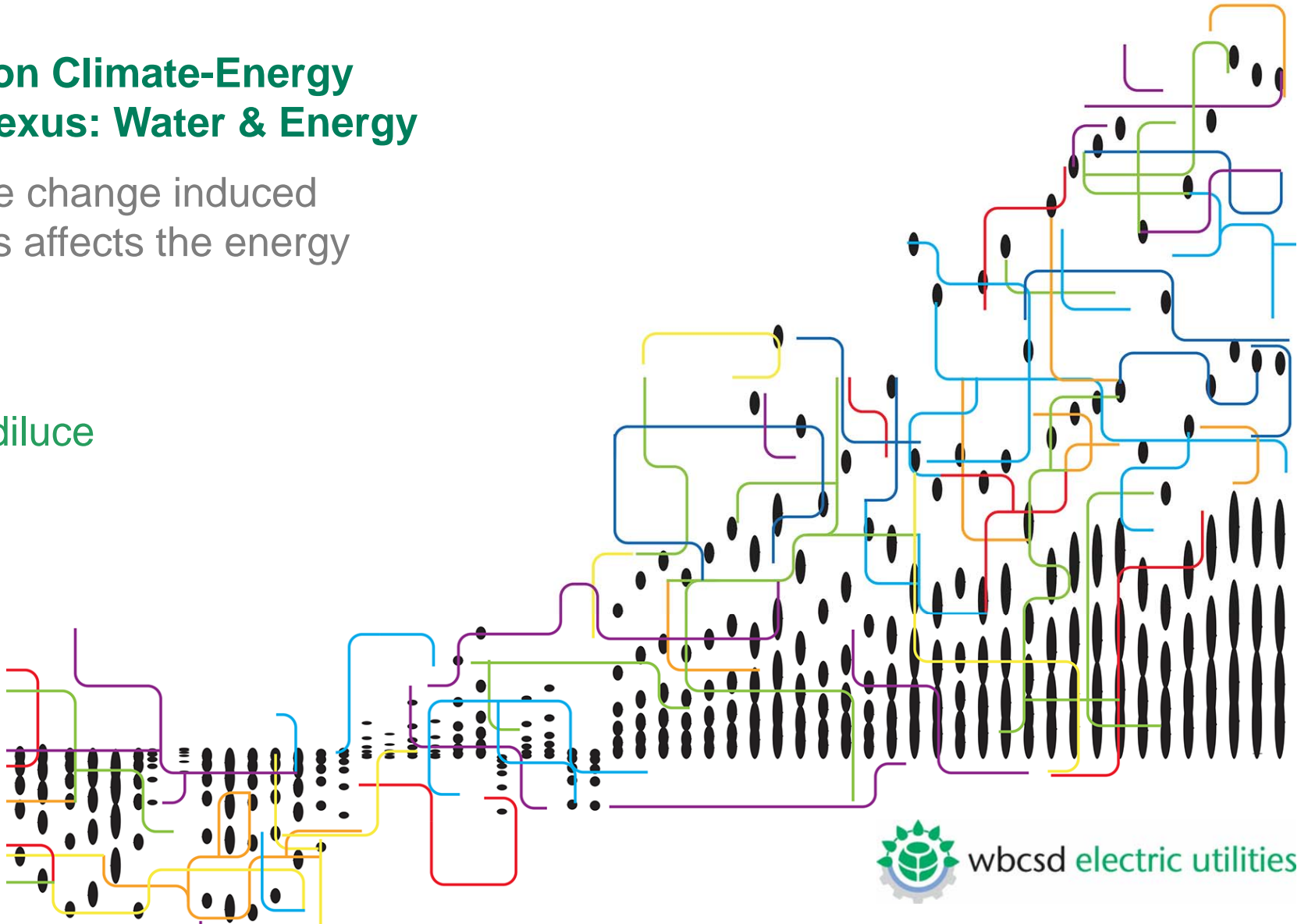


4th Forum on Climate-Energy Security Nexus: Water & Energy

