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Bearing the cost: the economic and resource implications of degrading groundwater quality

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Deteriorating groundwater quality

- What are the main issues?
- What have these cost the water supply industry?
- What might the future costs be?
- What are the implications for water resources?
- The WFD?



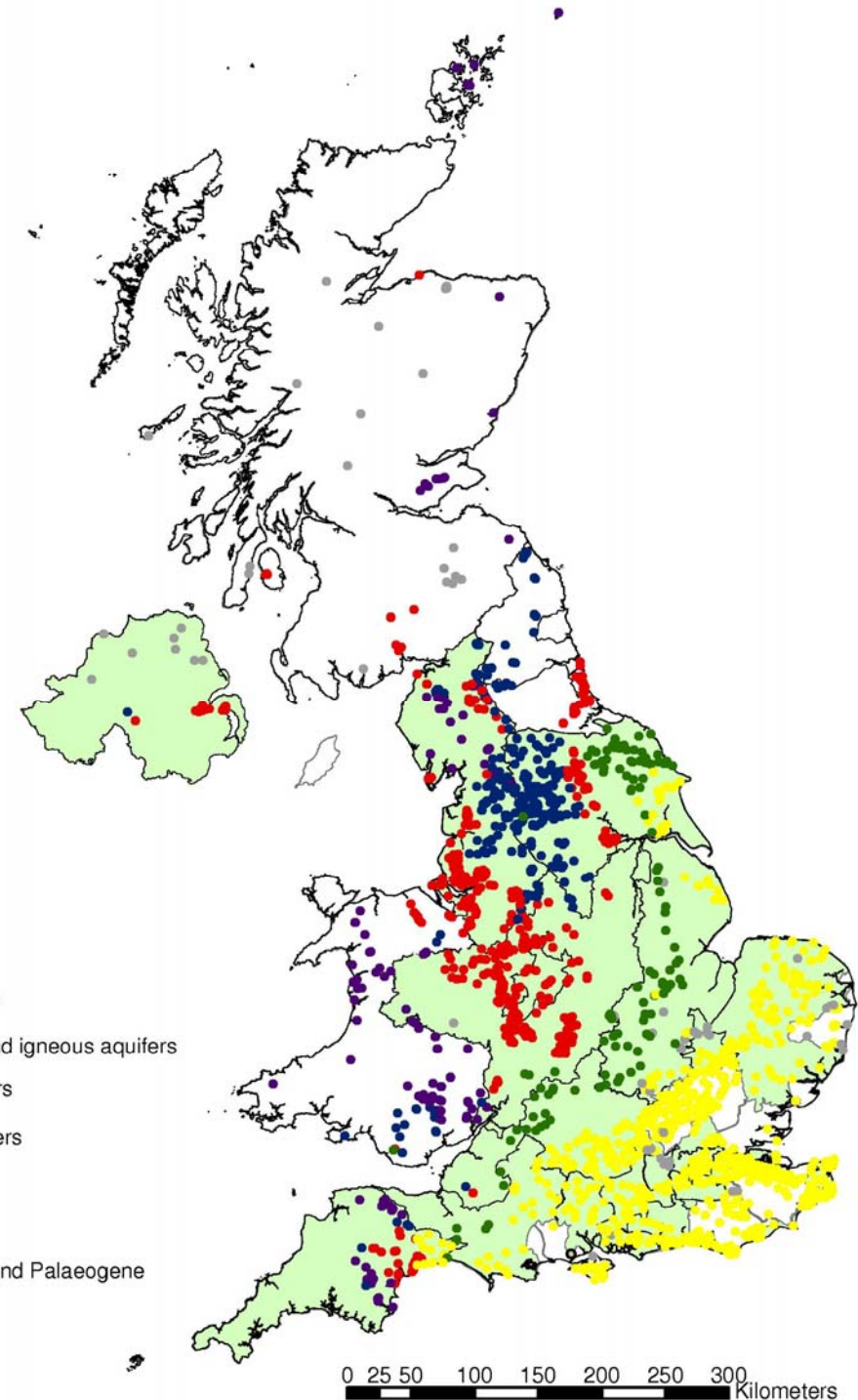
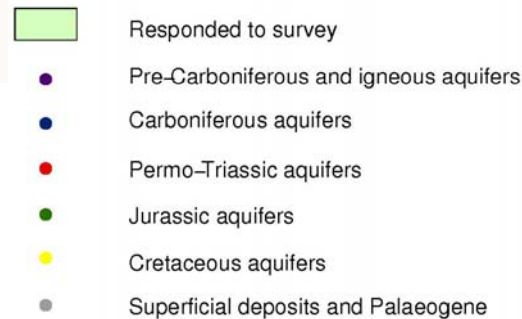


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Survey responses & groundwater supply sources

