

Write your name here

Surname

Other names

Centre Number

Candidate Number

Edexcel GCE

Geography

Advanced

Unit 3: Contested Planet

Tuesday 25 January 2011 – Morning

Time: 2 hours 30 minutes

Paper Reference

6GE03/01

You must have:

Resource Booklet (enclosed)

Total Marks

Instructions

- Use **black** ink or ball-point pen.
- **Fill in the boxes** at the top of this page with your name, centre number and candidate number.
- Answer TWO questions in Section A and ALL parts of Section B.
- Answer the questions in the spaces provided
– *there may be more space than you need.*

Information

- The total mark for this paper is 90.
- The marks for **each** question are shown in brackets
– *use this as a guide as to how much time to spend on each question.*
- The quality of your written communication will be assessed in ALL your responses
– *you should take particular care on these questions with your spelling, punctuation and grammar, as well as the clarity of expression.*

Advice

- Read each question carefully before you start to answer it.
- Keep an eye on the time.
- Spend approximately 80 minutes on Section A and 70 minutes on Section B.
- Check your answers if you have time at the end.

Turn over ►

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SECTION A

Answer TWO questions in this section.

You are reminded of the need to use examples to support your arguments.

You are advised to spend approximately 80 minutes on Section A.

Water Conflicts

1 Study Figure 1.

- (a) Suggest possible consequences for people and the environment of the projected changes in water withdrawals. (10)
- (b) Using examples, assess the role of named players in securing water supplies. (15)

(Total for Question 1 = 25 marks)

Biodiversity Under Threat

2 Study Figure 2.

- (a) Suggest reasons for variations in the percentage of protected terrestrial and marine areas. (10)
- (b) Using examples, assess the relative importance of human and physical factors in influencing levels of biodiversity. (15)

(Total for Question 2 = 25 marks)

Superpower Geographies

3 Study Figure 3.

- (a) Suggest how the three scenarios for 2025 might have very different consequences for the planet and its people. (10)
- (b) Evaluate the need for superpowers to play a key role in trade and international decision-making to maintain their status. (15)

(Total for Question 3 = 25 marks)



Bridging the Development Gap

4 Study Figure 4.

(a) Suggest how the information shown can be considered as both good and bad news for the developing world. (10)

(b) Using named examples, evaluate the success of two contrasting strategies used to narrow the development gap. (15)

(Total for Question 4 = 25 marks)

The Technological Fix?

5 Study Figure 5.

(a) Examine the factors that may have influenced the global pattern of internet use shown. (10)

(b) Using named examples, assess the effectiveness of technological leapfrogging in contributing to the development process. (15)

(Total for Question 5 = 25 marks)



Put a cross in the box indicating the first question you have chosen to answer .
If you change your mind, put a line through the box
and then put a cross in another box .

You will be asked to indicate your second question choice on page 11.

Chosen Question Number:

Question 1 Question 2

Question 3 Question 4

Question 5

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(Total for Question = 25 marks)



Put a cross in the box indicating the second question you have chosen to answer ☒.
If you change your mind, put a line through the box ☒
and then put a cross in another box ☒.

Chosen Question Number:

Question 1 ☒ Question 2 ☒

Question 3 ☒ Question 4 ☒

Question 5 ☒

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(Total for Question = 25 marks)

TOTAL FOR SECTION A = 50 MARKS



SECTION B

Answer ALL parts of this section, referring to the advance information you have been asked to study.

You are reminded of the need to use examples from any part of your GCE Geography course to support your answers.

You are advised to spend approximately 70 minutes on Section B.

Energy Security

- 6 (a) Explain why there are growing concerns about North America’s energy security. (12)**

- (b) Evaluate the arguments for and against large scale development of unconventional and technically difficult fossil fuel sources in North America. (14)**

- (c) Assess the contribution renewable energy could make in securing North America’s energy future. (14)**

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(Total for Question 6 = 40 marks)

TOTAL FOR SECTION B = 40 MARKS
TOTAL FOR PAPER = 90 MARKS



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Geography

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RESOURCE BOOKLET

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6GE03/01

Do not return the Resource Booklet with the question paper.

