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

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NATURAL ENVIRONMENT RESEARCH COUNCIL

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?

British Geological Survey
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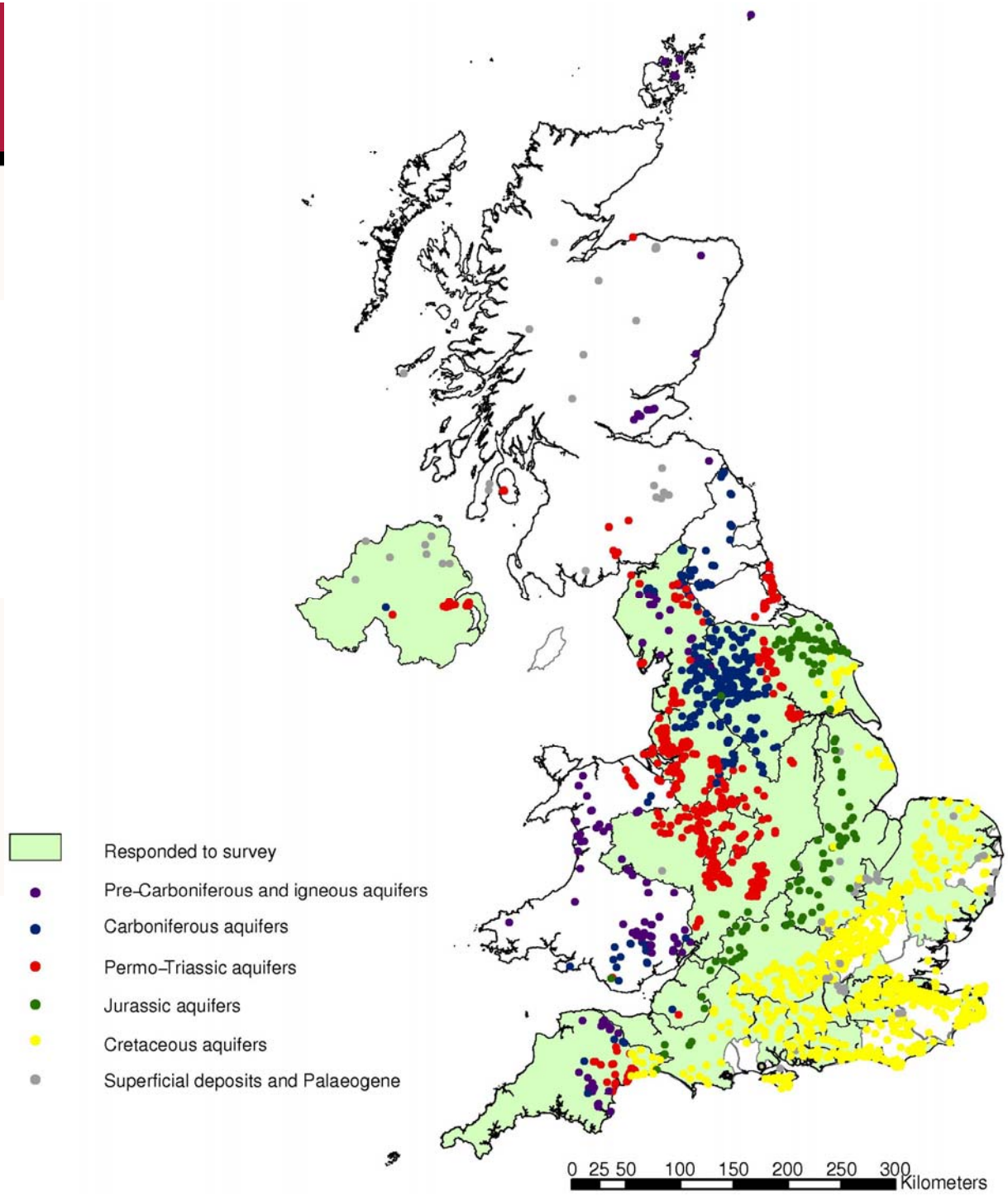
Survey responses & groundwater supply sources

- 14 utilities
- 75.6% of supplied groundwater



Issues

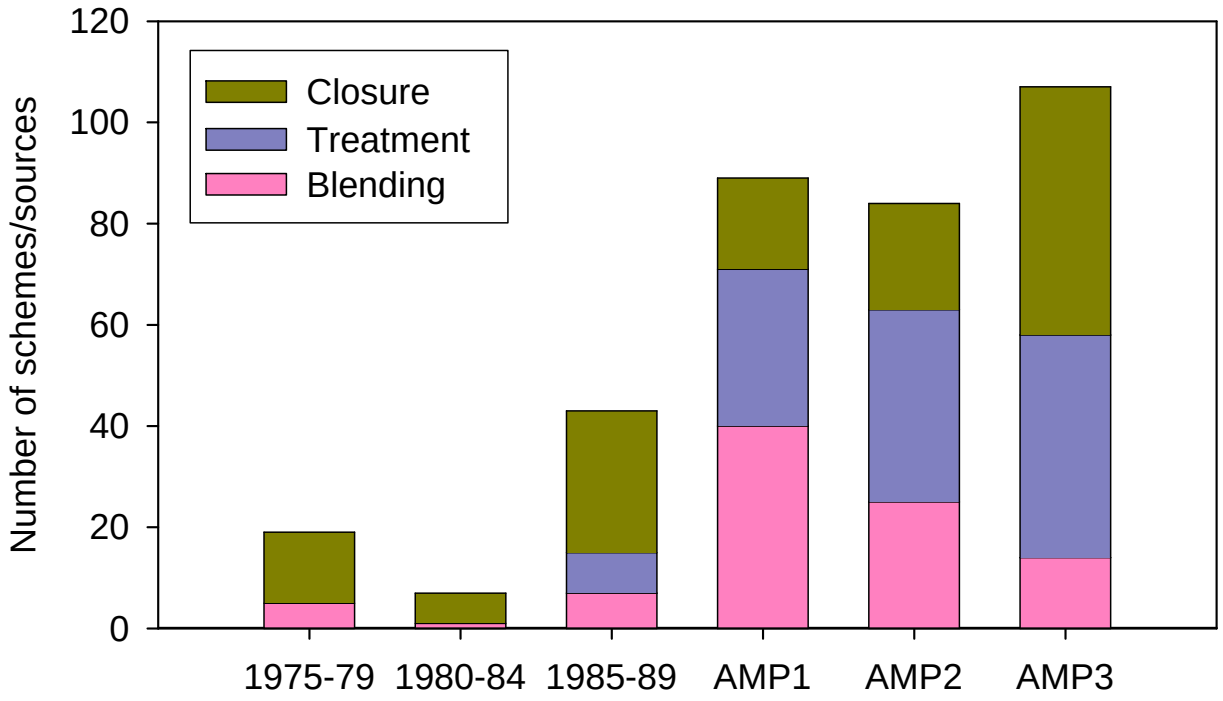
- Nitrate
- Pesticides
- Hydrocarbons & solvents
- Other point sources