- 14 utilities
- 75.6% of supplied groundwater





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Issues

- Nitrate
- Pesticides
- Hydrocarbons & solvents
- Other point sources

- Cryptosporidium
- Arsenic

- Iron & manganese

- Salinity



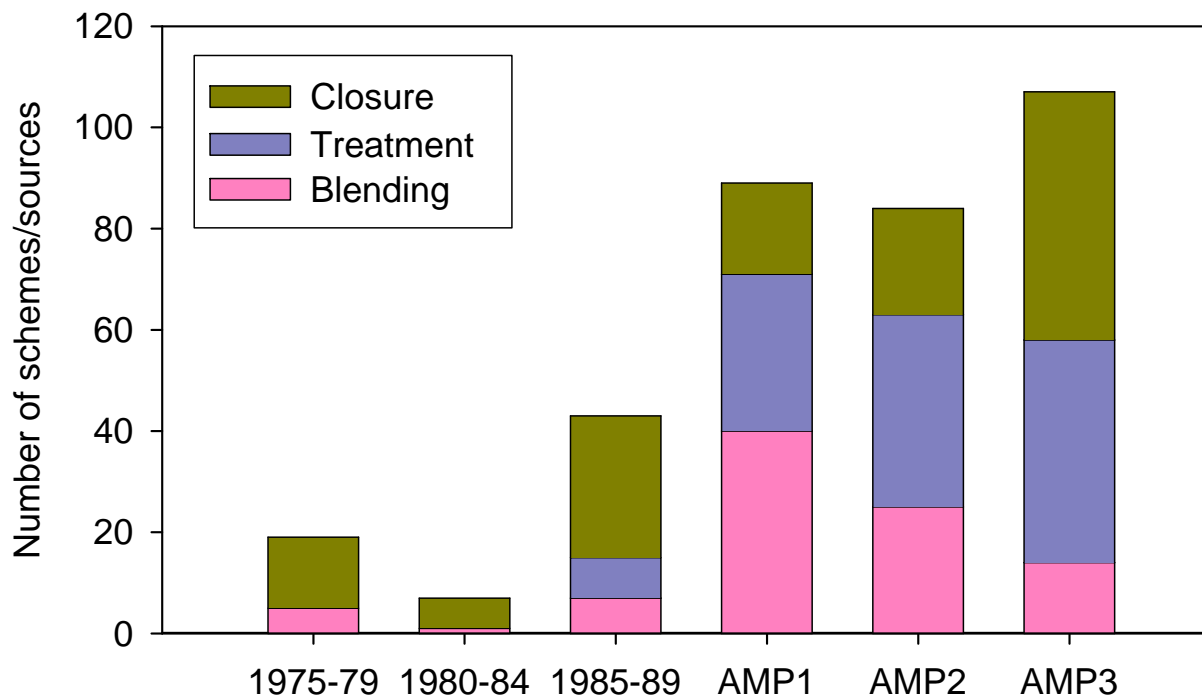
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Scheme implementation in sample





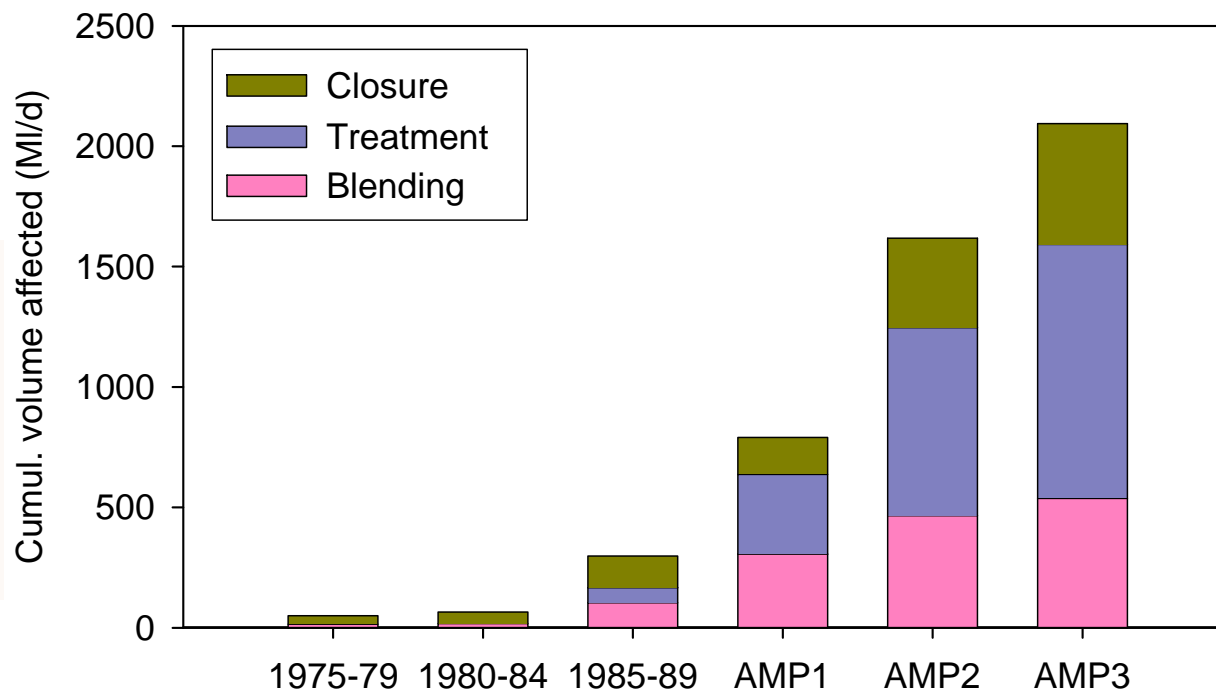
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Amounts of water affected in sample





Calculated mean unit costs

	Blending		Treatment	
	Capex (£/MI/d)	Opex (£/MI)	Capex (£/MI/d)	Opex (£/MI)
Nitrate	261,500	7.2	476,100	68.1
Pesticides	111,300	2.9	263,000	19.5
Cryptosporidium	-	-	359,000	16.6
Hydrocarbons	220,000		723,200	8.1

- All costs at 2003 equivalent
- Very large data ranges particularly for capex (95% CL= $\pm 60\%$)



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Estimates

- Cost of replacement sources
- Missing abstraction volumes
- Missing costs
- Scaling to 100%