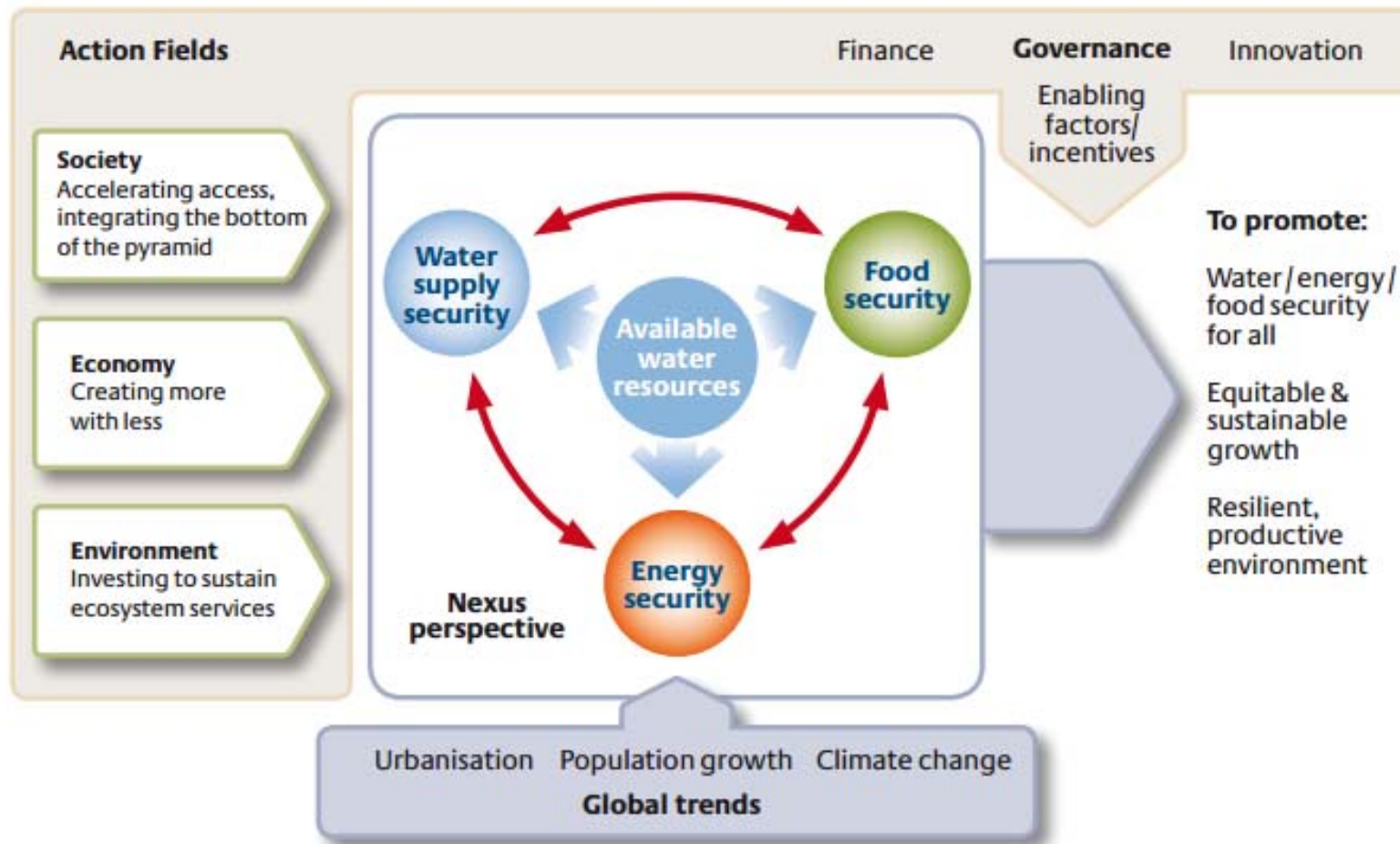
How climate change induced
water stress affects the energy
sector