- Cryptosporidium
- Arsenic

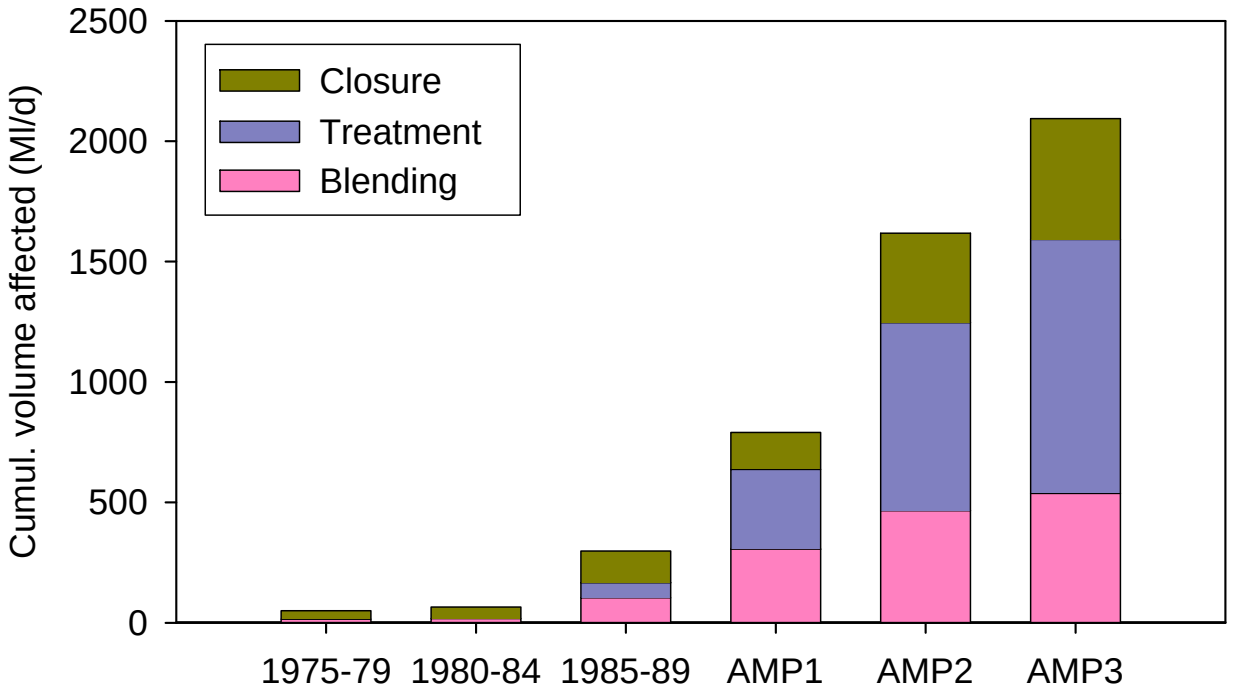
- Iron & manganese

- Salinity

Scheme implementation in sample



Amounts of water affected in sample



Calculated mean unit costs

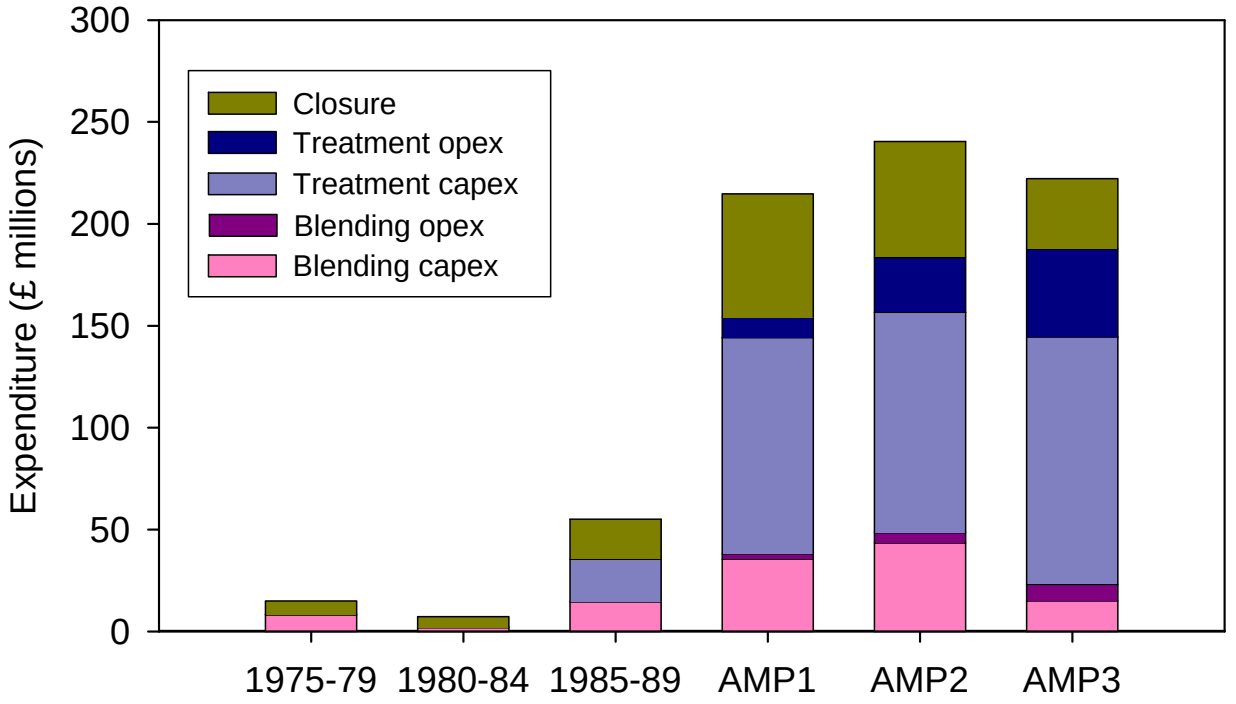
	Blending		Treatment	
	Capex (£/Ml/d)	Opex (£/Ml)	Capex (£/Ml/d)	Opex (£/Ml)
Nitrate	261,500	7.2	476,100	68.1
Pesticides	111,300	2.9	263,000	19.5
Cryptosporidium	-	-	359,000	16.6
Hydrocarbons	220,000		723,200	8.1