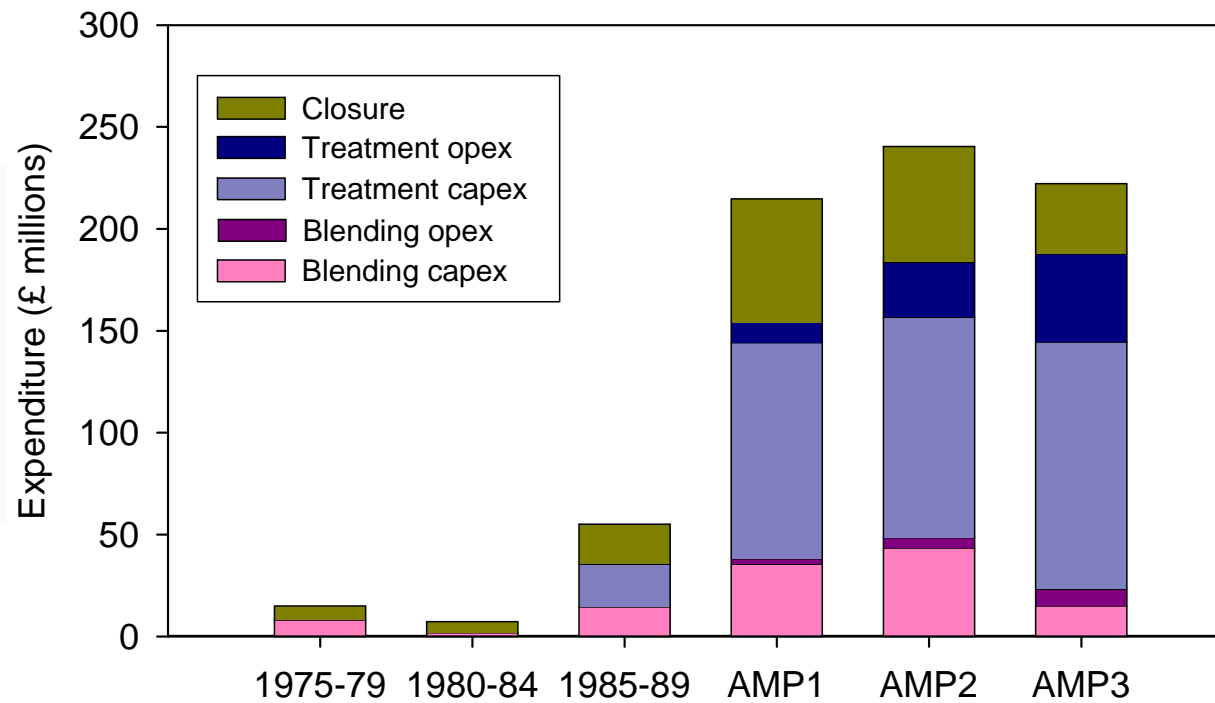
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Industry costs to date, opex & capex





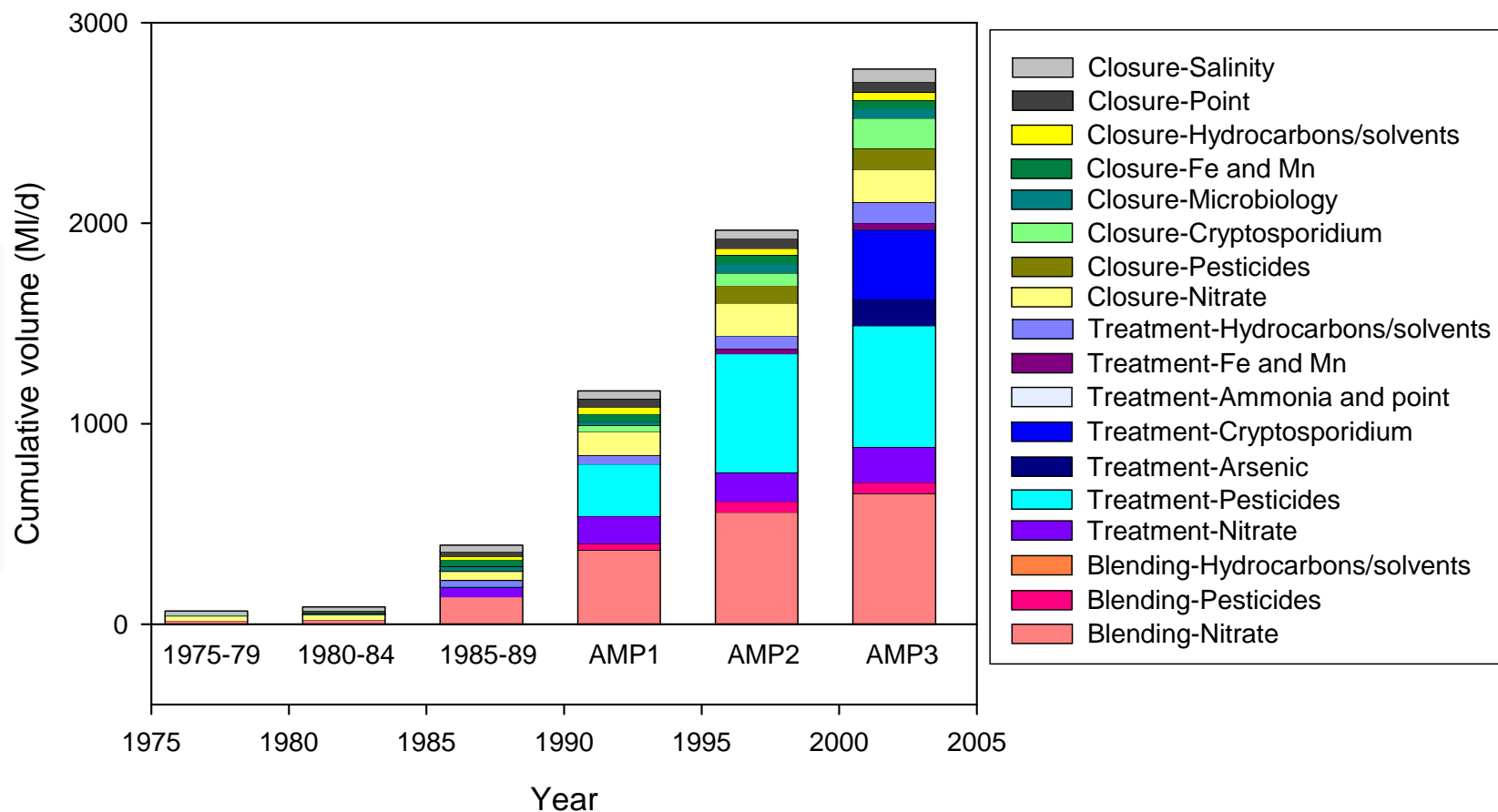
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Amount of water affected





