

What is the Value of the Environment?

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About RAS

25
years



Safety Risk



Business Risk



Environmental Risk

The screenshot shows the RAS website's homepage. At the top, there is a navigation bar with links for Home, About, Services, Contact, and News. Below the navigation is a large green banner featuring a photograph of industrial cooling towers and a quote: "We cannot solve our problems with the same level of thinking that created them." - Albert Einstein. Underneath the banner are three circular icons representing different risk types: Safety Risk (red), Business Risk (yellow), and Environmental Risk (blue). At the bottom of the page, there is a section titled "Risk Management Consultants" with a detailed description of their services.

Risk Management Consultants

Understanding and reducing the critical management of risk is not just business. Data when the risk is being managed must understand how it can be effectively managed. Key to the success of risk management is understanding what needs to be done and how to do it. Using the right processes and the right tools, we believe we are unique in our ability to identify the opportunities and the threats in a risk register. We don't design each tool to suit each other; we design each tool to suit each other's particular need, current and changing business needs, working in collaboration with our clients.



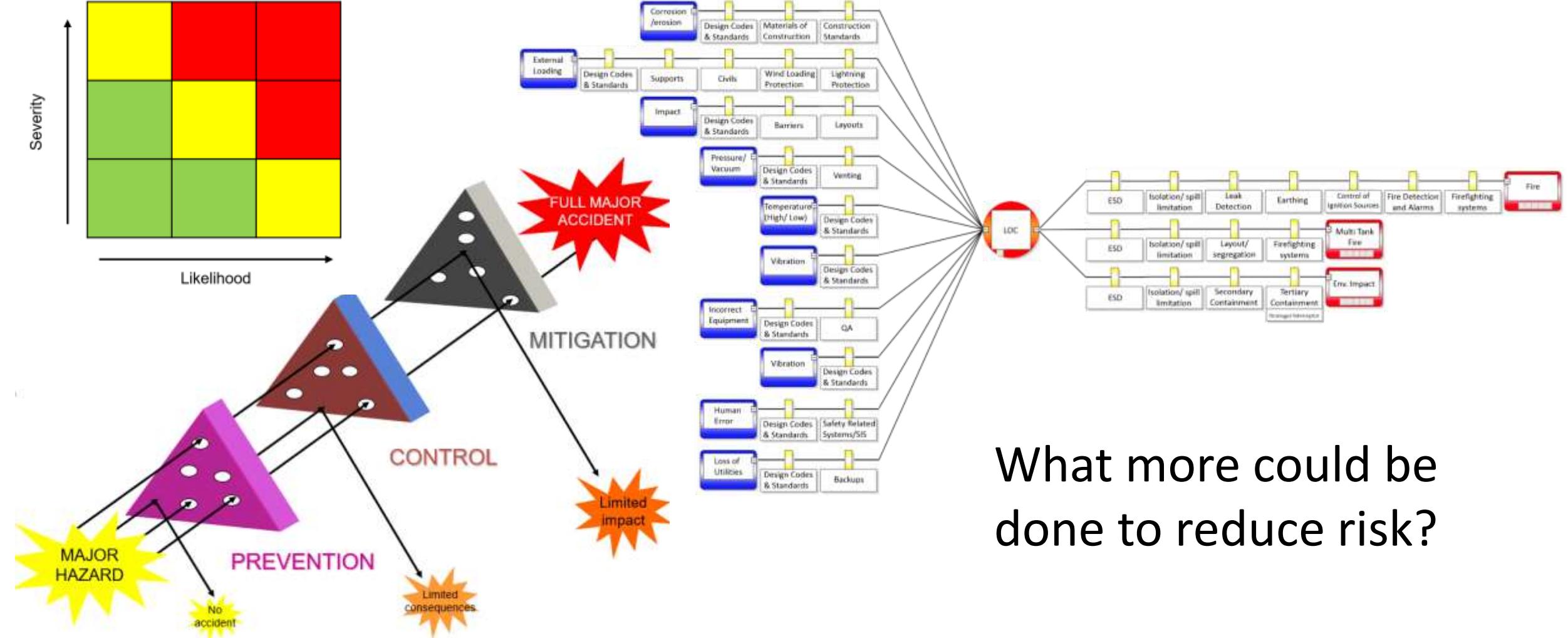
About RAS

- Risk and hazard management company based in Chester
- Our areas of expertise include:
 - Safety risk analysis
 - Environmental risk analysis
 - COMAH Safety Reports
 - DSEAR compliance
 - Environmental permitting

Why are we here?