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

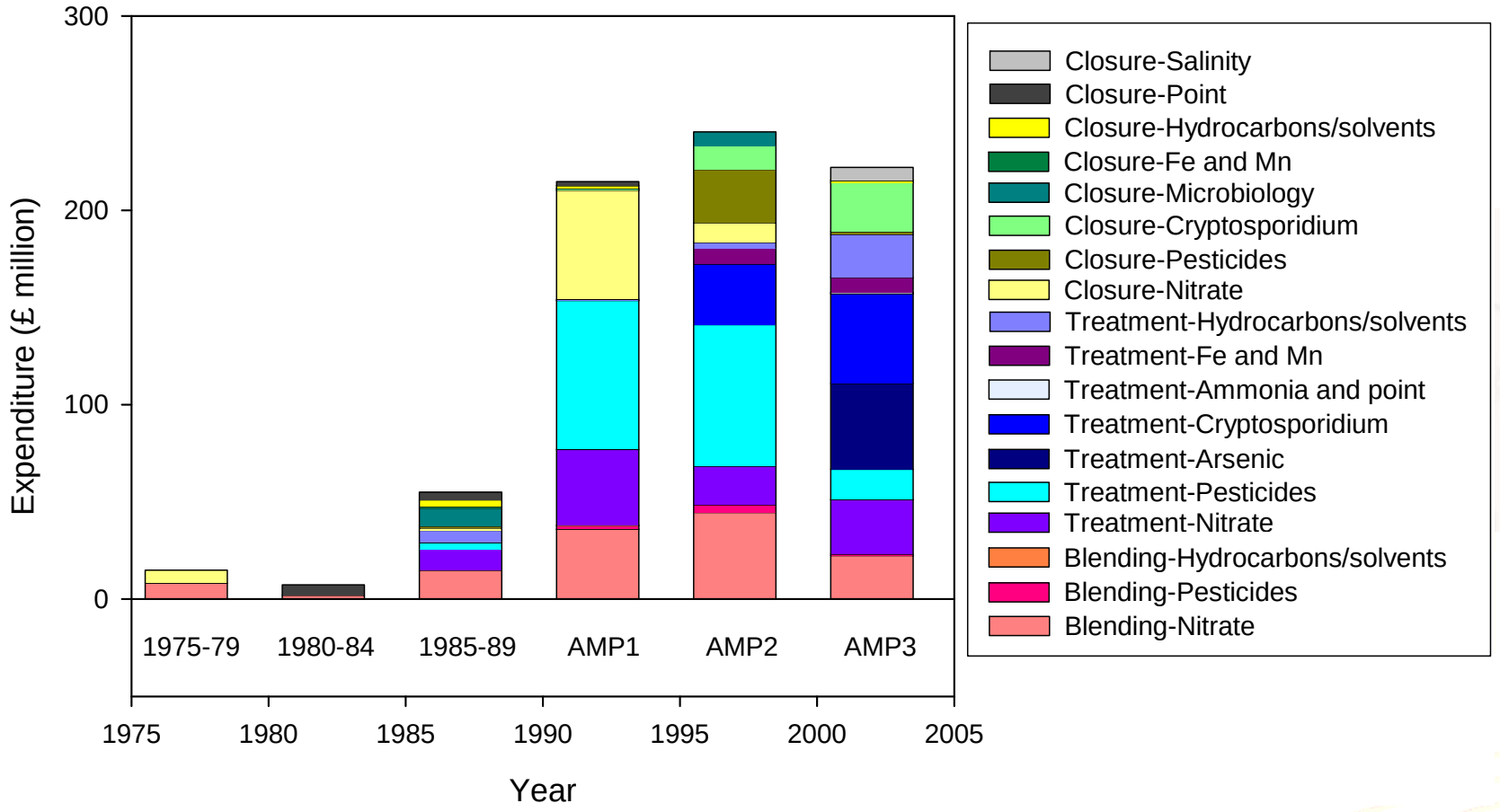
Estimates

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

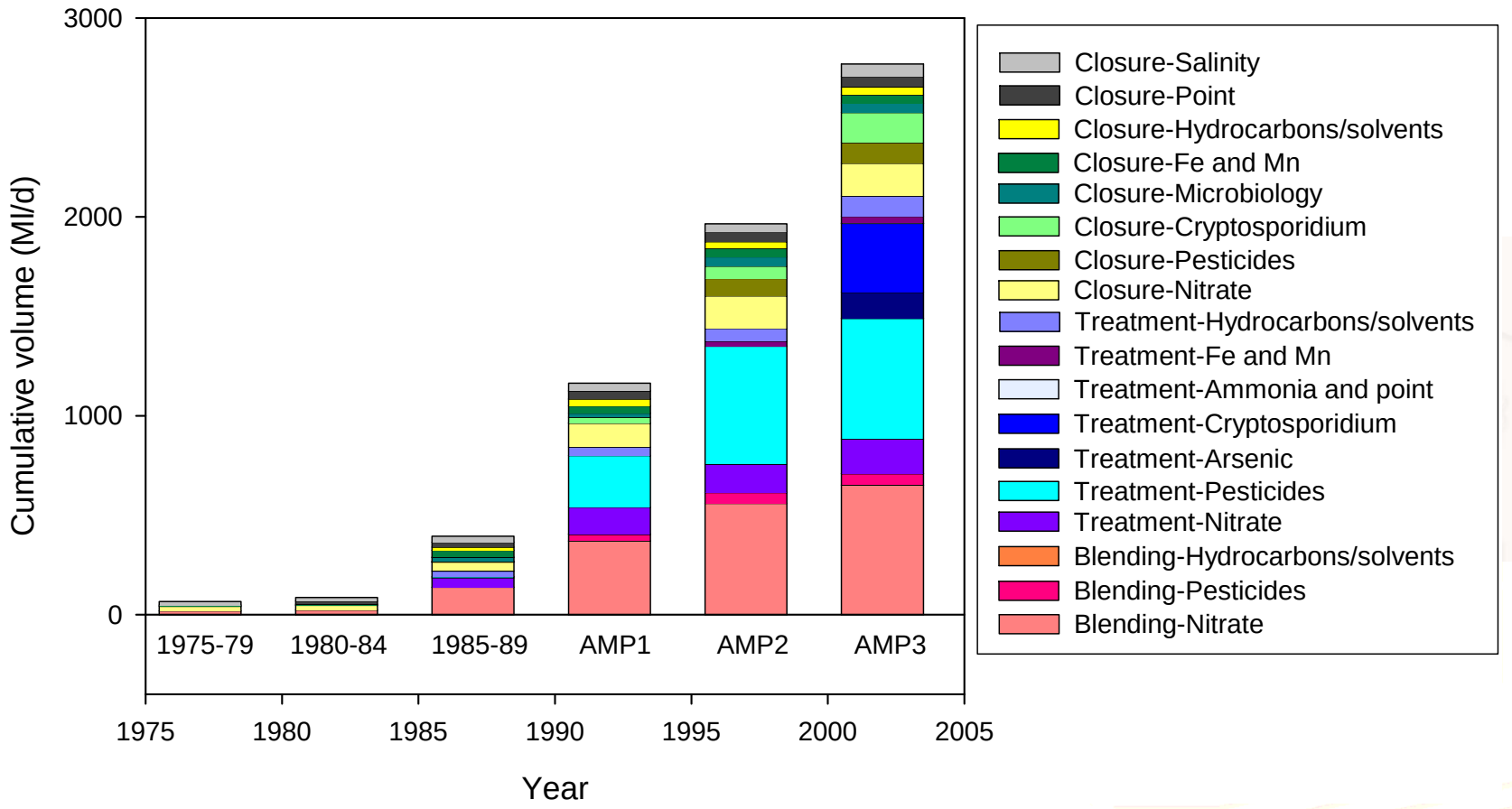
Industry costs to date, opex & capex



Industry costs to date, problem & action