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Future scenarios tested

- A. Best case:** linear extrapolation based on past trends for nitrate only
- B. Likely case:** linear extrapolation based on past trends for all contaminants except Cryptosporidium and As
- C. Worst case:** as B but with no new blending/treatment after end of AMP4 – curtailment after 2010

Assumptions:

- Demand remains at current level - no account of demographic or climate changes
- No quality improvements from protection measures
- No further regulatory changes



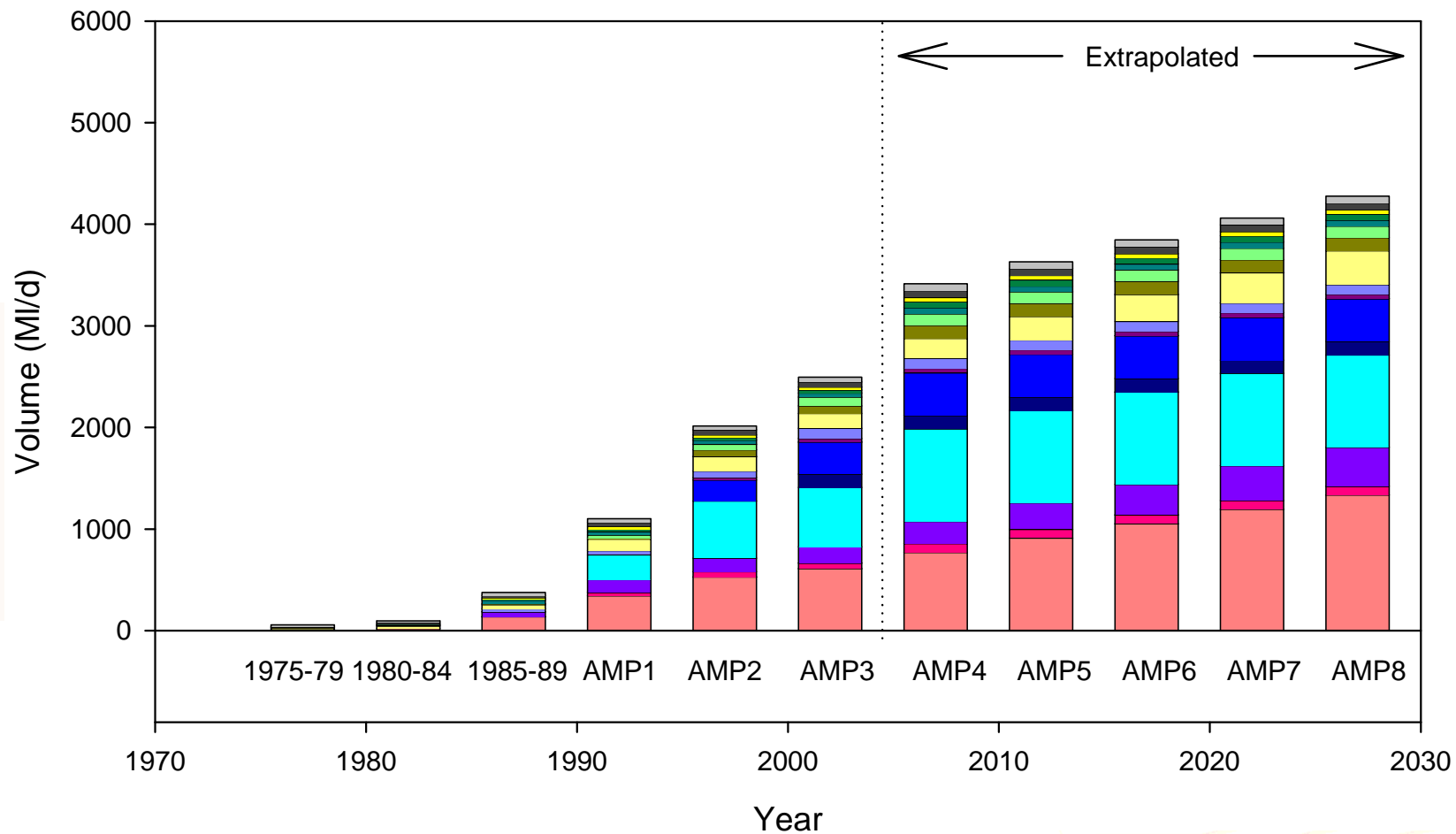
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Scenario A - volumes