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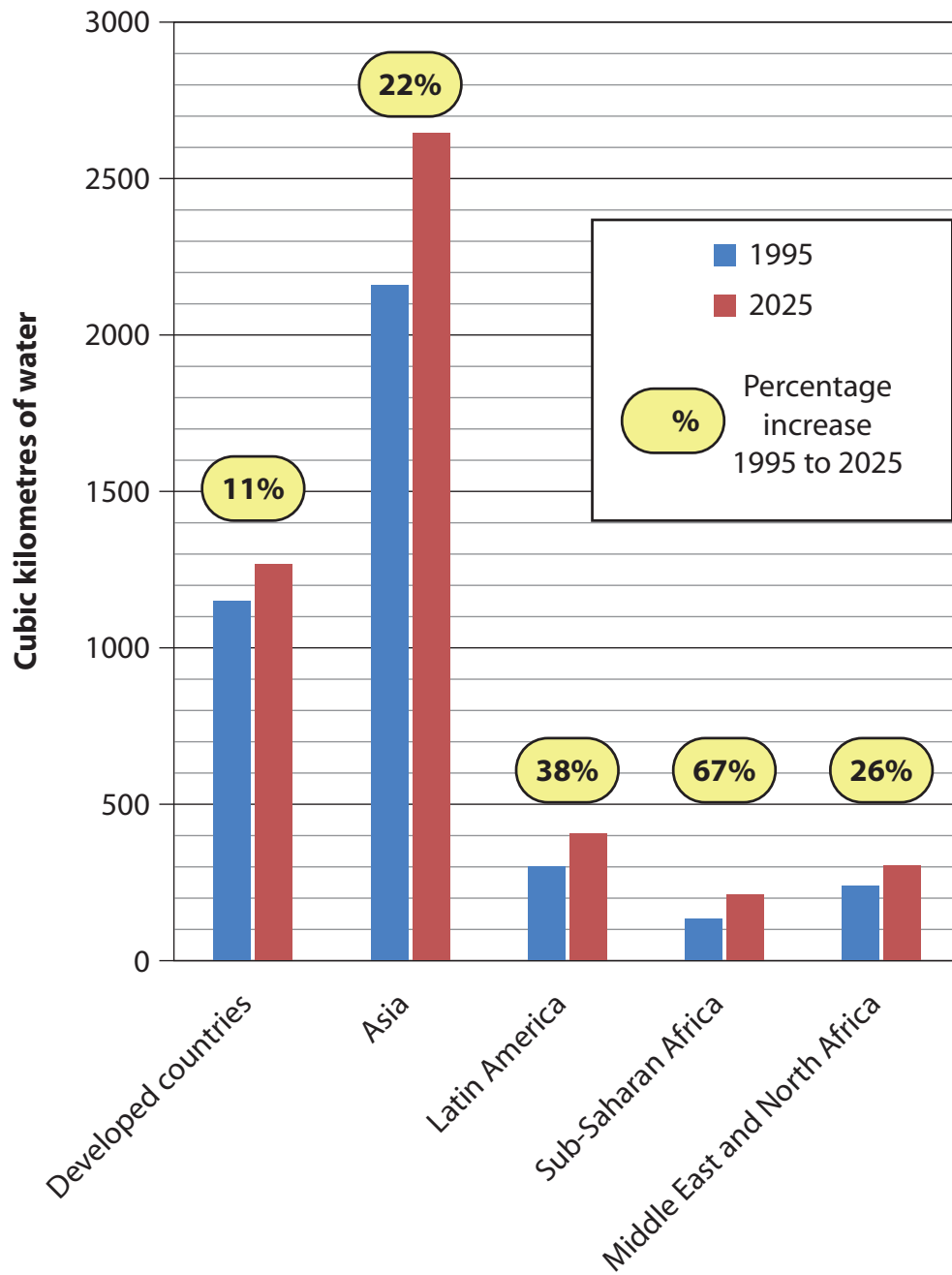


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SECTION A

The following resources relate to Questions 1–5.

Figure 1 Total freshwater withdrawals by region in 1995 and 2025 (projected)



(Source: International Food Policy Research Institute, Global Water Outlook)

Figure 2 Protected Terrestrial and Marine areas around the world

Global region	Percentage (%) of area protected	
	Terrestrial (land)	Marine (sea)
North America	18	10
Europe	14	6
Australia and New Zealand	10	24
South America	21	11
Caribbean	15	3
South East Asia	14	1
South Asia	7	1
Western and Central Africa	10	4

Protected areas include:

**National Parks
Wilderness Areas
Nature Reserves
Marine Reserves
Conservation Areas
Biosphere Reserves**

...and many other types of conserved and protected areas.