Amount of water affected



Future scenarios tested

A. **Best case:** linear extrapolation based on past trends for nitrate only

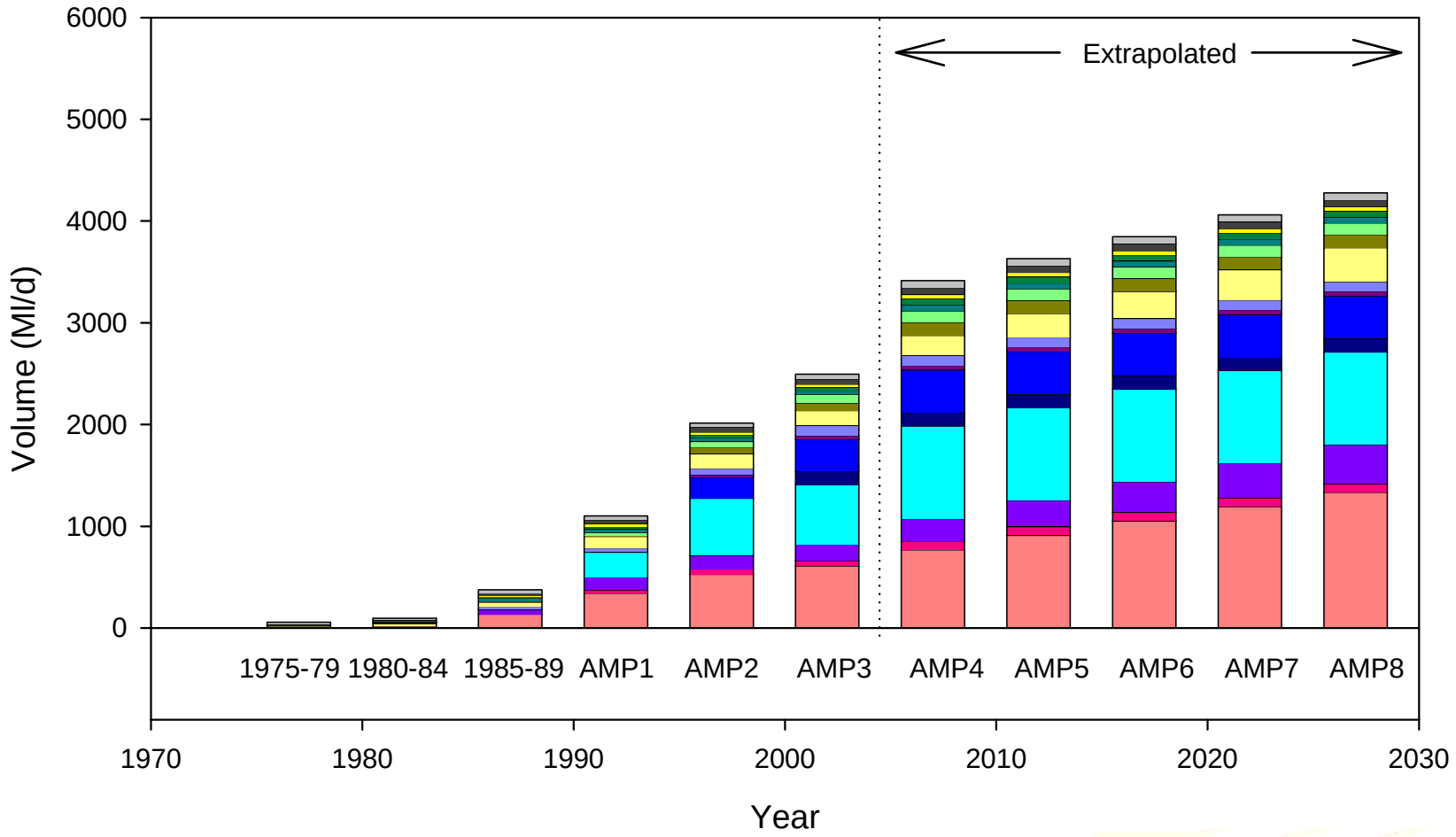
B. **Likely case:** linear extrapolation based on past trends for all contaminants except Cryptosporidium and As