Total = 4300 MI/d by 2029

Groundwater supplied 2002 = 5178 MI/d



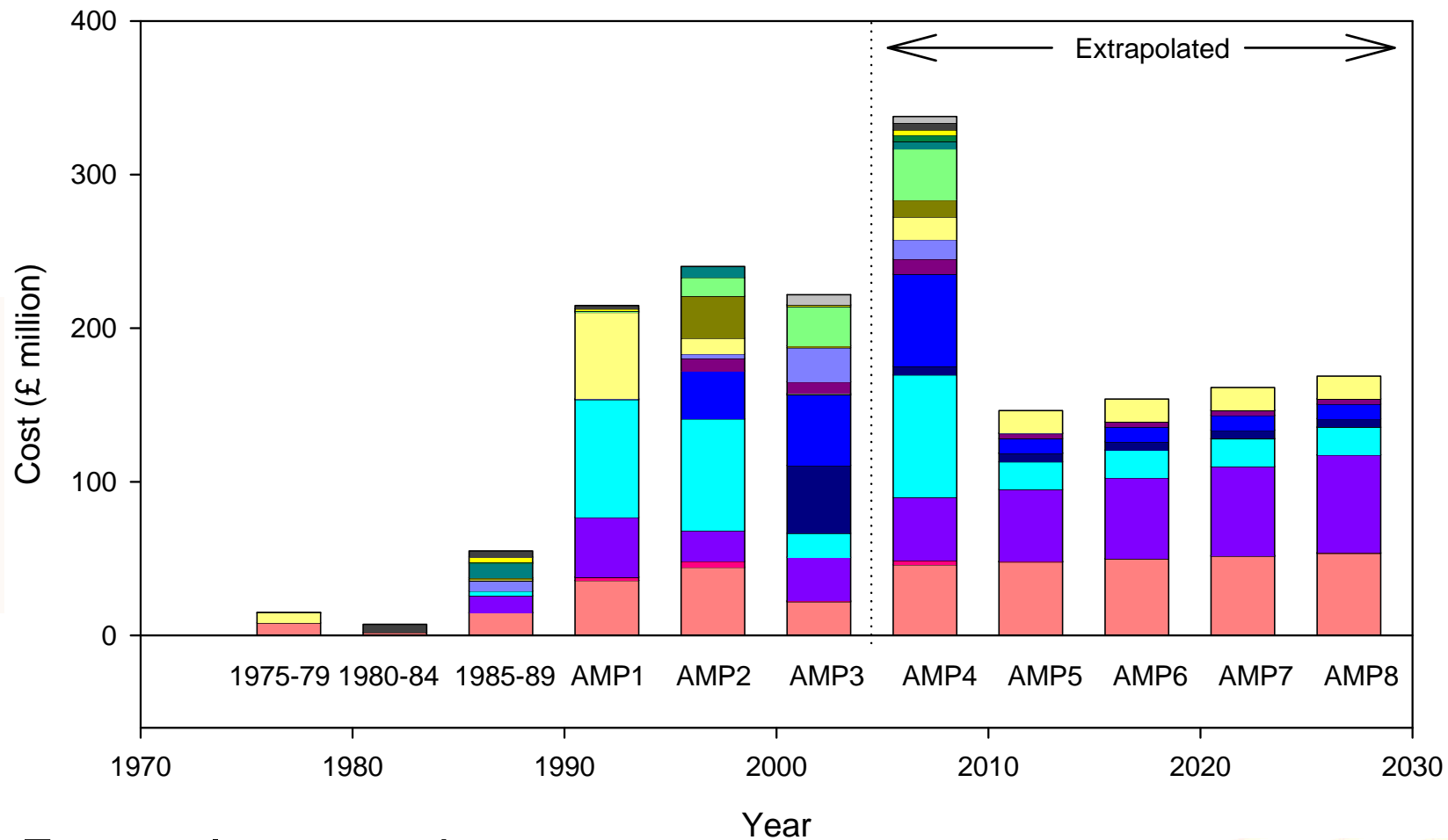
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Scenario A - costs