- Ultimate goal - assign a monetary value to the environment
- Context - UK COMAH Regulations:
 - Risk analysis
 - Demonstration that risk is As Low As Reasonably Practicable (ALARP)
- Cost-benefit analysis (CBA):
 - Health and safety - established approach
 - Environment - challenges

ALARP Demonstration



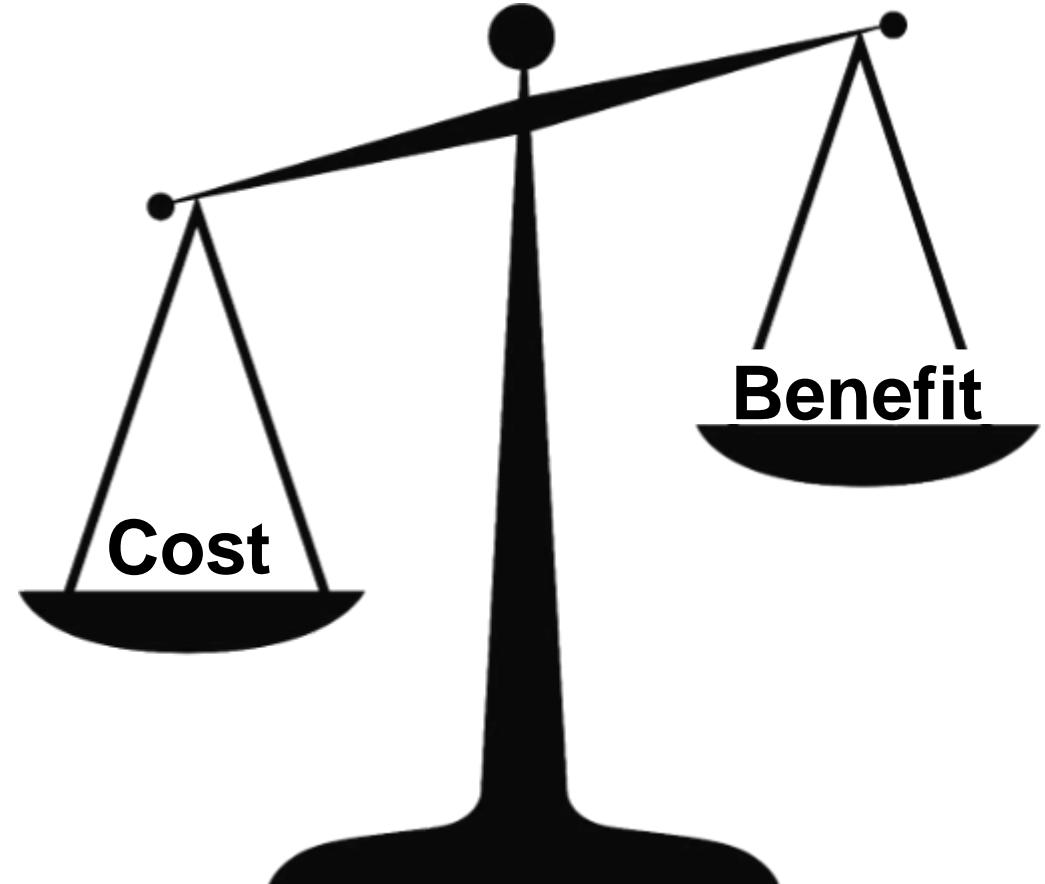
Cost vs. Benefit

- Cost of implementing risk reduction measure(s), e.g.

- Installation
 - Operation
 - Training
 - Maintenance

- Benefit of reduced risk includes:

- Value of avoided fatality/harm
 - Value of avoided harm to the environment (sub-MATTE/MATTEs A-D)



Avoided Harm

Health and Safety: Environment:

- Fatality
 - Injury or illness
 - Permanent
 - Serious
 - Slight/minor
 - Recipients - people
- Sub-MATTE, MATTE A-D (CDOIF Guideline)
 - Receptors
 - Terrestrial
 - Freshwater
 - Marine
 - Groundwater
 - Designation/importance