María Mendiluce

Geneva 3/6/14



Water, Energy and Food Security Nexus



Source: Hoff, H, 2011

Freshwater – the issue at a glance

Population growth, increased wealth and industrialization are driving demand

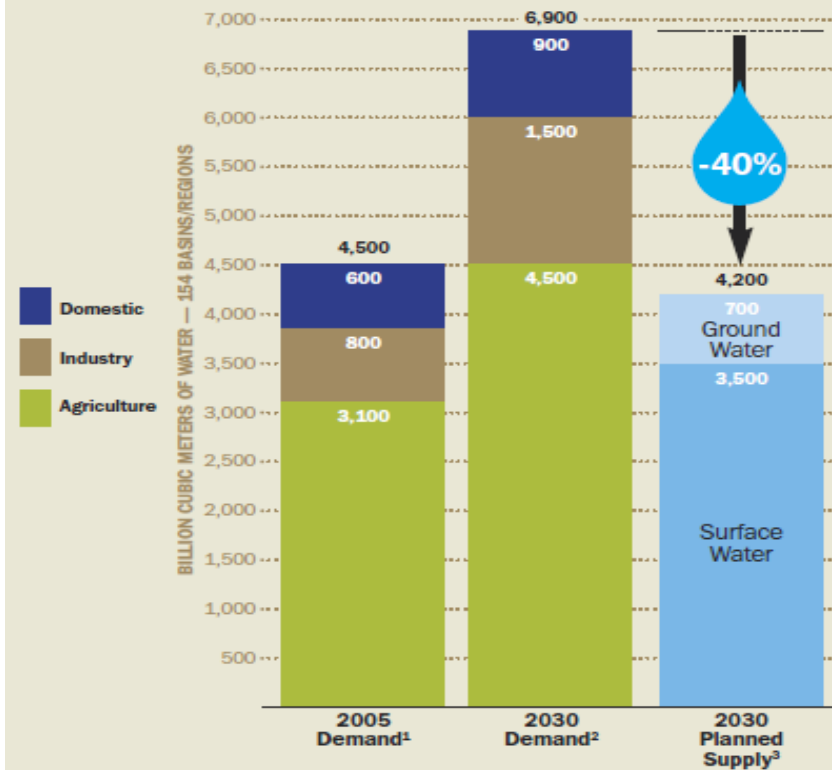
Many regions are on course to suffer major **freshwater deficits** over the next two decades

Renewable but fixed amount of water on Earth to be shared among people, agriculture, business and the environment

Allocation will have to balance these competing needs while managing tradeoffs

Historical water trends are no longer reliable in the face of **climate change**

Figure 1.1: Global Fresh Water Demand Gap Projected By 2030



1. Demand in 2005 based on inputs from IFPRI

2. Demand in 2030 based on frozen technology and no increase in water efficiency after 2010

3. Supply at 90% reliability and including infrastructure investments scheduled and funded through 2010; supply in 2005 is 4,081 BCM per year; supply in 2030 under projected technological and infrastructural improvements equals 4,866 BCM per year; net of environmental requirements

Source: 2030 Water Resources Group, "Charting Our Water Future: Economic frameworks to inform decision-making," (2009).

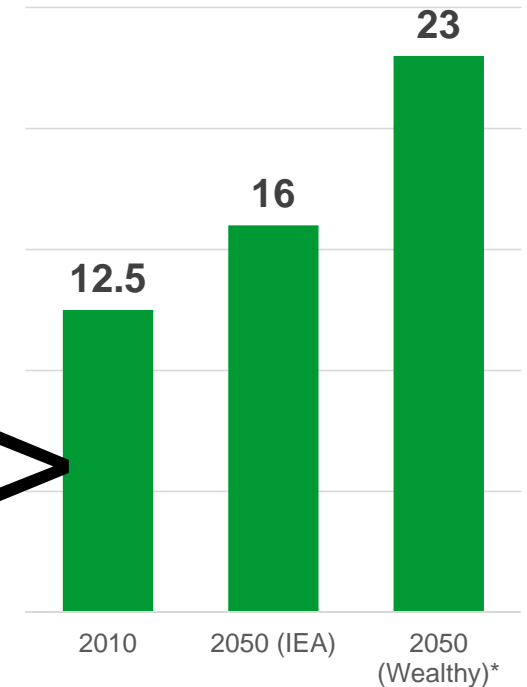
Potential exponential energy demand growth...

- 1.2 Bn people without access to electricity
- 1.1 Bn people without access to water
- Around 1 Bn people undernourished
- 1 Bn Slum dwellers

+

2010	Population	Energy pc
Poorest (GDP<2000\$)	645 Mn	514 koe
Developing (GDP<6500\$)	2775 Mn	534 koe
Emerging (GDP<12000\$)	2335 Mn	1829 koe
Developed (GDP<12000\$)	1145 Mn	4718 koe
Total	6900 Mn	1664 koe