From volume × unit costs



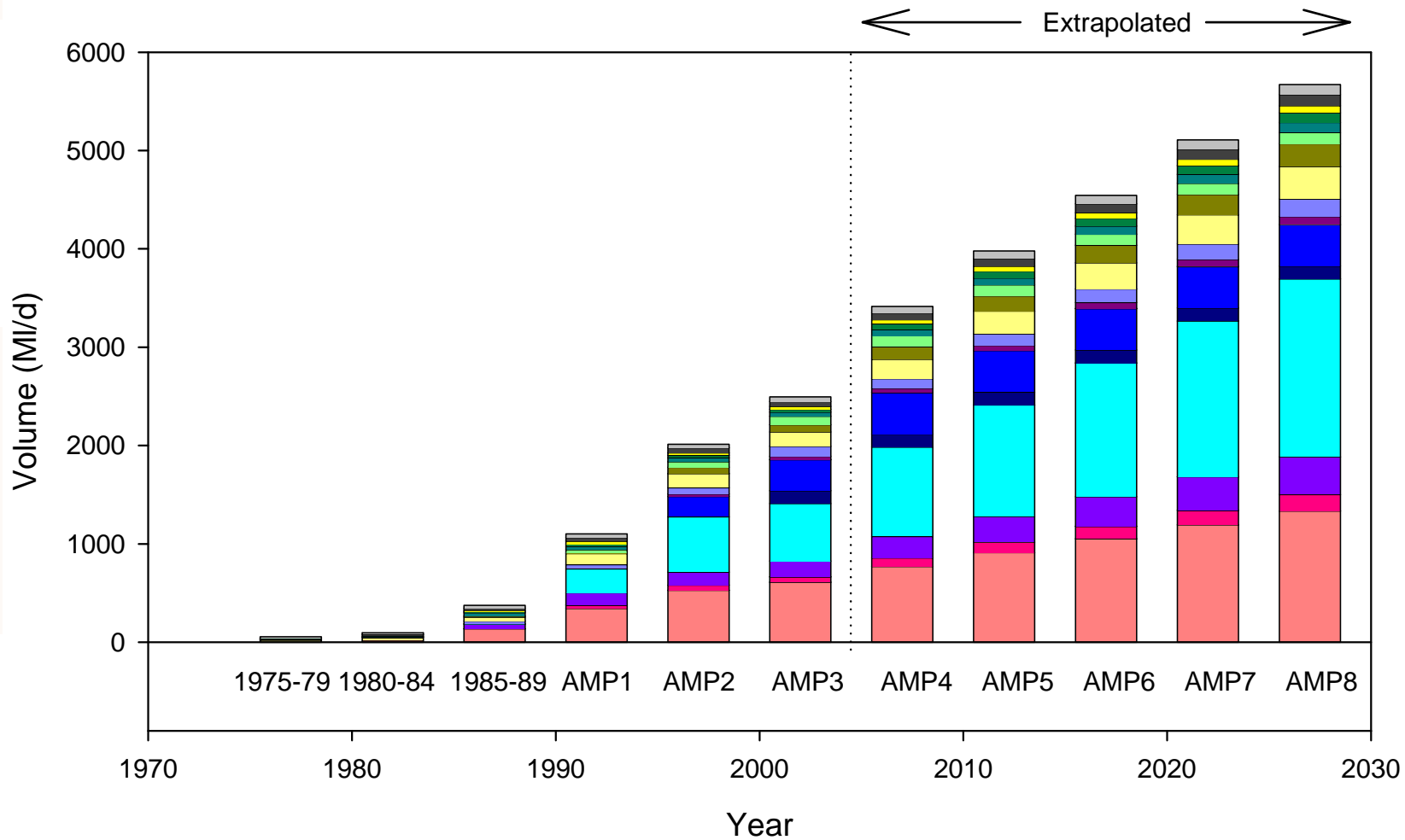
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Scenario B - volumes



Total = 5700 MI/d by 2029

Groundwater supplied 2002 = 5178 MI/d



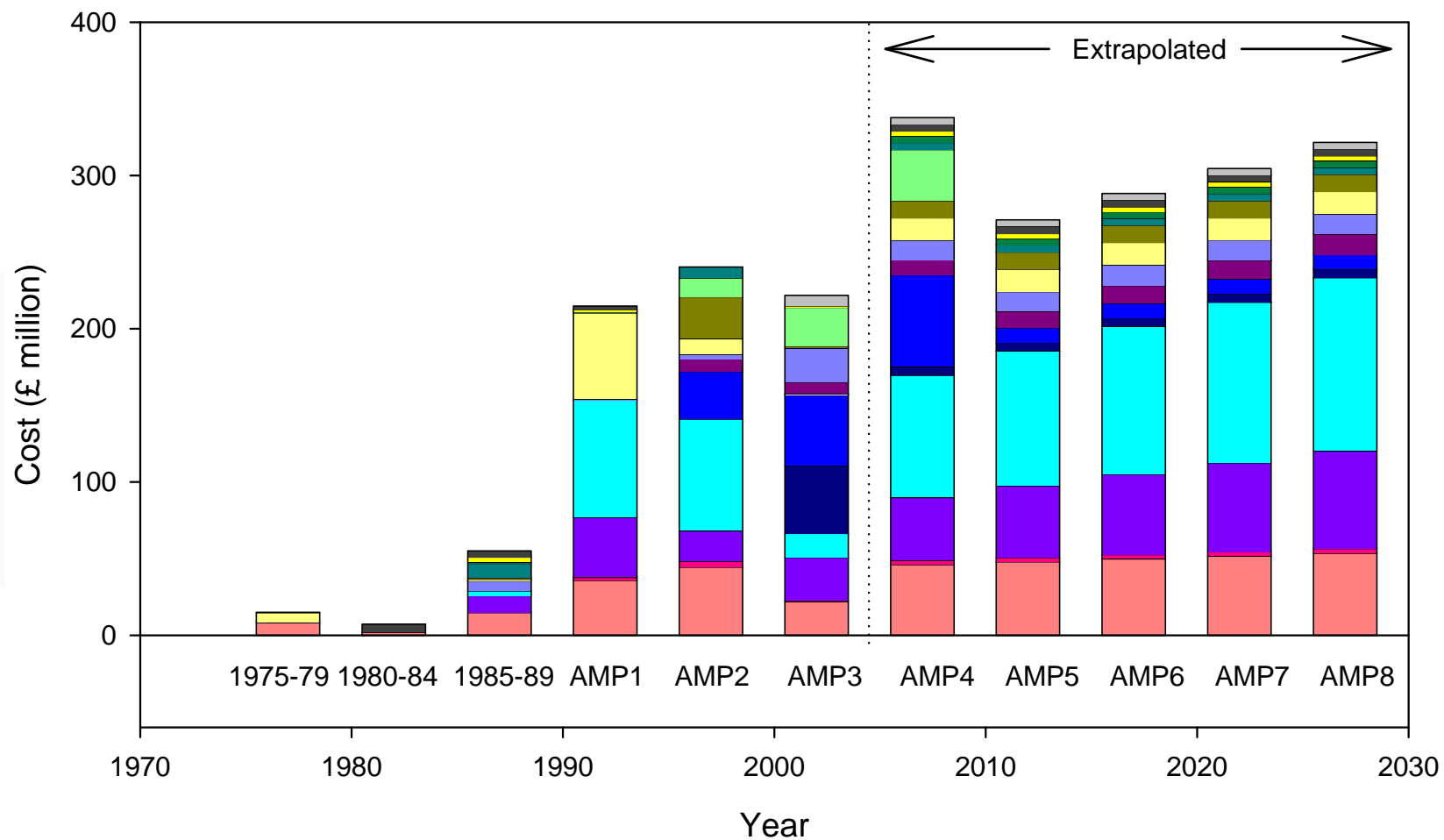
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Scenario B - costs





