INDUSTRIAL WATER MANAGEMENT

IMPACT OF INDUSTRY ON WATER RESOURCES

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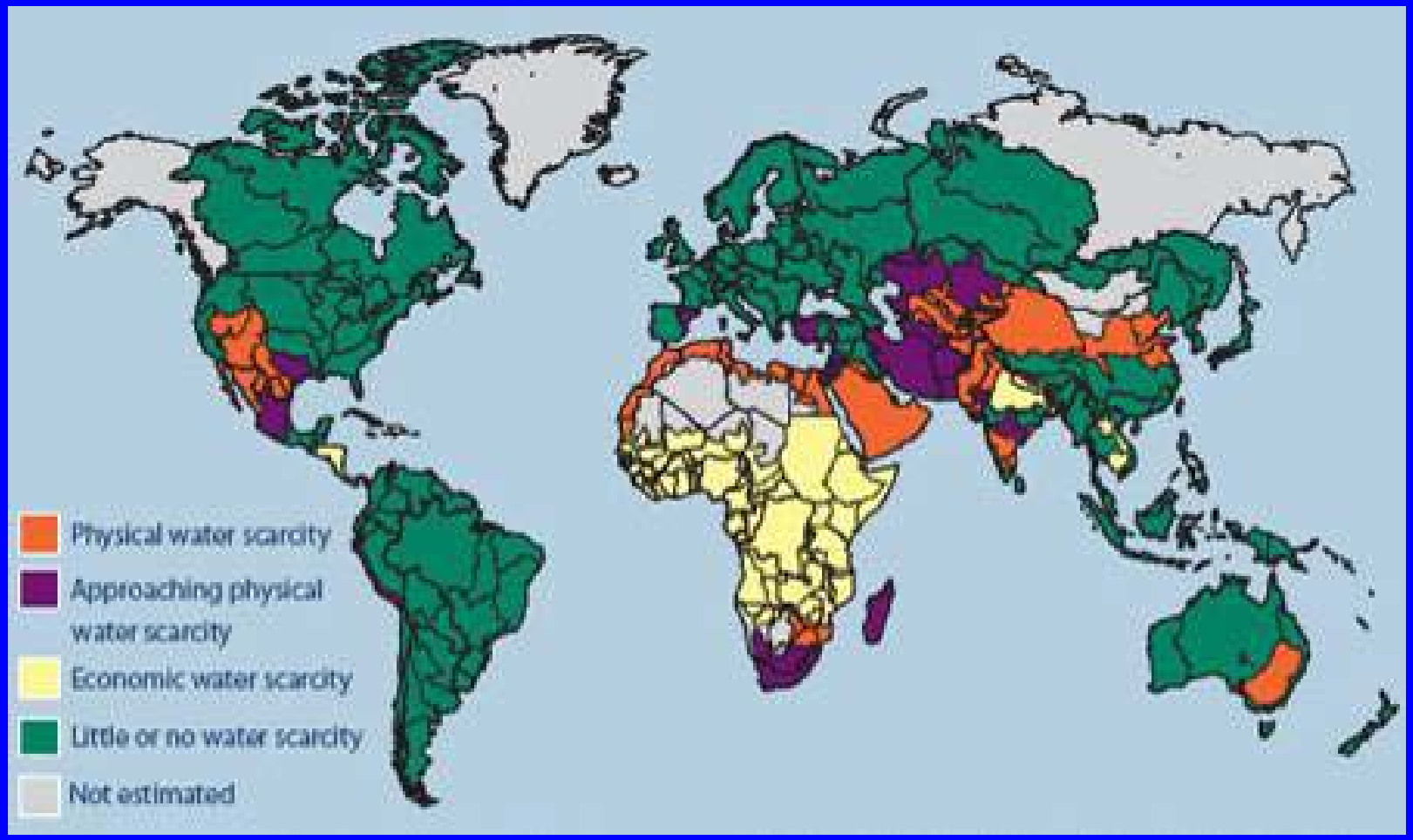
World Water Resources



World Water Resources

- *Increasing population*
- *Increasing urbanisation*
- *Climate change creating new arid areas*
- *Globalisation of utilities*
- *Over 1bn people have no safe drinking water (WHO)*