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

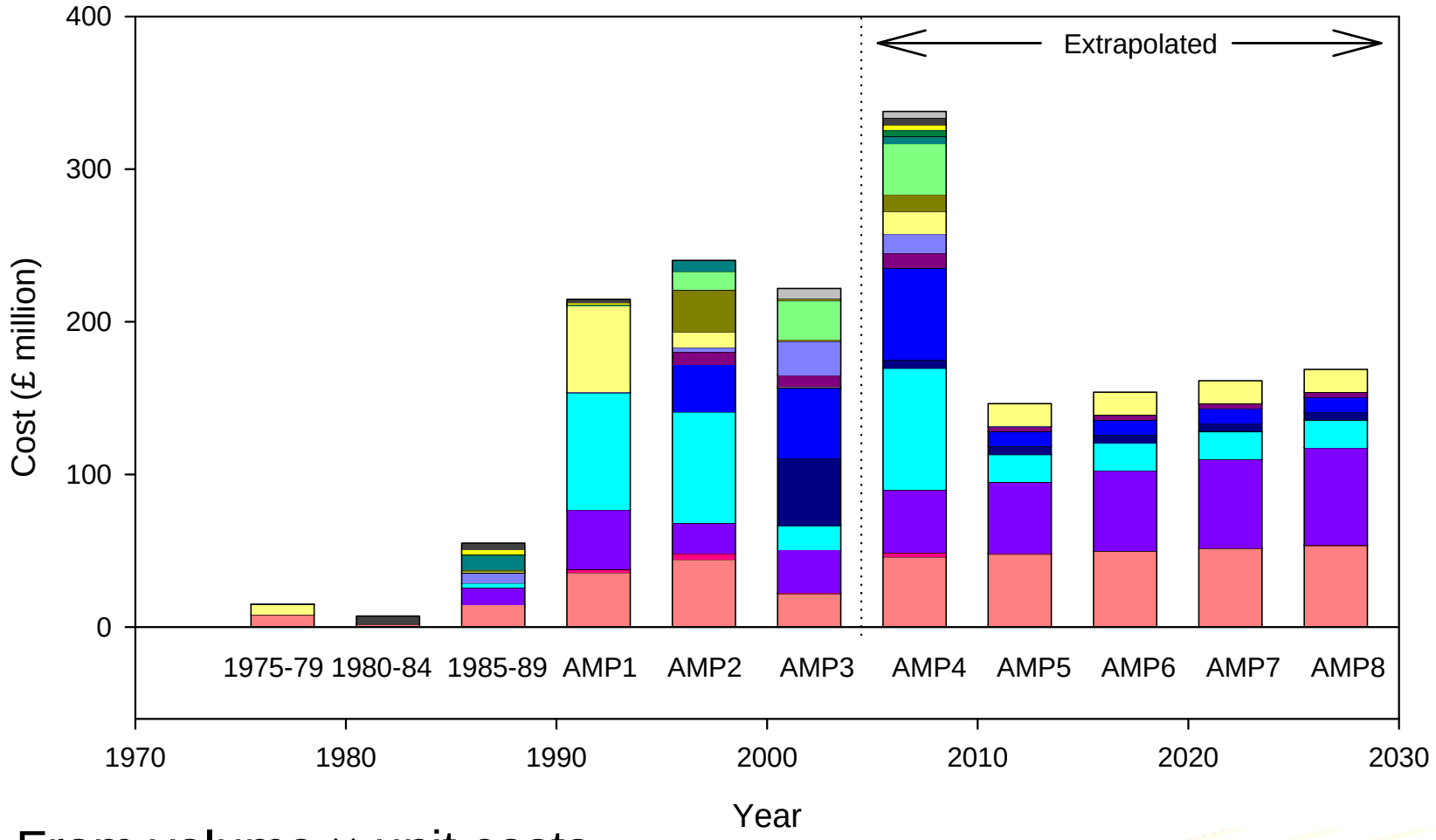
Scenario A - volumes



Total = 4300 Ml/d by 2029

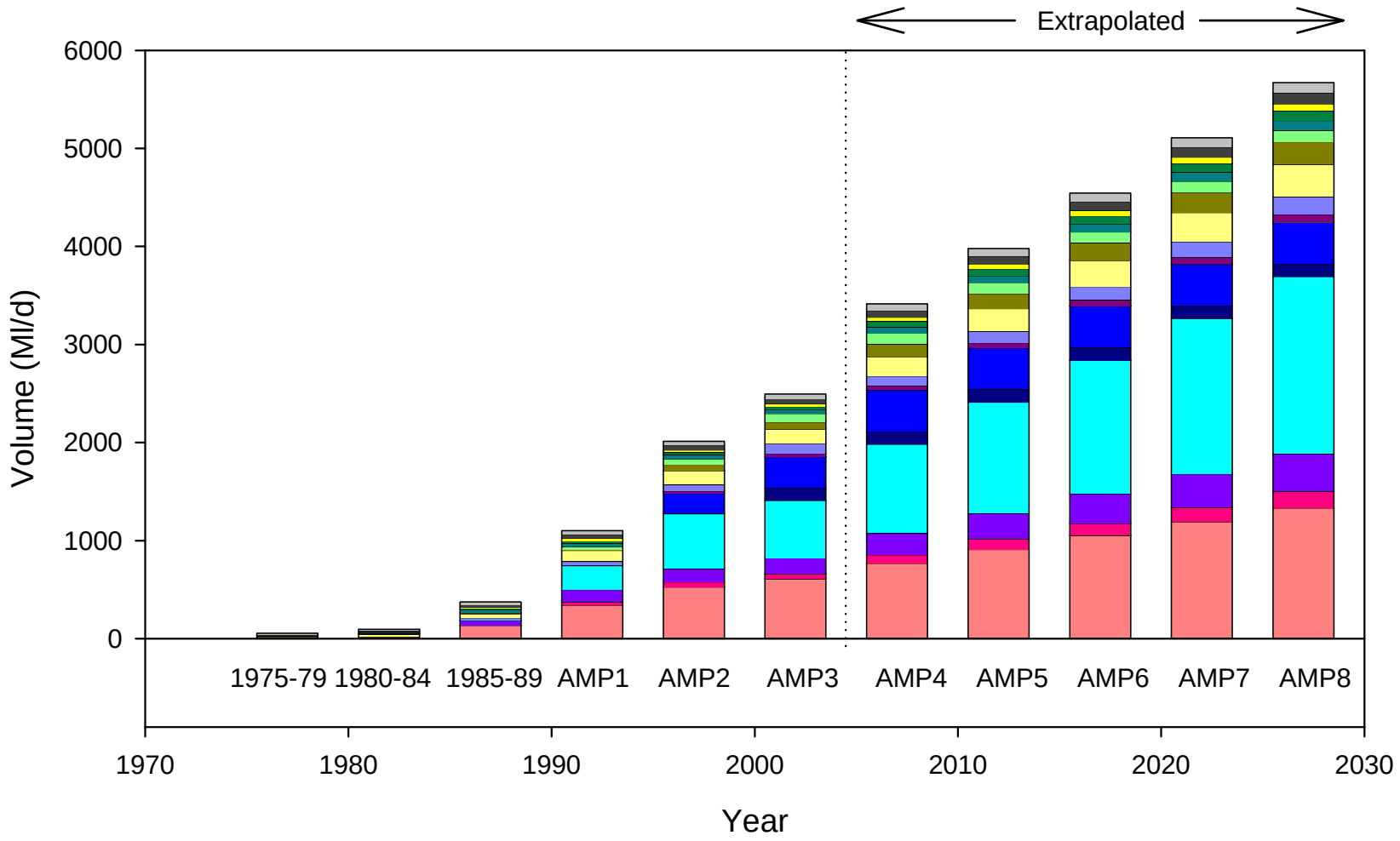
Groundwater supplied 2002 = 5178 Ml/d

Scenario A - costs



From volume × unit costs

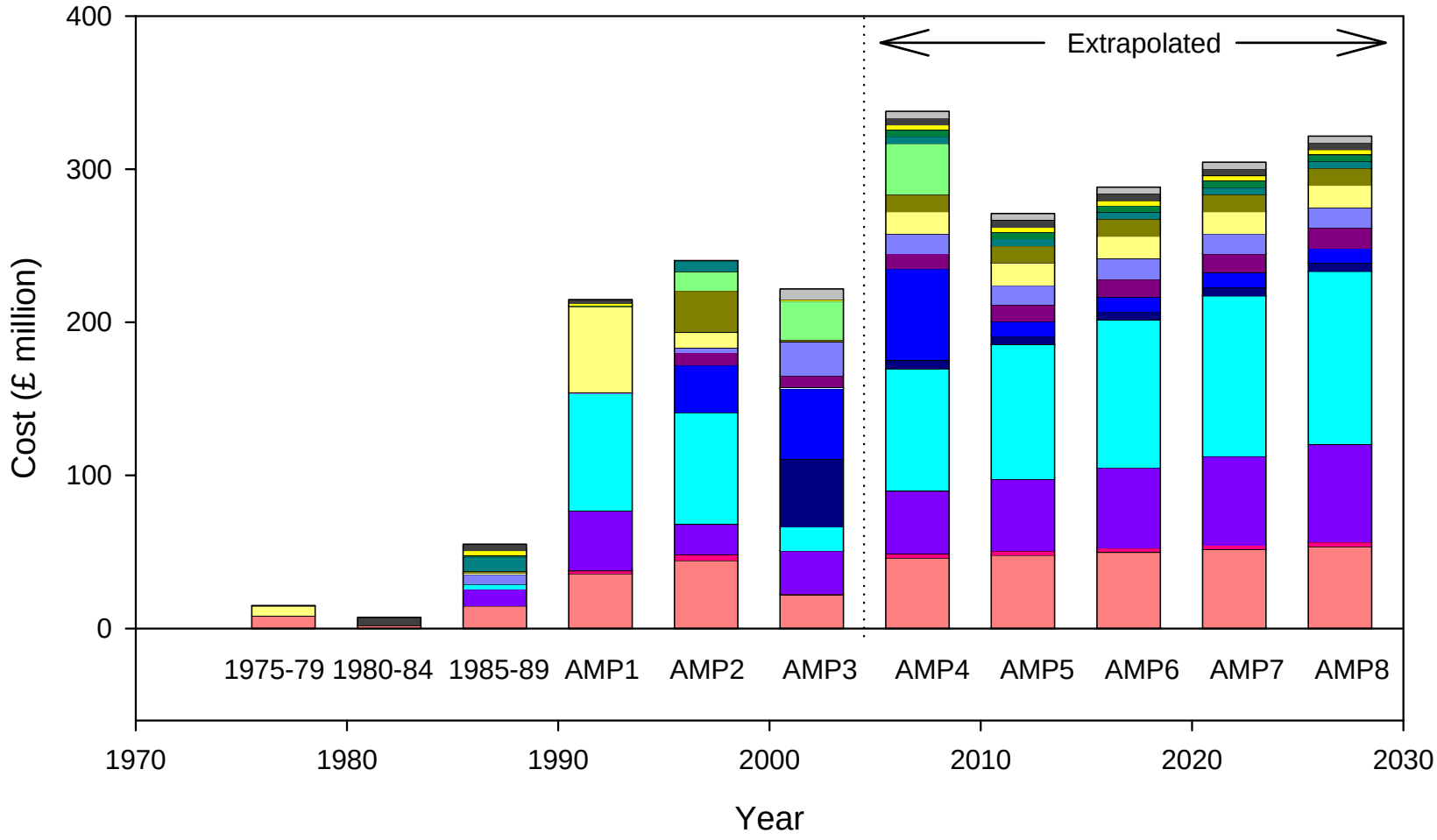