(Source: *State of the World's Protected Areas 2007*, UNEP 2008)

Figure 3 Three possible global scenarios for 2025



GLOBALISED

**Inter-dependent global economy much like today's.
USA still the dominant superpower.**



GLOBAL GOVERNANCE

**Worldwide efforts to reduce greenhouse gases and resource
consumption.
Global organisations such as the UN have enhanced role.**

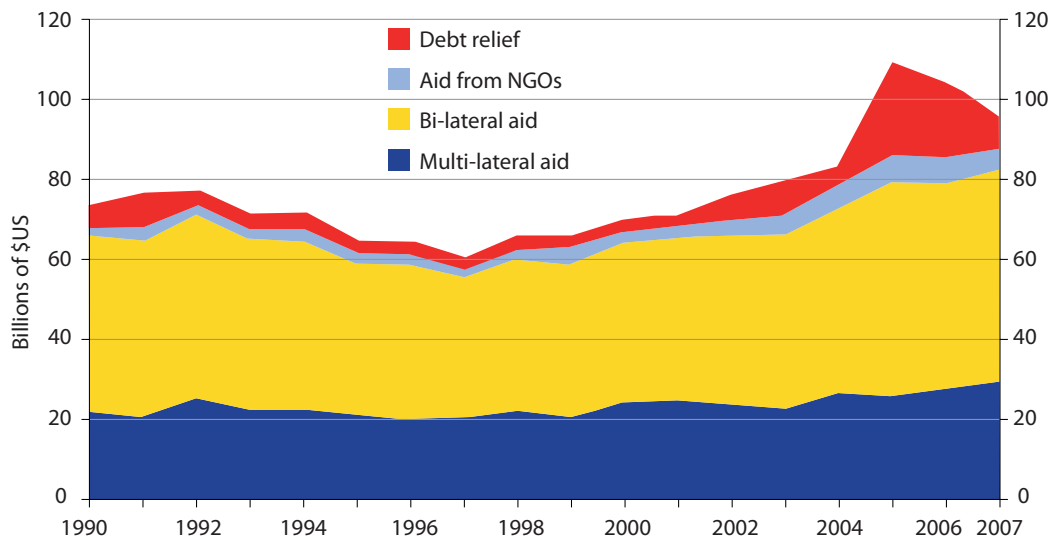


MULTIPOLAR

**Continued rise in the power of the BRICs, at the expense of the USA
and EU.
Global agreement is hard to reach – regional power dominates.**

(Source: based on *Global Scenarios to 2025*, World Economic Forum, 2008)