= >



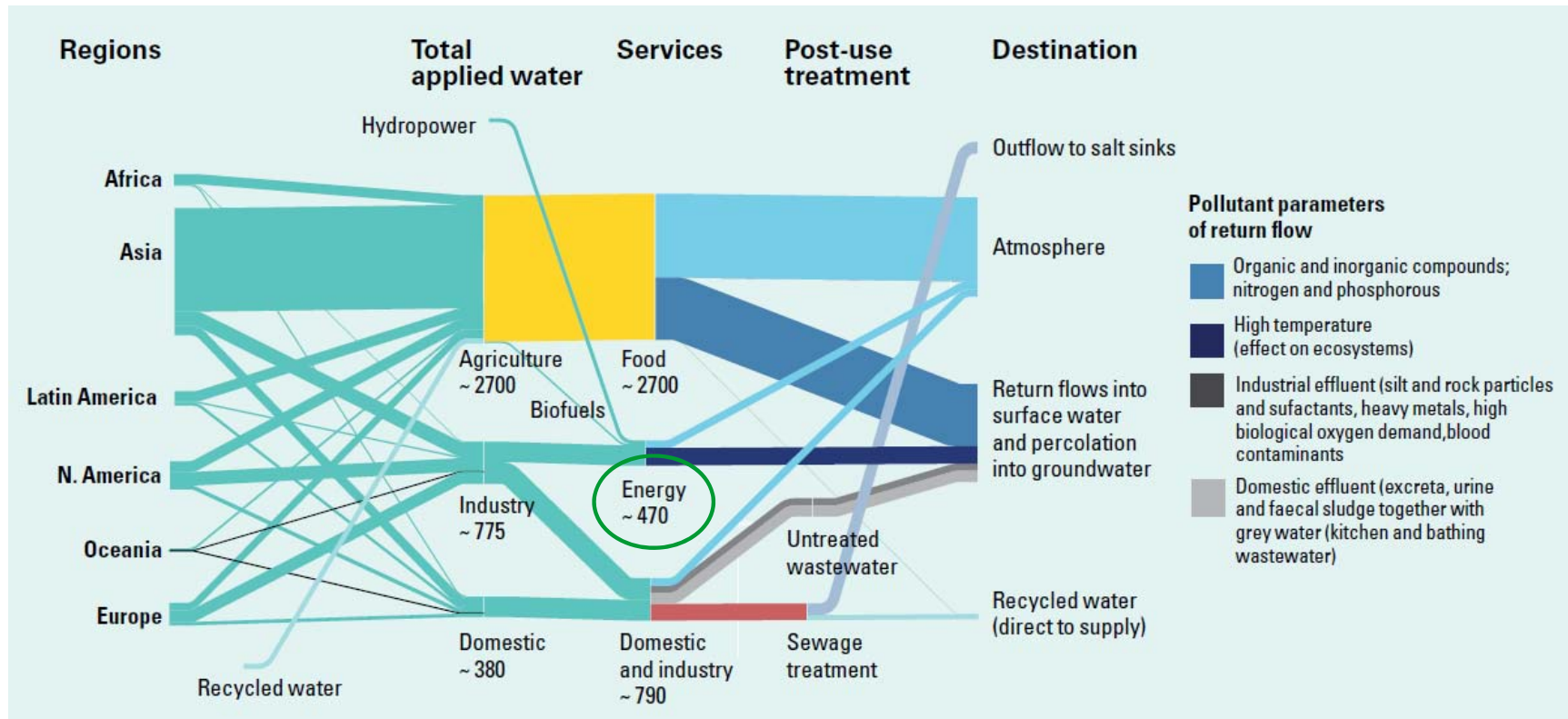
Filling development gaps...