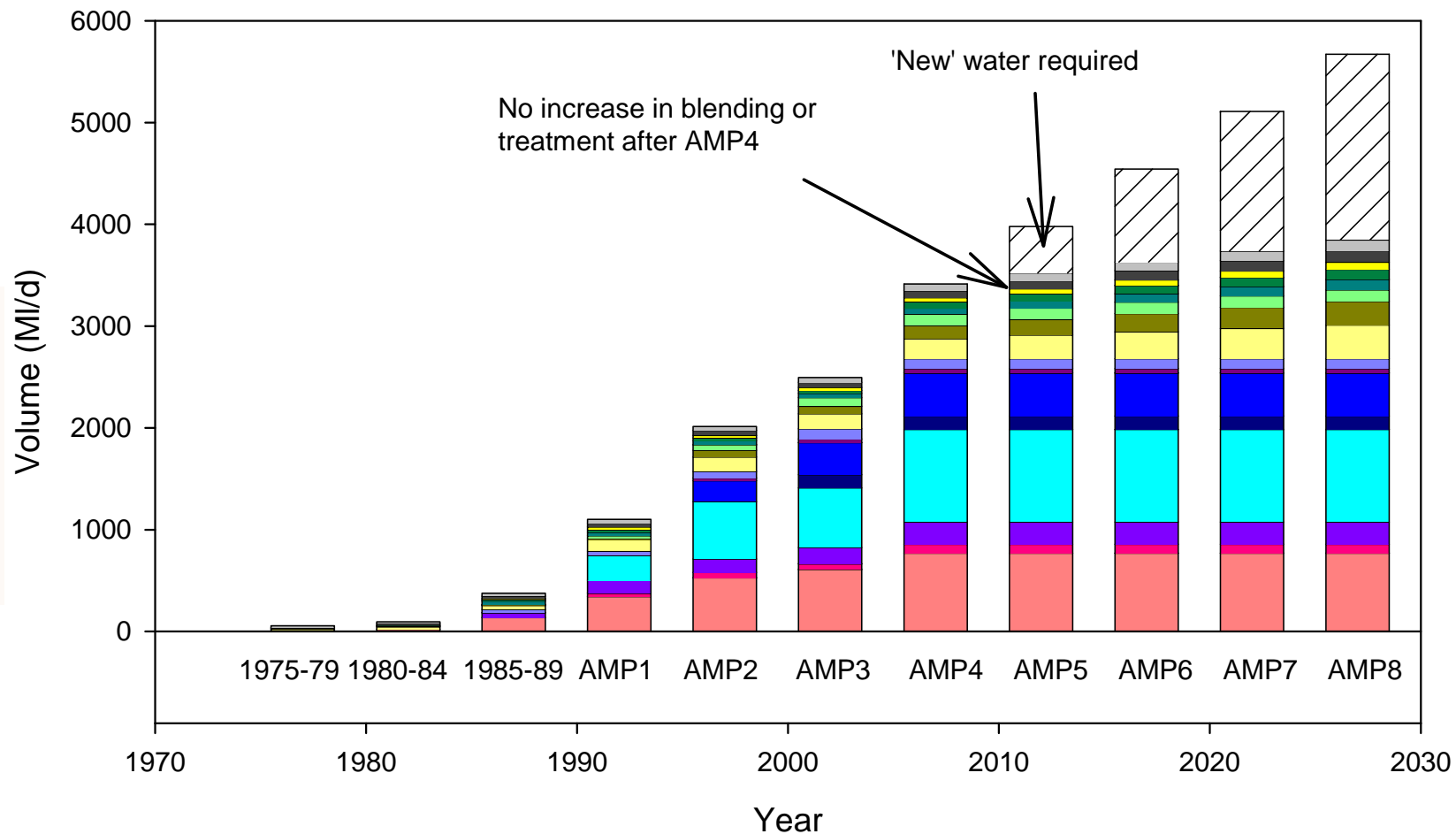
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Scenario C - Groundwater shortfall