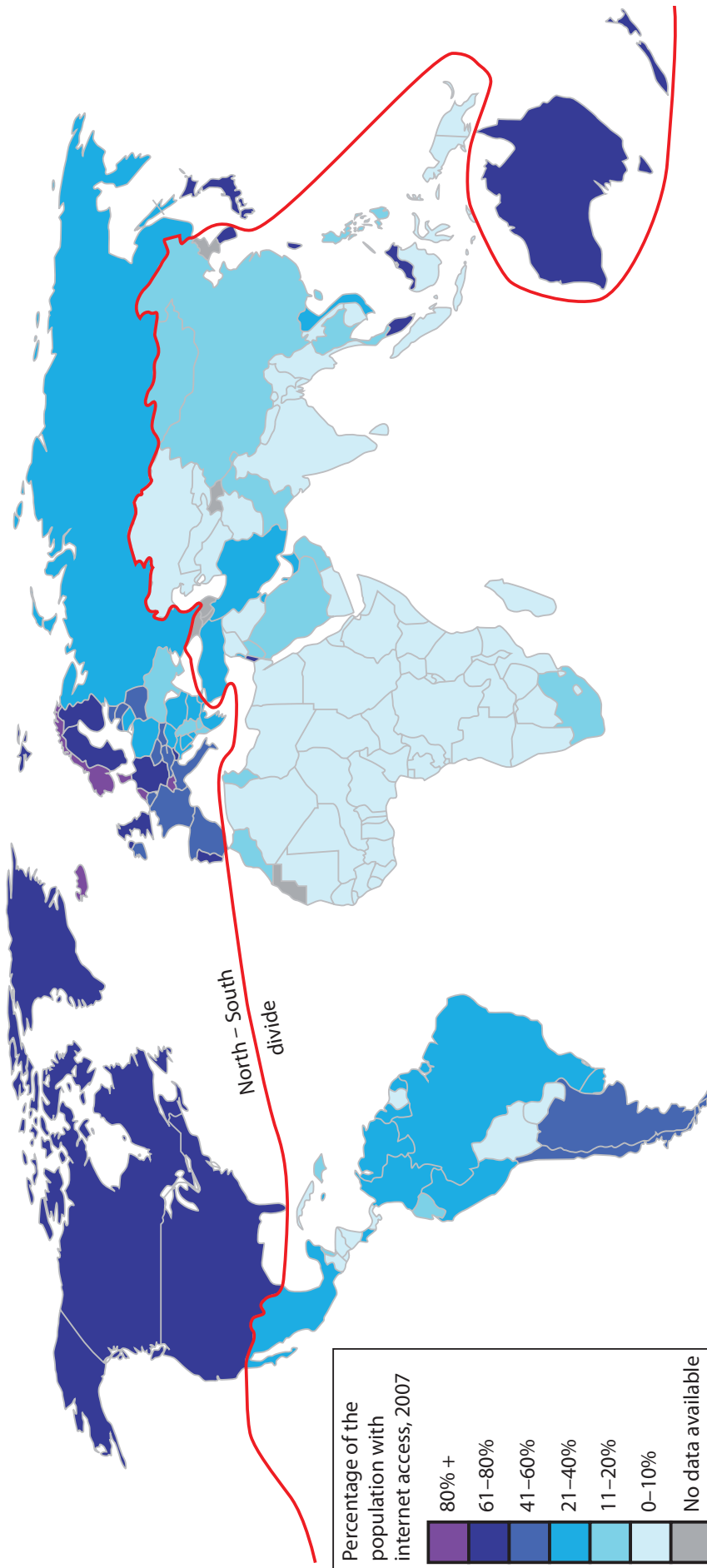
Figure 4 OECD Official Development Assistance (aid) to the developing world, 1990–2007



The OECD (Organisation for Economic Co-operation and Development) represents 30 developed countries.

(Source: adapted from the UN MDG Report, 2008)

Figure 5 Global Internet use in 2007



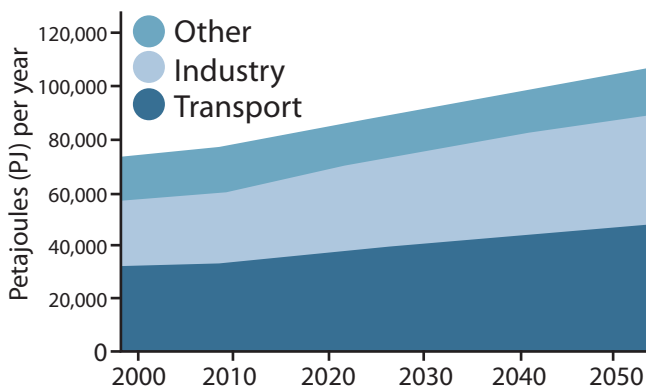
SECTION B

The following resources relate to Question 6.

ENERGY SECURITY ENERGY SECURITY OPTIONS FOR NORTH AMERICA

North America is hungry for energy. The three countries of Mexico, Canada and the USA had a combined population of 448 million people in 2008 and a combined GDP of \$16.8 trillion – around 27% of global GDP. Figure 1 shows one projection for total energy demand growth in the three countries to 2050.

Figure 1: Projected energy demand in North America



Mexico, Canada and the USA work closely together as a **regional bloc**, especially on economic issues. On January 1 1994 they signed the North American Free Trade Agreement (NAFTA) creating a free trade bloc. Other **trilateral** agreements deal with the following policy areas:

- North American Agreement on Environmental Cooperation (NAAEC) relating to conservation issues.
- North American Agreement on Labour Cooperation (NAALC) relating to working conditions.
- Security and Prosperity Partnership of North America relating to agriculture, immigration and other issues.

In 2001 the **North American Energy Working Group**, led by Natural Resources Canada (a government department), was set up to increase cooperation on energy related issues.

