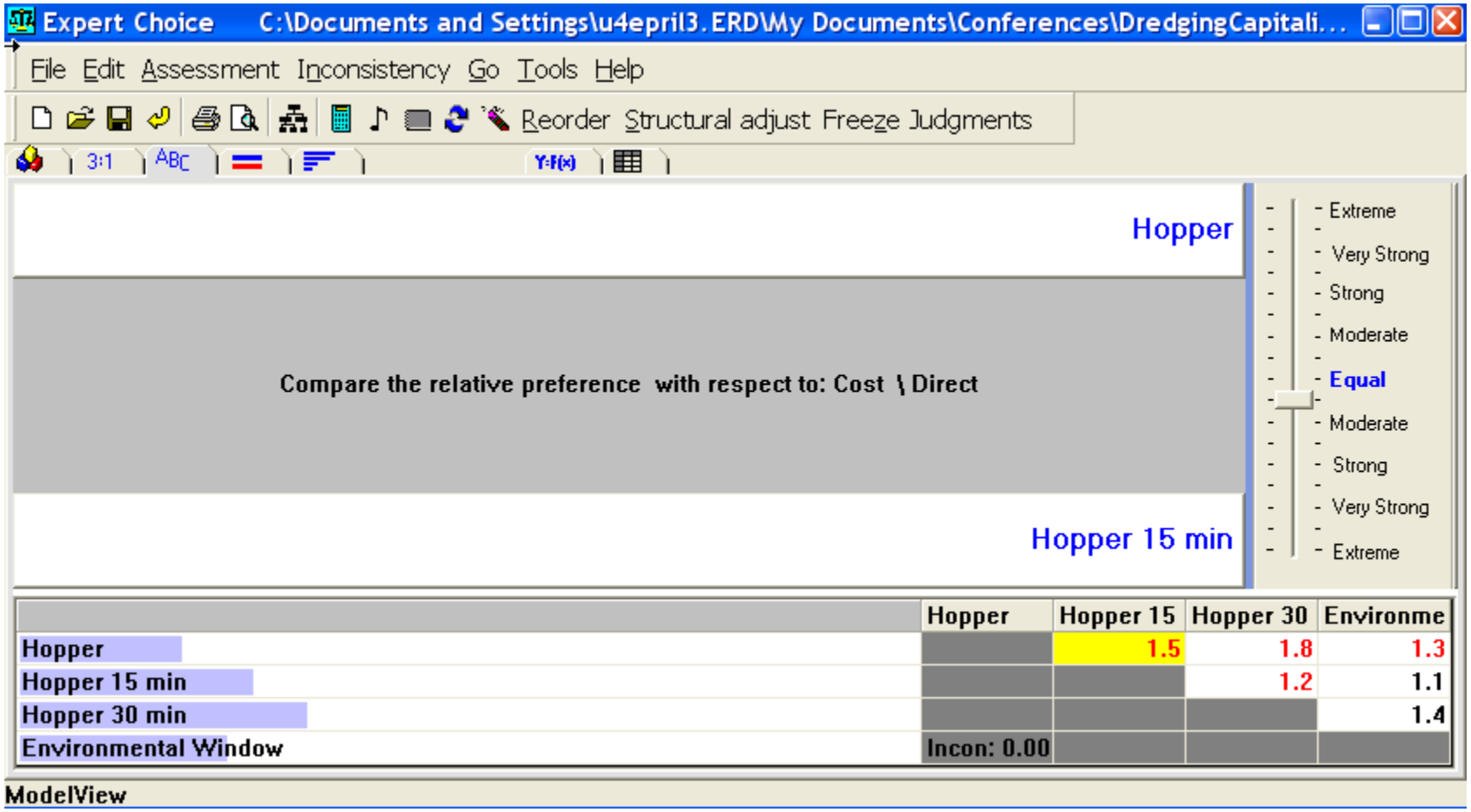
Assessment Criteria



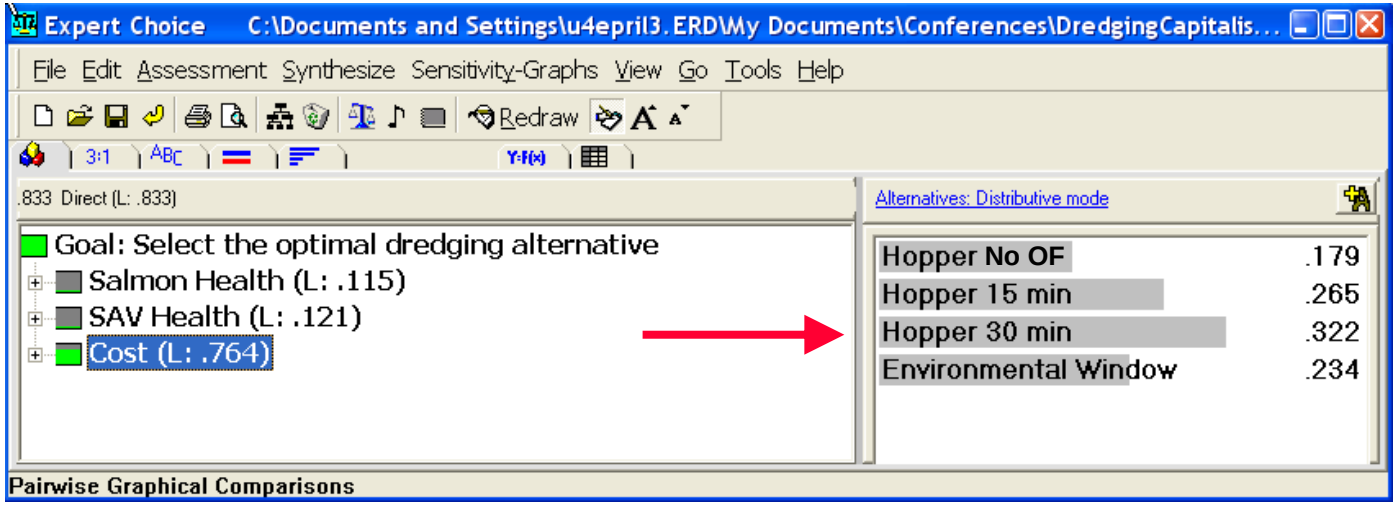
Criteria Weights



Metric Assessment by Criteria

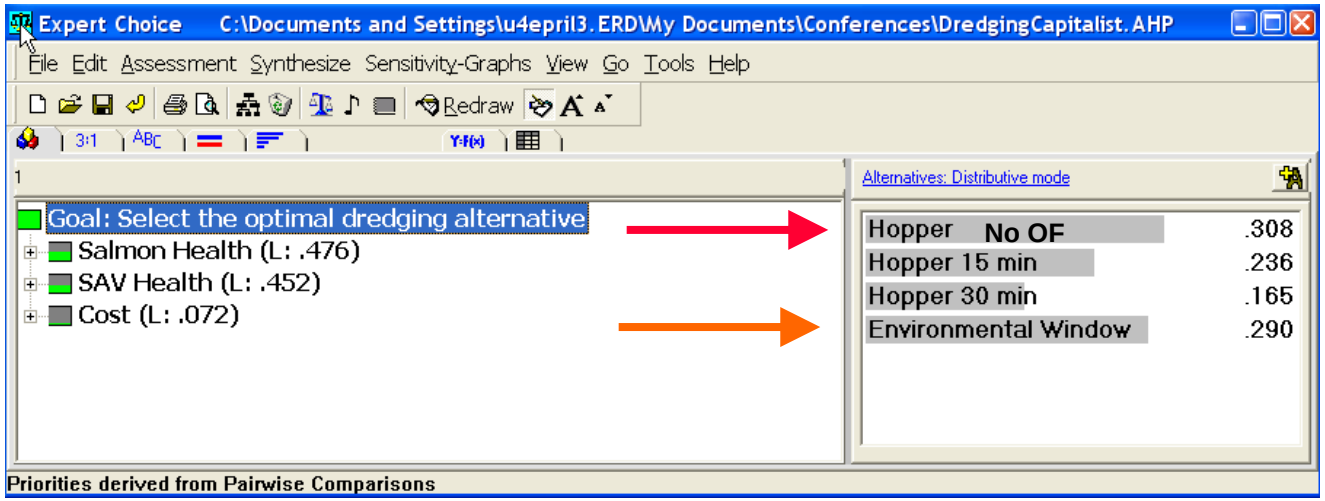


Results for Different Stakeholders

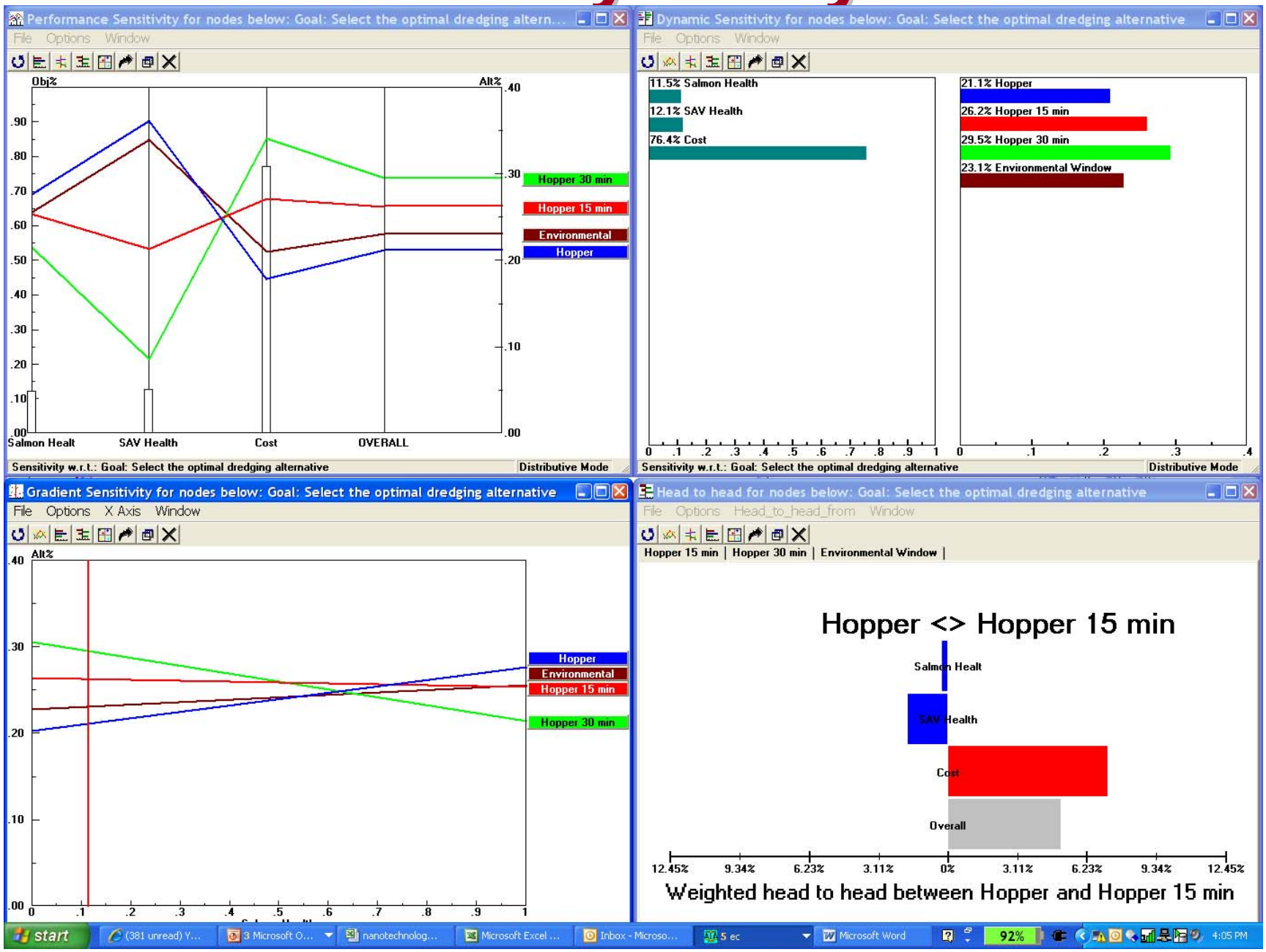


Toddistan Officials

World Bank



Sensitivity Analysis



Results

- **Balanced weighting** would yield selection of **15 minutes of overflow** as the optimal alternative
- **High weighting of cost and indirect costs/ schedule** yields selection of **30 minutes of overflow** as the optimal alternative
- **High weighting of environmental resource protection** yields selection of **no overflow or possibly environmental windows** as the optimal alternative

Summary

- 15 minutes of overflow was selected as the optimal alternative
- Adaptive management will be used to address uncertainties concerns
- Monitoring within a adaptive management framework will be used to ensure ecological risks are acceptable

Questions?