World Water Resources

- *Industry is*
  - *Moving to developing countries to reduce costs*
  - *Contributing to developing national economies*
  - *Competing with agriculture for food production*
  - *Competing with domestic use for drinking, cooking, sanitation and personal hygiene, which are vital to public health.*
  - *Taking advantage of poorly implemented environmental protection legislation*
  - *Polluting water resources*

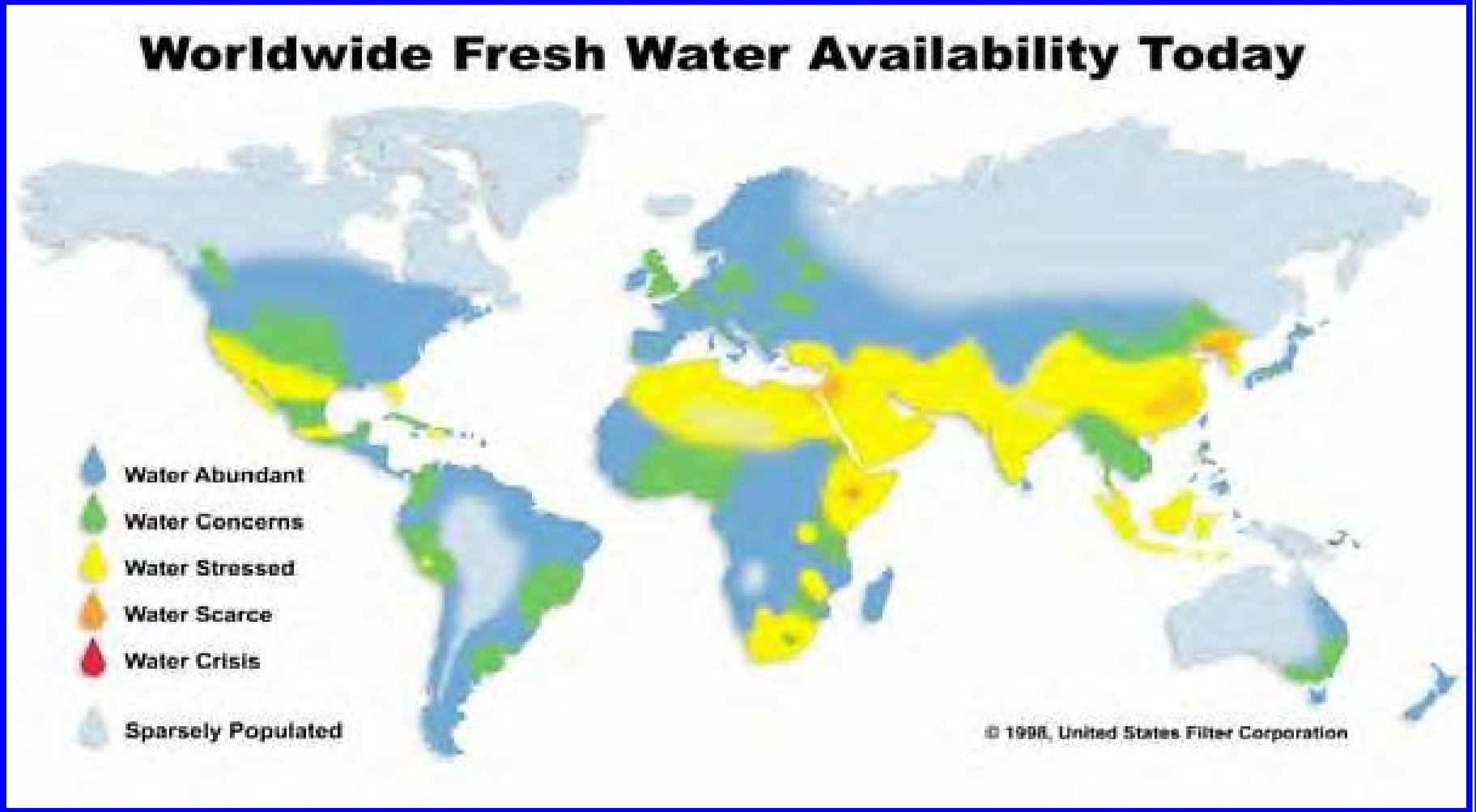
Impact on Water Resources

- *Abstraction of water for industrial use*
- *Industrial water consumption*
- *Industrial wastewater*
- *Socio-economic aspects*