Figure 2: Fossil fuel production and demand

		Production			Demand 2010
		1990	2000	2010	
Canada	Crude oil (thousand barrels / day)	1,667	2,197	3,083	1,880
	Natural gas (billion cubic ft / yr)	3,494	5,920	7,050	3,940
	Coal (million tonnes / year)	68	69	65	53
Mexico	Crude Oil	2,548	3,012	4,024	1,920
	Natural Gas	1,333	1,713	3,184	3,000
	Coal	8	19	20	28
USA	Crude Oil	7,355	5,822	5,080	23,000
	Natural Gas	17,810	19,403	23,000	28,000
	Coal	1,590	1,968	2,260	1,130

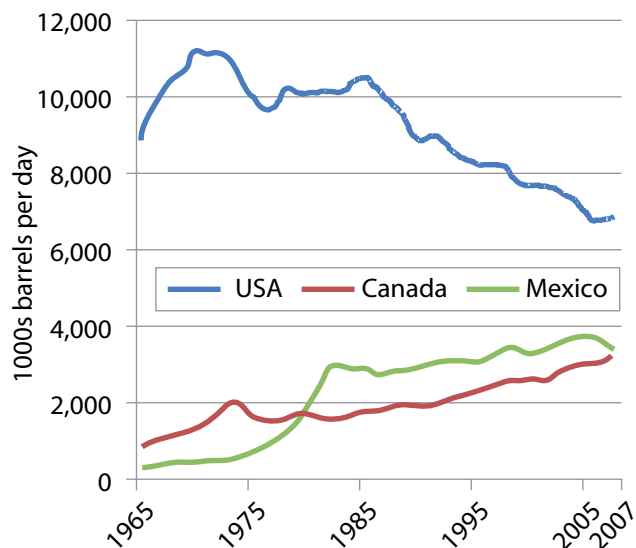
(Source: North American Energy Working Group)

North America has rich fossil fuel reserves and Mexico, Canada and the USA are major players in the global petroleum industry. Production has changed significantly in recent years (Figure 2) although crude oil production may have peaked in some countries (Figure 3, page 8).

There are a number of risks to energy security in North America:

- the short term dependence of the USA on imported natural gas
- the growing dependence of China and India and others on imported oil, creating a very competitive market and high prices
- the need to control carbon emissions making traditional energy sources politically difficult
- the **proliferation** risks from commercial nuclear power
- vulnerability of energy infrastructure to terrorist attack
- the power of the environmental lobby.

Figure 3: Crude oil production, 1965–2007



As the USA relies on imported oil and gas there is awareness that maritime trade could be disrupted by the threats of terrorism and piracy (Figure 4, page 9). Choke points, narrow shipping routes through which large volumes of tanker-borne oil pass, are vulnerable to political and terrorist disruption.

Mexico, Canada and the USA are all commercial nuclear powers (Figure 5). No new nuclear power plant was constructed in the USA between 1996–2008. Many nuclear plants constructed in the 1960s and 1970s have either been shut down or will be decommissioned soon. Planned reactors will tend to replace older power plants going off-line rather than add to nuclear capacity.

Figure 5: North American nuclear power, 2008

Country	USA	Canada	Mexico
Number of reactors 2008	104	18	2
MW capacity	100,600	12,600	1,300
% of all electricity generation	19%	15%	4.6%
Planned reactors	31	10	2

Supporters of nuclear power argue that it is clean in terms of carbon emissions when compared to fossil fuels. Nuclear power plants operate in all weather conditions unlike some renewable sources.

In addition, the fuel source uranium, is available from some nations which are generally viewed as 'friendly and stable' (Figure 6).

Figure 6: World uranium production (% of global production, 2007)

Canada	23%	Niger	7.5%
Australia	21%	Uzbekistan	5.5%
Kazakhstan	18%	USA	4%
Russia	8%	Ukraine	2%
Namibia and South Africa	8%	China	1.5%

Declining fossil fuel production in some areas and the pressure to maintain energy supply has led some analysts to argue for increased use of **unconventional** and **technically difficult** fossil fuel resources (Figure 7, page 9). These resources have the benefit of being domestic rather than foreign. Within the USA there is an ongoing debate over drilling for oil in the outer continental shelf areas. New continental shelf developments were stopped in 1990 but allowed again in 2008.