Scenario B - volumes



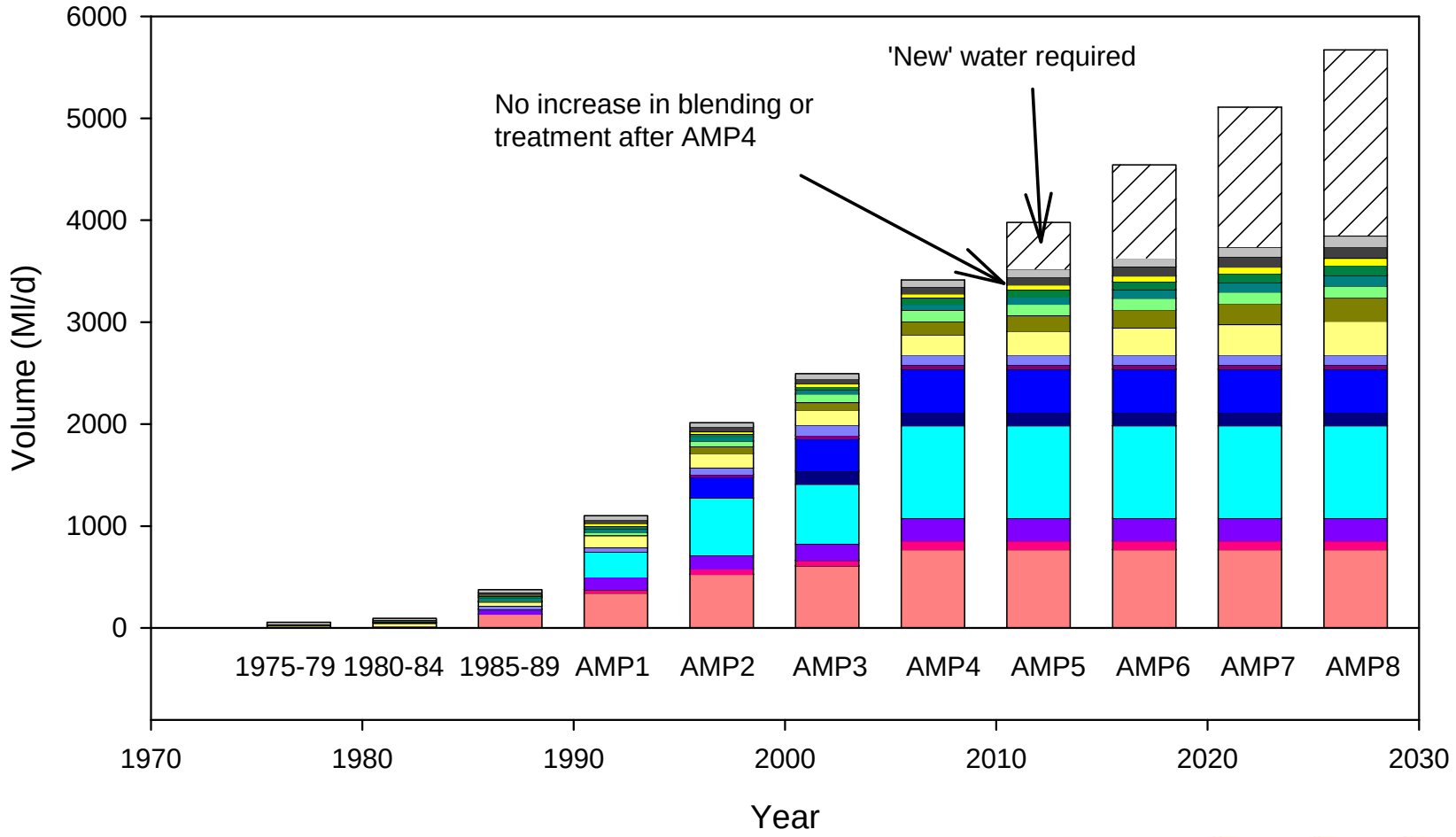
Total = 5700 Ml/d by 2029

Groundwater supplied 2002 = 5178 Ml/d

Scenario B - costs

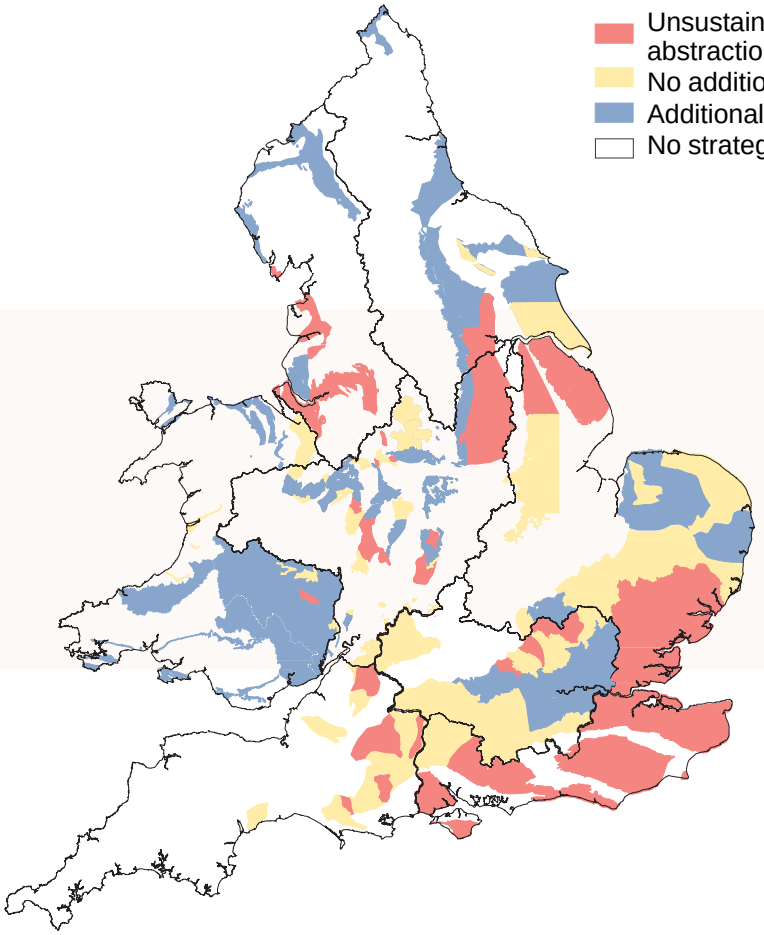


Scenario C - Groundwater shortfall

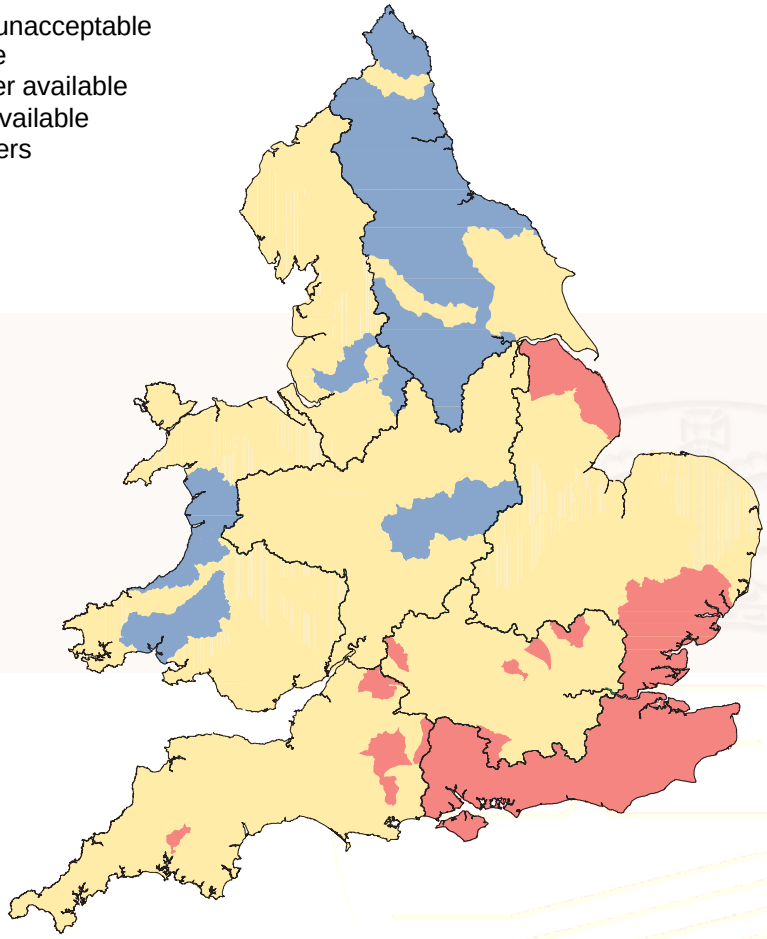


1800 Ml/d by 2027

Current water availability



Groundwater



Summer surface water (from EA)

Mean capital costs for replacement water

	Cost (£ million/Ml/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

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

Conclusions

- 2450Ml/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 Ml/d
- This is unsustainable

Implications

- Increased costs for dealing with quality degradation could change balance of options:
  - further leakage control (ELL currently ~3600 Ml/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 Ml/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