.... affluent middle class is expanding

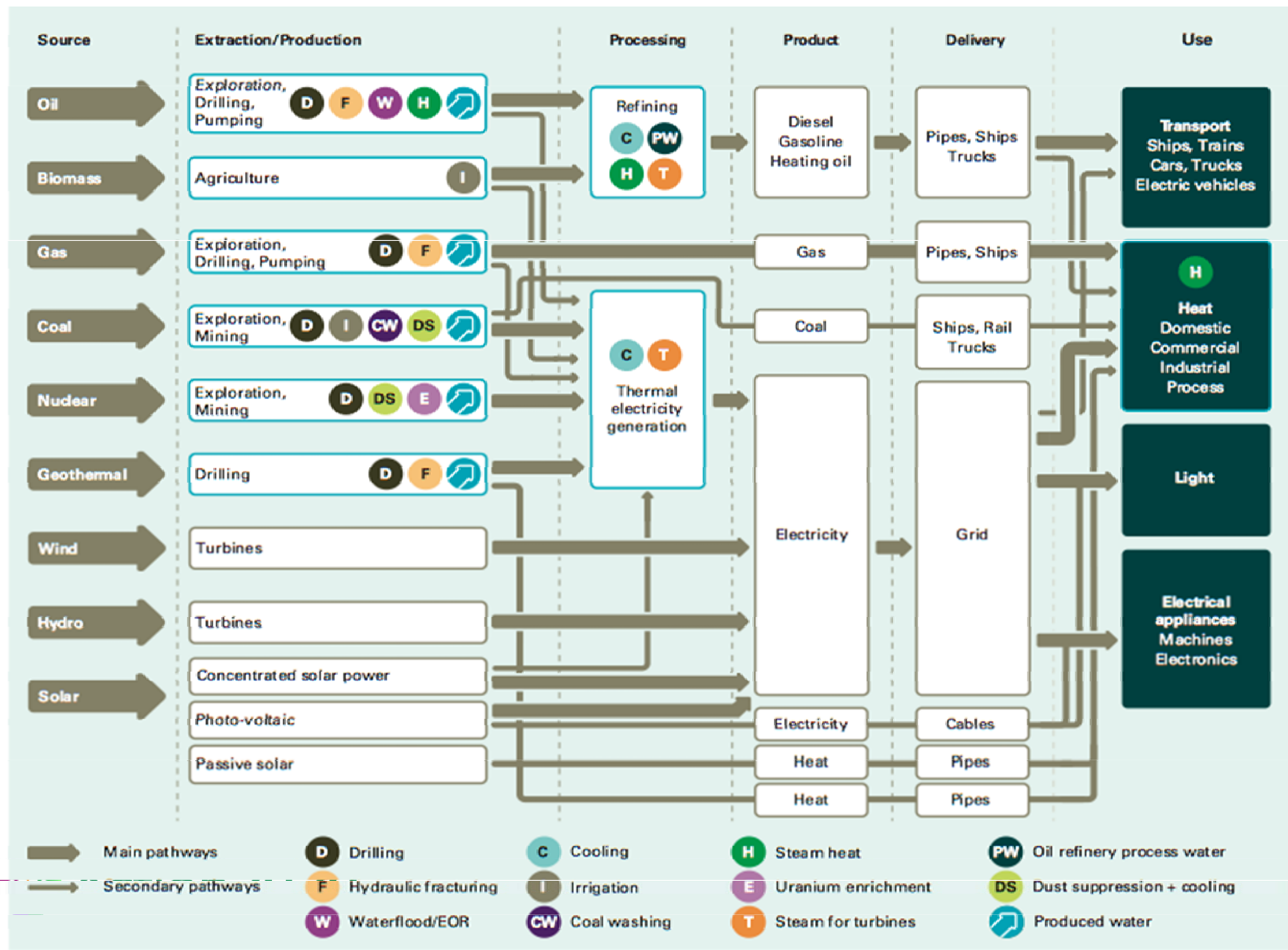
.... demand could double in the next 40 years

.... and associated water requirements

12% of freshwater withdrawal in the Energy sector



▲ Figure 1.10
Freshwater water consumption in energy pathways



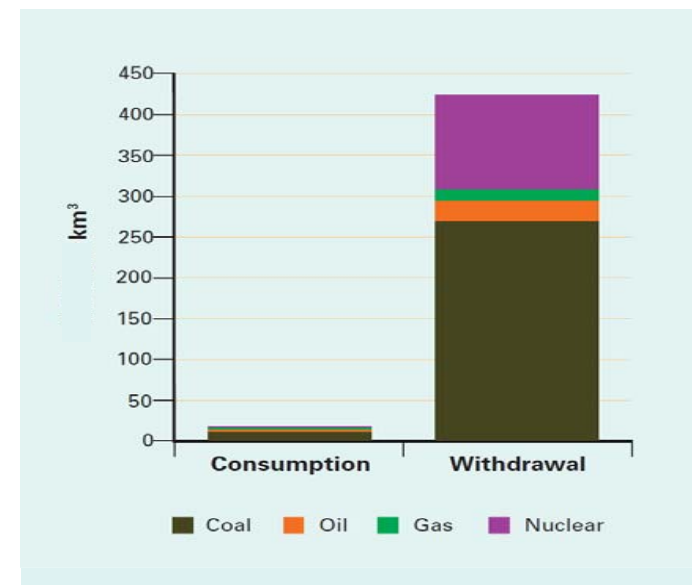
Source: BP, 2013

Most of the water is withdrawn for cooling purposes

Estimated global fresh water

	% total	Withdrawals	Consumption
Power	12%	450 km ³	16 km ³
Fuel processing	0.5%	20 km ³	5 km ³
Biofuel production*	0.5%	20 km ³	8-11 km ^{3**}
Fossil fuel extraction	<0.5%		9 km ^{3***}

Estimated annual cooling water consumption and withdrawal by fuel type (2009):



Source: BP, 2013



...with low water consumption rates

* 80% of all crops rely on precipitation (green water). ** Considering irrigation inefficiencies (38-56%). ***7.7 km³ in coal and conventional oil production

Several technology option exists...