In addition the **Arctic National Wildlife Refuge** (ANWR) is estimated to contain 6–16 billion barrels of recoverable oil. Oil exploitation is currently banned in the ANWR. However, if high oil prices continue and older fields increasingly cease production, pressure may grow to open up further areas of the Arctic to oil and gas development.

Biofuel production has expanded in North America especially in the USA. **Bioethanol** is made from crops such as maize. **Biodiesel** is manufactured from soy or oilseed rape and other crops.

Figure 8: USA Bioethanol production

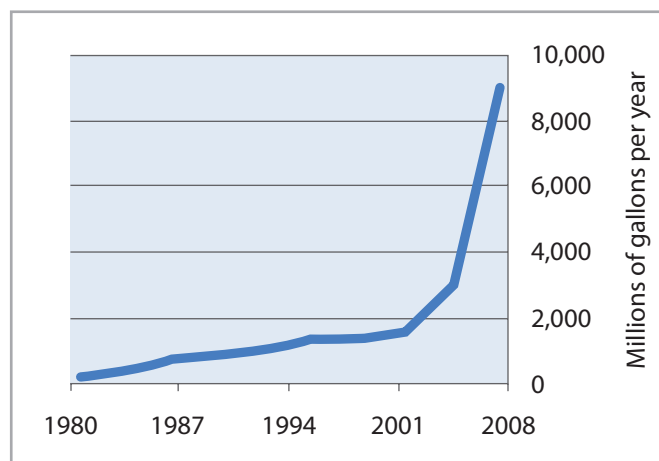
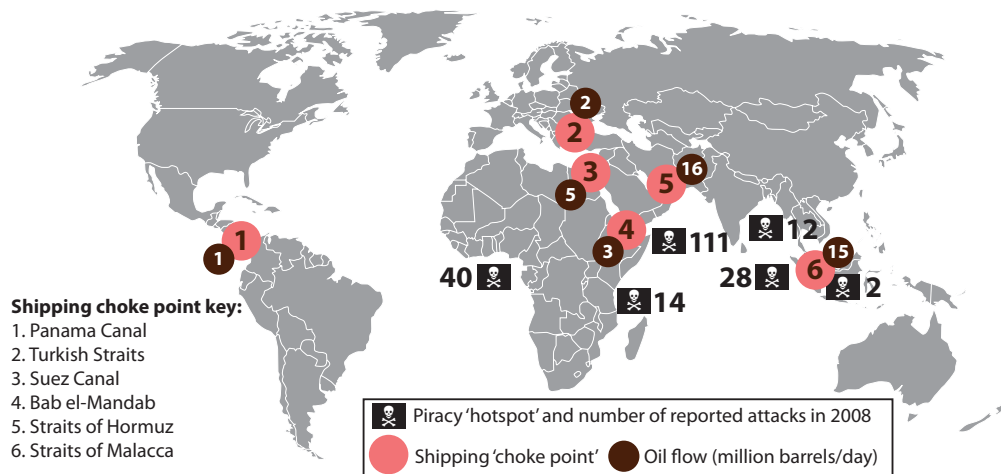


Figure 7: Unconventional and technically difficult fossil fuel sources and reserves in North America