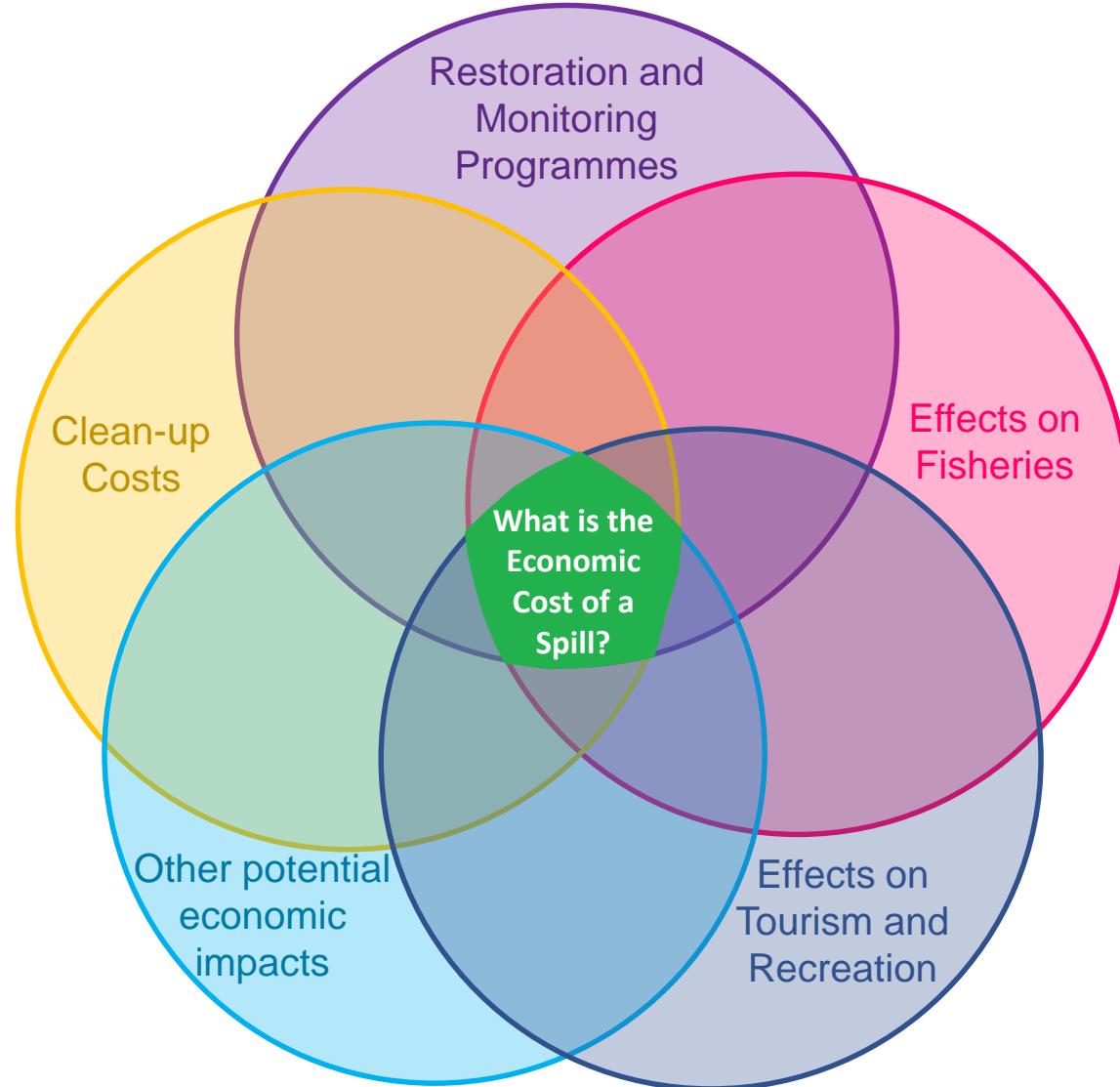
		MATTE		
Severity of harm (area)	4	Sub-MATTE Harm	C	D
	3		B	C
	2		A	B
	1			C
			1	2
		Harm duration (time to recover)		
		1	2	3
		4		

Costs of Environmental Harm



- *Costs* that make up the value of avoiding environmental harm
 - ...the value then used in the justified spend calculation
 - ...then compared to the *cost* of implementing risk reduction measures

Contributing Costs



Environmental Fines

- CDOIF – include environmental fines in costing
- Sentencing Council (England and Wales):
 - Culpability
 - Deliberate
 - Reckless
 - Negligent
 - Low or no culpability
 - Harm
 - Categories 1 – 4 (decreasing)
 - Company turnover
 - Previous incidents



Clean Up Costs

- Depends on receptor
- Groundwater/soil:
 - Location – aquifer properties
 - Pollutant properties/behaviour
 - Plume dimensions and concentrations
 - Clean up method
 - Passive vs. active
 - In- vs. ex-situ
- Surface/marine water:
 - Clean up method
 - Booms, skimmers, sorbents
 - IR/UV aerial surveillance
 - Satellite imagery