1800 ML/d by 2027



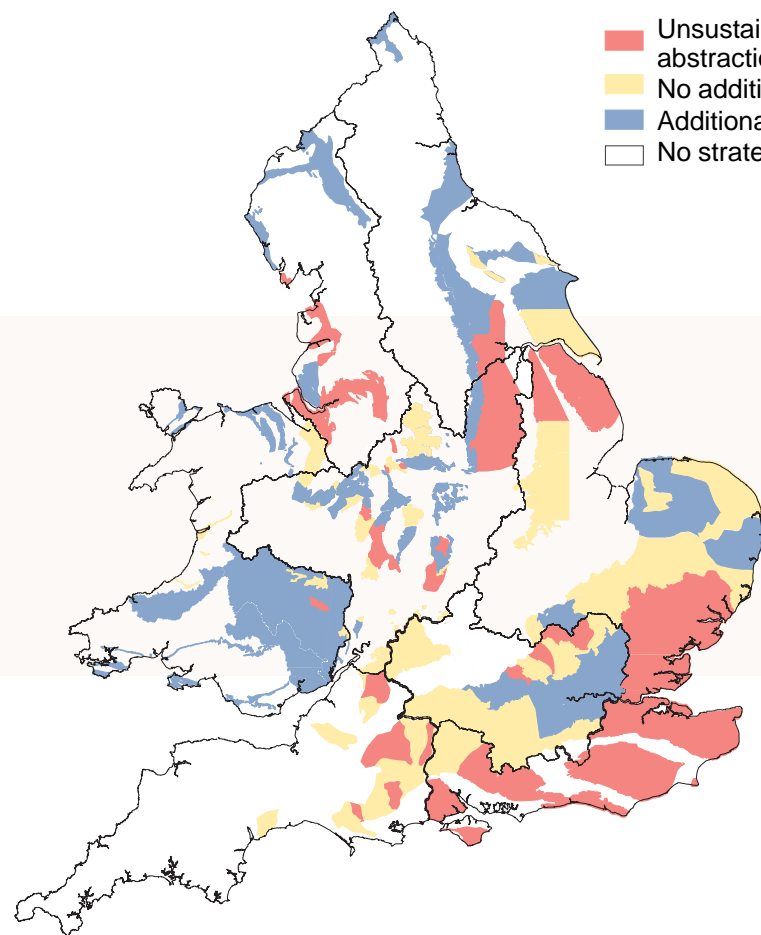
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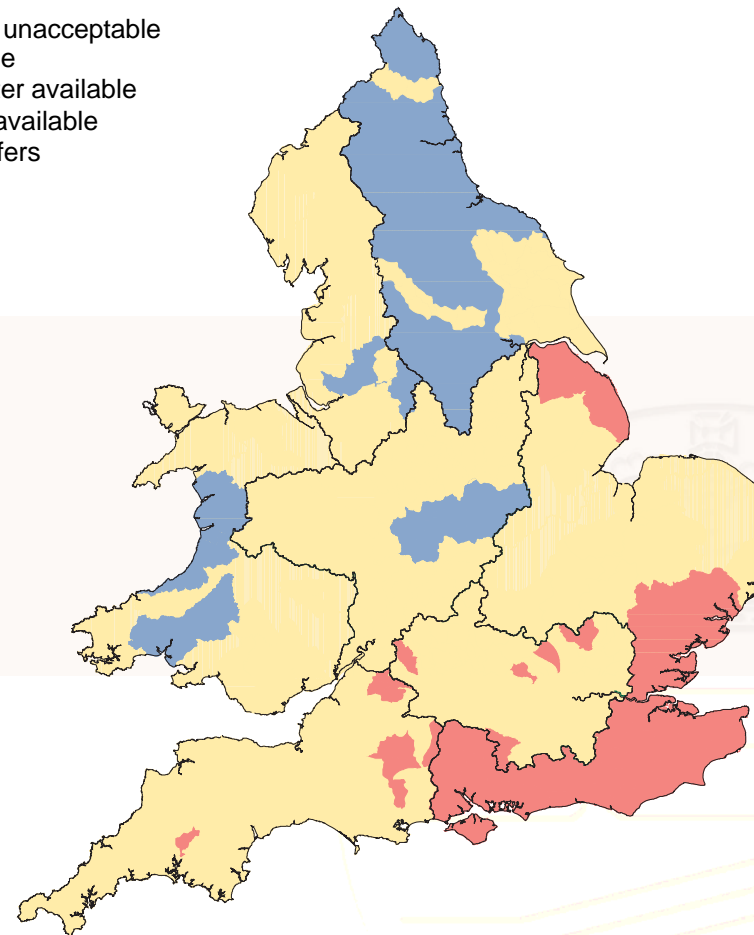
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Current water availability



Groundwater

- Unsustainable or unacceptable abstraction regime
- No additional water available
- Additional water available
- No strategic aquifers



Summer surface water (from EA)



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Mean capital costs for replacement water

	Cost (£ million/MI/d)	Cost per AMP period (£ million)	Total AMP5 – AMP8 (£ million)
New groundwater source	1.3	580	2,300
Surface impoundment	2.75	1,240	4,950
Desalination	3.35	1,500	6,000



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For a more rigorous estimate

- Complete survey of all water companies
- Inclusion of data from AMP4
- Assessment of current baseline concentrations
- Data for detailed assessment of groundwater quality trends, particularly for nitrate and pesticides
- Industry forward look to provide a consensus view on future quality issues and changes in regulations and standards



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Conclusions

- 2450MI/d of supplied water is affected – 50% of total
- Actions additional to disinfection have cost the industry >£750 million from 1975 to 2004
- In 25 years time, groundwater quality deterioration could affect 4,300 – 5,700 MI/d
- This is unsustainable





Implications

- Increased costs for dealing with quality degradation could change balance of options:
 - further leakage control (ELL currently ~3600 MI/d for E&W)
 - demand management
 - efficient use of water
- If treatment were limited under the WFD, this could lead to a shortfall of 1800 MI/d by 2029
- This could require costly alternatives, such as surface water impoundments, effluent reuse or desalination
- This may put the emphasis back on protection