<p>CANADIAN TAR SANDS</p> <p>There are extensive tar sand deposits in Alberta, covering an area of 140,000 sq km at three locations: Athabasca, Cold Lake and Peace River. Around 25% of the total area has been leased for exploration and recovery.</p>		<p>Reserves: 1.7 trillion barrels?</p> <p>Economic at \$80-90 per barrel</p>
<p>Extraction:</p>	<p>Extraction is by either opencast mining or 'in situ' recovery. In situ mining involves 'steaming' the sticky bitumen out of the sands and pumping it to the surface. Natural gas is often used as the fuel source for steam generation.</p>	
<p>Environment:</p>	<p>The area is mostly undisturbed boreal forest which is lost due to mining activities although it can be restored to some extent.</p>	
<p>USA OIL SHALE</p> <p>Oil shales of the Green River Formation extend across vast swathes of Utah, Wyoming and Colorado in the Rocky Mountains. Sedimentary rocks contain solid hydrocarbon material known as kerogen.</p>		<p>Reserves: 800 billion to 1.5 trillion barrels?</p> <p>Economic at \$100+ per barrel</p>
<p>Extraction:</p>	<p>Oil shale must be heated to at least 400°C in order to capture the resultant liquid oil; this takes place after the rock has been mined but 'in situ' technologies are being developed. Coal, gas or even nuclear power could be used as a heat source.</p>	
<p>Environment:</p>	<p>The oil shale area covers much of the wild, mountainous and forested Colorado River basin, itself an important water source.</p>	
<p>MEXICAN DEEP WATER OIL</p> <p>Mexico has significant offshore oil in the Gulf of Mexico, west of the Yucatan Peninsula. These include the huge Cantarell field discovered in 1976. In 2006 Pemex discovered the Coatzacoalcos field in the Gulf, in 600m+ of deepwater.</p>		<p>Reserves: 30 billion barrels?</p> <p>Economic at \$60 per barrel</p>
<p>Extraction:</p>	<p>Offshore drilling has a long history although deepwater drilling is more costly and technically challenging. Drillships and Floating Production, Storage and Offloading (FPSO) vessels tend to be used rather than fixed oil platforms.</p>	
<p>Environment:</p>	<p>Minor offshore oil spills are common, and wastes from drilling vessels frequently pollute the sea bed. Most incidents are small but over time can be significant.</p>	

Figure 4: Maritime trade 'choke points' and piracy incidents in 2008



Today most biofuel comes from processed food crops and the area of cropland used for this purpose has expanded in the USA and Canada (to supply the US market). Increasing food prices in 2007–08 were partly blamed on the rapidly rising use of food crops as **biofuel feedstocks**. In 2007 'tortilla riots' broke out in Mexico as people protested against rising maize prices.

- In February 2007 up to 70,000 people marched in Mexico City to protest against rising food prices.
- In May 2008 the Mexican Government began monthly payments of 120 pesos to help the poorest buy food.
- A basket of food costing \$80 in January 2006 cost \$115 by Jan 2008.

The USA has encouraged biofuel production using farm subsidies. So-called **second generation biofuels** could break the link with food crops. Cellulosic biofuels are being developed which could use stalks and leaves and other 'waste' products.

Clean coal technology is another option being explored by some in the energy industry as coal reserves are large. However the fuel has the reputation as being 'dirty'. Clean coal is a catch-all term which includes technologies such as flue gas desulphurisation (FGD), selective catalytic reduction (SCR) to remove nitrogen oxides and carbon capture and storage (CCS).

North America has significant renewable energy potential (Figure 9). Many suitable hydroelectric sites have already been developed but other technologies could be expanded significantly. Many renewable sources are geographically constrained and considerable investment is needed to move towards a greener energy future. In some cases fossil fuels remain cheaper than renewable alternatives. Costs are likely to converge in the future due to improved renewable technology and possibly rising fossil fuel costs. Figure 10 shows one possible future renewable scenario for electricity generation in North America. In 2000 Canada consumed 550 TWh; Mexico 155 TWh and the USA 3,620 TWh of electricity.