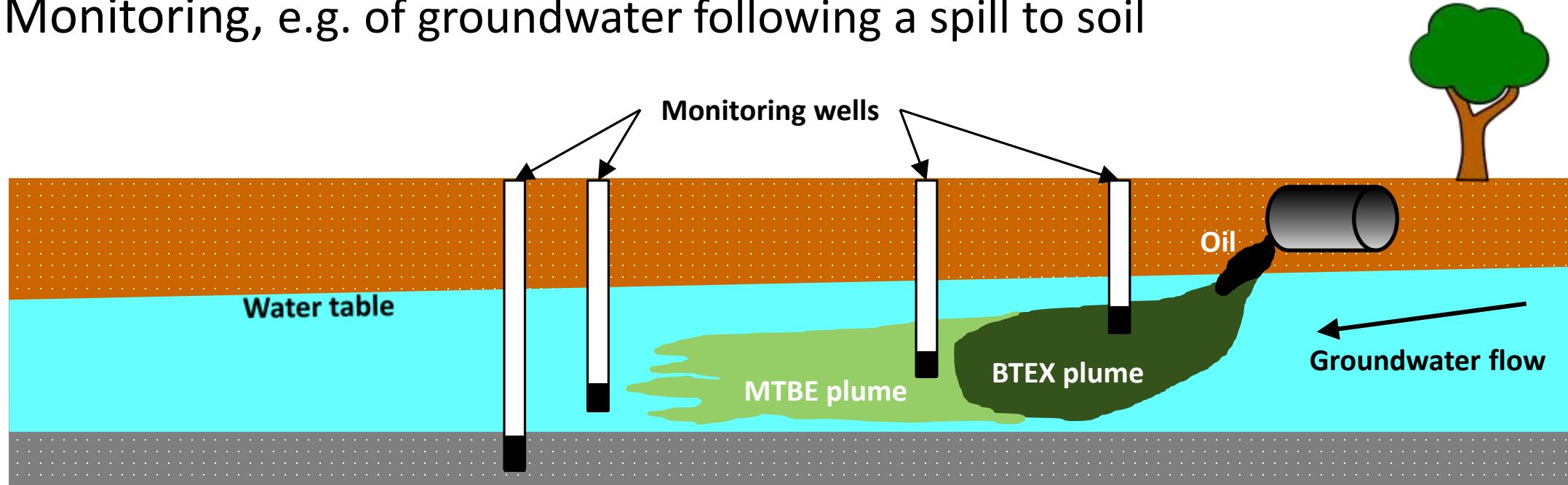
Clean Up Costs – Groundwater

Year	Location	Substance and Volume Spilled	Clean-up method	Clean-up Cost (£ 2018)	Cost Per m ³ split (£2018)	Reference
2007	Heathrow Airport	139 m ³ of Jet A1 spilled	Exploratory boreholes, skimmer kits and rubber hoses.	£1,260,000	£9,065	(Water Briefing, 2010; Brownfield Briefing, 2010)
2005	Milford Haven	653 tonnes (777 m ³) of kerosene spilled	Pumping of contaminated water through boreholes. Skimmers were used on a local stream.	£4,410,000	£5,676	(Institution of Chemical Engineers, 2008; BBC News, 2005)

- Fines:
 - Heathrow: £50,400
 - Milford Haven: £42,600

Restoration and Monitoring

- CDOIF – include cost of restoring the natural environment, e.g. fish stocking
 - Obligation on those responsible to restore
 - Extent of restoration can depend on time of year when spill occurs
- Monitoring, e.g. of groundwater following a spill to soil



Fisheries and Tourism

- Fishing
 - Loss of stock
 - Contaminated equipment
 - Fishing exclusion
 - Wider loss of products/ economic damage to seafood trade
 - Difficult; loss of sales and reduction in price
- Tourism
 - Lost income
 - National parks
 - Heritage sites
 - Hotels/ camp sites
 - Temporary closures
 - Media attention
 - Impact on unaffected areas
 - Disaster tourism

Other Costs

- Physical damage to property
- House prices
- Sea Empress
 - Impacted oil refineries
 - Defence industry
 - Power stations
- Intrinsic value of the environment
 - Less tangible



Sea Empress oil spill, 1996. Photo: [Wales Online](#)

Summary

- Judgment or CBA?
 - Often obvious, but sometimes need to examine in more detail
- Main issue from literature review - cost *prediction* is difficult
 - You can't know until after an event has occurred
 - Even after an accident, it may not be clear for years
- Consistency - real risk of drastic under or over estimation
 - Implementing risk reduction measures unnecessarily or worse, rejecting measures that are needed

What next?

- How do we improve the situation?
- CDOIF Guideline uses broad categories for consequence
- Analogous approach for the ALARP demonstration?
 - Consistent baseline value (or values)
 - Modifiers to tailor for specific receptors and consequences
- Middle ground between:
 - Single fixed value and
 - Current case-by-case approach - inconsistent

Conclusions

- ALARP demonstration is critical stage
- CBA is one supporting tool, if results are trustworthy
- Further work is needed for consistent and meaningful results
 - Without this - false or misinformed ALARP arguments are a real risk
 - Strip back and simplify inputs – more accessible
 - Success requires involvement of industry operators, environmental experts and the regulator