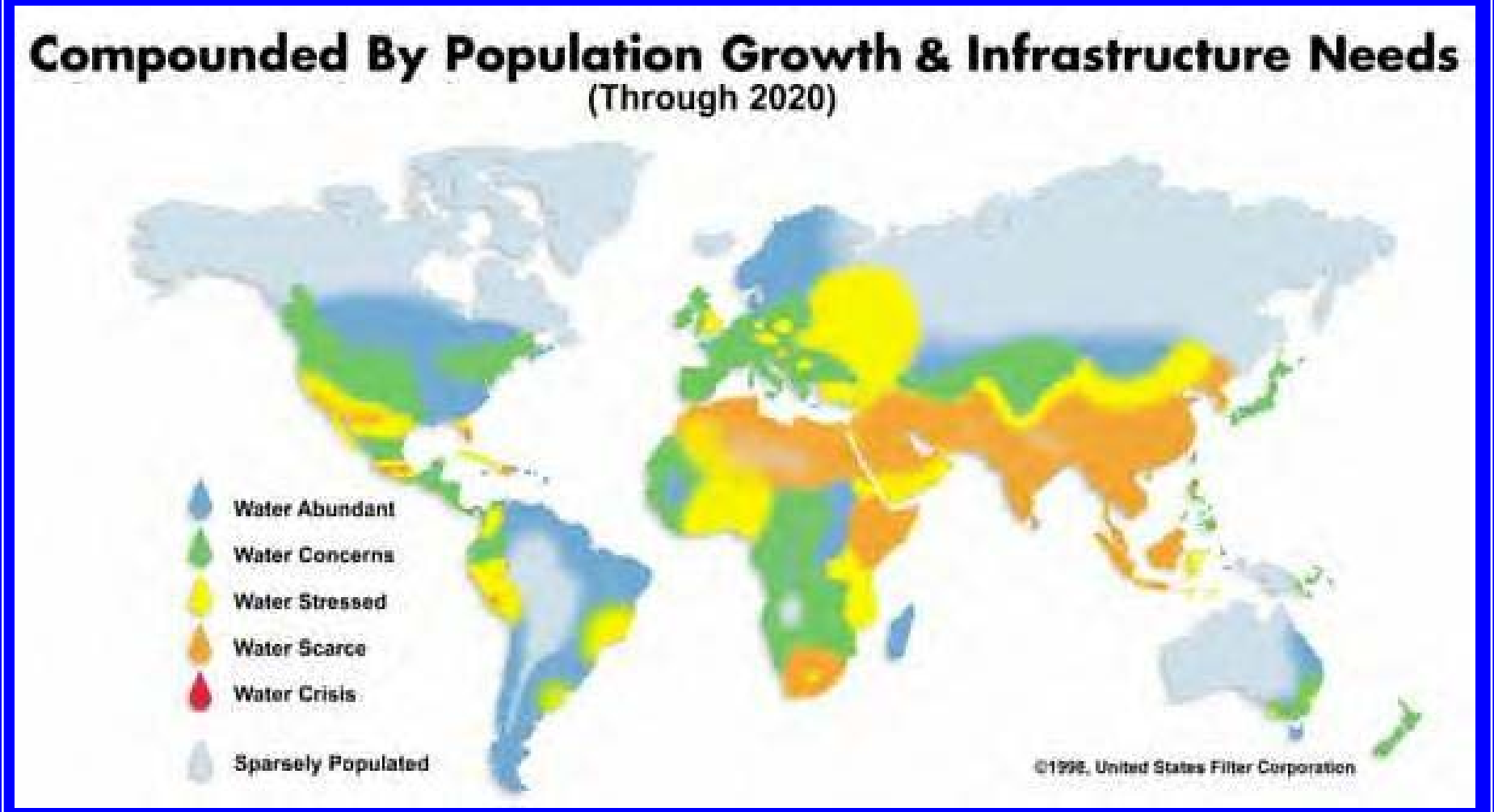
Abstraction for Industrial Use

- *Industry needs water for*
  - *heating*
  - *cooling*
  - *manufacturing processes*
  - *product washing*
  - *product component*

Abstraction for Industrial Use



Abstraction for Industrial Use



Abstraction for Industrial Use

Abstraction for Industrial Use

Water consumption in the UK 1998

USE	SURFACE Mld	GROUND Mld	TOTAL Mld
Public water supply	12,038	5,416	17,454
Private water supply	85	87	172
Industry	2,451	793	3,244
Mineral washing	40	209	249
Spray irrigation	203	167	370
Agriculture	38	97	135
Fish farming	4,005	333	4,338
Electricity supply	9,422	14	9,436
Other	414	113	527
TOTAL	28,696	7,229	35,925

Industrial Water Consumption

Product	Unit	Consumption
coal	m^3/te	0.250
bread	m^3/te	1.3
meat products	m^3/te	16
milk bottling	m^3/te	3
brewing	m^3/te	5
soft drinks	m^3/te	7
chemicals	m^3/te	5
steel rolling	m^3/te	1.9
iron casting	m^3/te	4
aluminium casting	m^3/te	8.5
electroplating	m^3/te	15.3
tanning	m^3/te	60
soap	m^3/te	2
sugar	m^3/te	4
textile dyeing	m^3/te	80

Industrial Water Consumption

concrete	m^3/te	0.2
paper	m^3/te	54
power generation	m^3/MWh	3 - steam
		60 - cooling
automobiles	m^3/vehicle	5
dairy farming	l/head.day	150
pig farming	l/head.day	15
poultry farming	l/head.day	0.3
schools	l/head.day	75
hospitals	l/head.day	175
hotels	l/head.day	760
shops	l/head.day	135
offices	l/head.day	60

Industrial Wastewater

- *Wastewaters produced by industry may contain*
  - *inorganics - high salinity*
  - *acids/alkalis*
  - *toxic metals*
  - *soft COD (high BOD)*
  - *hard COD (possibly high toxicity)*
  - *fats, oils and greases*

Industrial Wastewater

- *Wastewaters are discharged to*
  - *sewer - expensive*
  - *natural watercourse - consent required*
- *Non compliance with consent causes pollution and attracts prosecution*

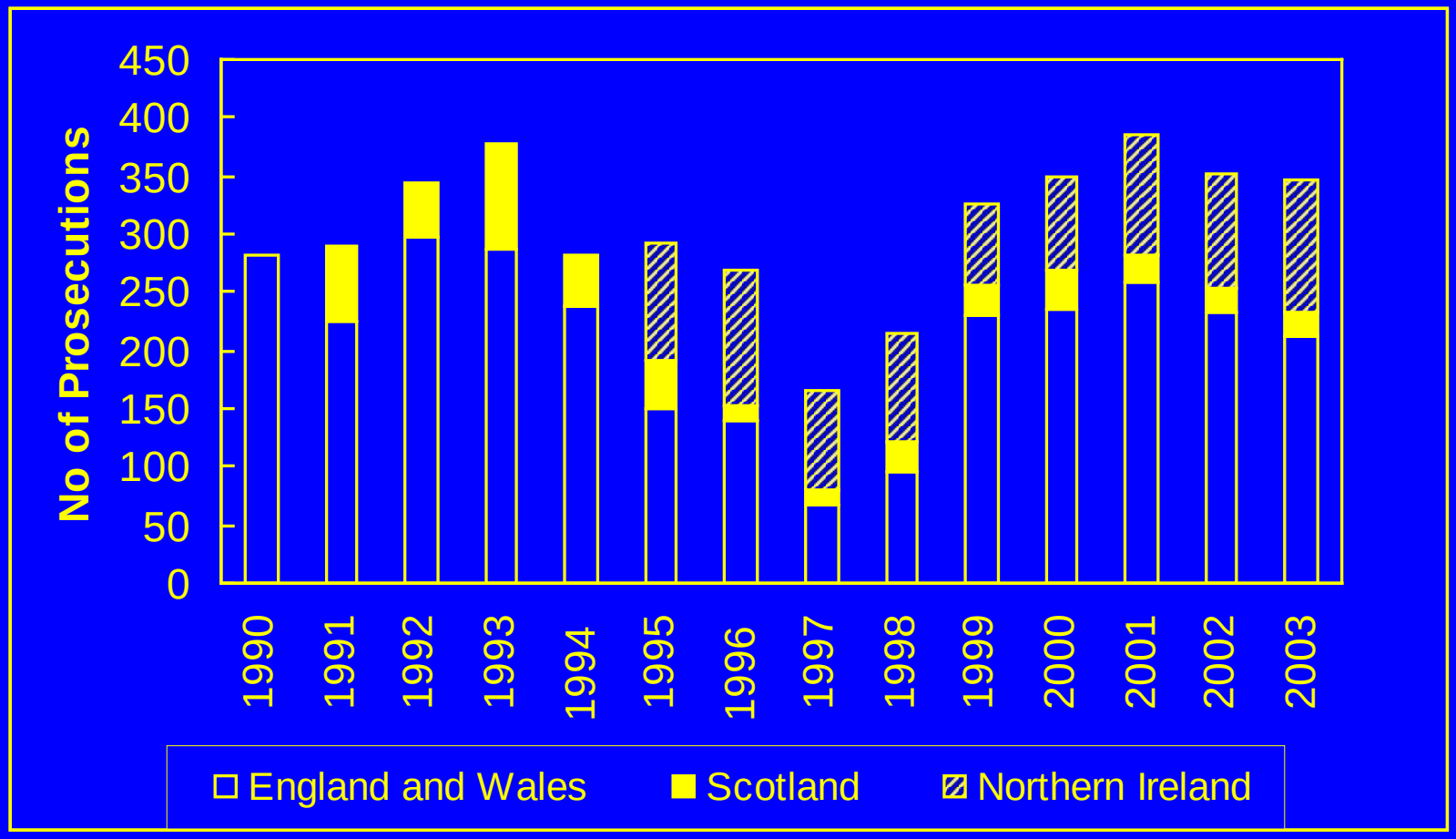
Industrial Wastewater

SERIOUS WATER POLLUTION INCIDENTS BY SOURCE IN ENGLAND AND WALES, 2003

	Number of incidents	Percentage of total
Agriculture	98	12.6
Domestic and residential	38	4.9
Industry	92	11.8
Sewage and water industry	198	25.4
Transport	27	3.5
Waste management facilities	20	2.6
Other	306	39.3
TOTAL Category 1 and 2	779	

Environment Agency

Industrial Wastewater



Environment Agency

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Industrial Wastewater

- *In 2008, the Environment Agency North West region undertook 67 successful prosecutions involving a total of 232 offences:*
  - *They prosecuted 36 companies.*
  - *The total amount of fines imposed on offenders was £288,050, and costs totalling £166,554 were awarded against them.*
  - *The average fine per offence was £1242, and the average fine per prosecution was £4299.*
  - *The highest fine for an individual case during the year arose from a prosecution brought against Tradebe North West Limited. They were fined a total of £30,000 for 3 offences under the Pollution Prevention and Control Regulations 2000.*

Industrial Wastewater

The cost of fines is less than the cost of treating effluent.

"Clearly this is not sending out a strong enough message to deter large businesses that have the potential to seriously damage the environment."

Ed Gallagher UK Environment Agency

Socio-Economic Aspects

- *Industrial activity:*
- *international companies increasingly manufacture high tech products in developing countries*
- *brings benefits to the economy*
- *abstracts water from the environment and depletes natural resources which are already stressed*
- *adds to the demand from public water supply system*
- *adds to the load on sewage treatment works*
- *discharges effluent to surface waters*
- *contaminates surface and groundwater resources*

Socio-Economic Aspects

- *Priorities*
  - *environment or employment?*
  - *industry or agriculture/fisheries*
- *Who should pay for pollution?*
  - *industry?*
  - *government (that is the community)*

Socio-Economic Aspects

- *How should we try to prevent pollution?*
- *Legislation*
  - *has not proved to be effective*
- *Education*
  - *long term solution*
- *Economics*
  - *effective in the short term*

Socio-Economic Aspects

- *In the developed world increasing costs have focussed attention on water*
- *Industrial water management has reduced water consumption and*
  - ***Saved money** on water purchase*
  - ***Saved money** on wastewater discharge*
  - ***Saved money** on raw materials*

We Have The Technology

- *Sea water desalination*
- *Grey water recycling*
- *Industrial water re-use and recycling*
- *Energy from wastewater*
- *Recycling sewage works final effluent as drinking water*
- *Zero liquid discharge*

Ashkelon, Israel

320,000tpd output commissioned 2005, currently the largest sea water desalination plant

Sandwell, West Midlands, UK

Braybrook House, part of Sandwell's Lyng Development was refurbished in 2007 with grey water recycling

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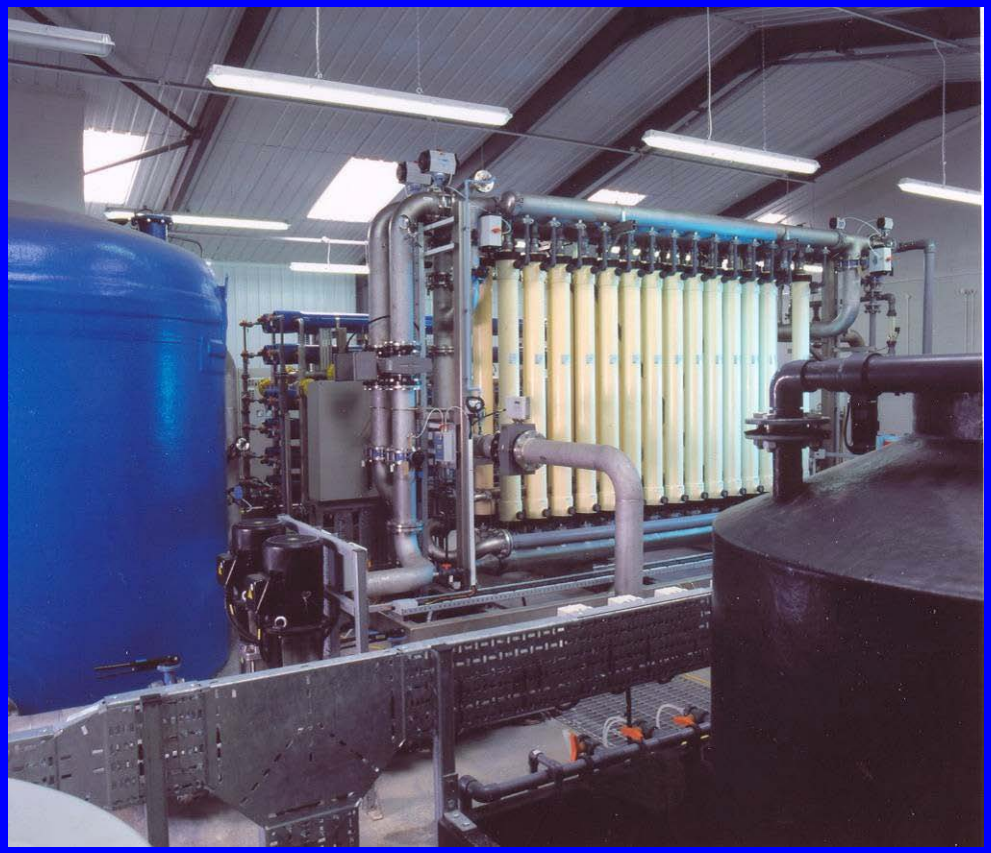
Widnes, UK

The membrane plant at Fiddler's Ferry Power Station, commissioned 2007, treats used cooling water to produce 3,600tpd of 0.1µS/cm boiler make-up water

Peterborough, UK



The membrane plant at Anglian Water's Flag Fen Sewage Treatment Works, commissioned 2001, treats 1,200tpd of final effluent for recycling as boiler make-up water in the adjacent power station

Delft, Netherlands

The first Biothane anaerobic bioprocess at Gist Brocades, commissioned 1985, reduces effluent COD and generated methane as a boiler fuel

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La Felguera, Spain

Loprox® wet air oxidation plant at Bayer treating 190tpd of pharmaceutical manufacturing wastewater commissioned 1993

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Orange County, Florida

Microfiltration, reverse osmosis and UV/H_2O_2 treatment for 250,000tpd of sewage works effluent for groundwater recharge commissioned 2007

Windhoek, Namibia

Dissolved air flotation, ozonation, activated carbon adsorption, membrane filtration and chlorination reuses 21,000tpd of sewage works effluent for drinking water commissioned 2002

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Zero Liquid Discharge

Evaporation and crystallisation is now an economic possibility in some applications

Impact on Water Resources

ENVIRONMENTAL PROTECTION IS NOT A DRIVING FORCE FOR INDUSTRY

MONEY IS!!!