Figure 9: Solar, wind and geothermal potential

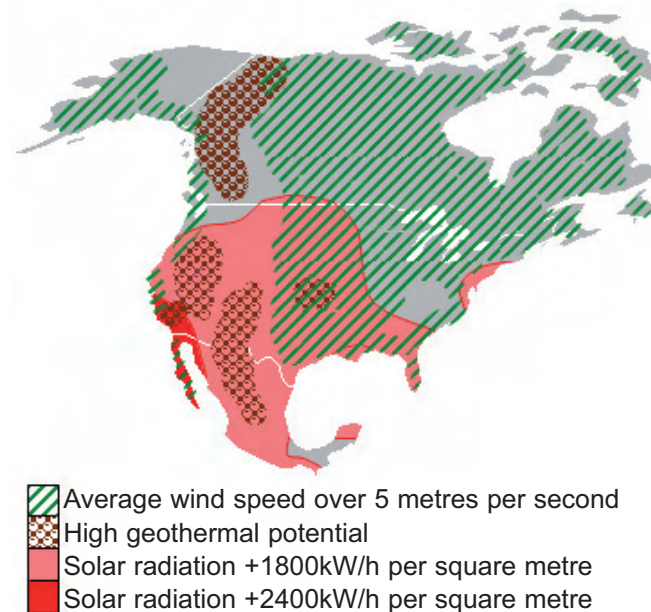
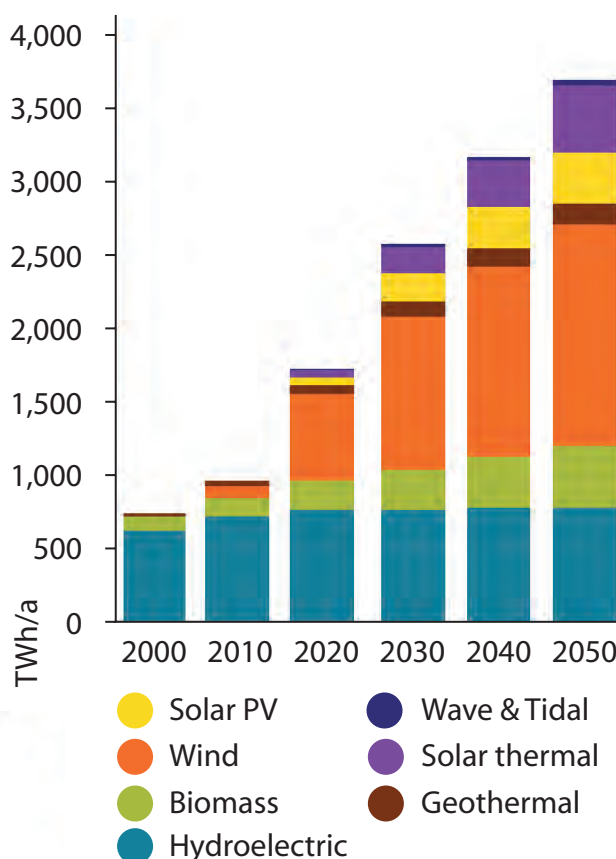


Figure 10: Renewable energy scenario for electricity generation for North America to 2050



(Source: adapted from Greenpeace / EREC, "A Sustainable OECD North America Energy Outlook", 2007)

Views on energy security in North America

View 1

"Of all the environmental impacts of oil shale development, the most serious appears to be the extent to which land will be disturbed. Regardless of the technical approach to oil shale development, a portion of the land over the Green River Formation will need to be withdrawn from current uses, and there could be permanent topographic changes and impacts on flora and fauna."

Oil Shale Development in the United States Prospects and Policy Issues (Rand Corporation, 2005)

View 2

"The idea of a North American or continental energy policy has been around for years. Today, the George W. Bush administration is again talking up what it calls North American energy security, with an eye to meeting as much of the United States' imported energy needs as possible from Canada and Mexico, thereby reducing dependence on the Middle East."

The Toronto Star, 2004

View 3

"The green message - use less energy - is not going to solve the problem unless economic growth stops at the same time. If it does not (and it won't), any efficiency saving will soon be eaten up by higher consumption per head. Wind power is taking on natural gas, which has risen in price in sympathy with oil. Wind is closing in on the price of coal, as well. Solar energy is a few years behind, but the most modern systems already promise wind-like prices. Indeed, both industries are so successful that manufacturers cannot keep up, and supply bottlenecks are forcing prices higher than they otherwise would be."

The Economist, 2008

View 4

"At present around 80% of global energy demand is met by fossil fuels. The unrelenting increase in energy demand is matched by the finite nature of these sources."

Greenpeace / EREC 2008

View 5

"One can provide good social, environmental and economic rationales for why the commercialisation of unconventional oils by rich developed countries is wrong headed, but the long and short of it is that it is plain and simply 'wrong'. How can we expect the developing world to emerge along a low carbon path when (a) the vast bulk of CO₂ already in the atmosphere is from us and (b) we then go on to exploit even more climate hostile sources of energy."

Foreword to: "Unconventional Oil - Scraping the bottom of the barrel?" WWF/ Cooperative Bank 2008

View 6

"By 2025 the world will be in the midst of a fundamental energy transition—in terms of both fuel types and sources. Non-OPEC liquid hydrocarbon production (i.e., crude oil, natural gas liquids, and unconventionals such as tar sands) will not be able to grow commensurate with demand."

Global Trends 2025, USA Department of National Intelligence, 2008

Websites for further research

- www.energyblueprint.info provides a range of information on energy in North America, and globally, including energy future scenarios. It is run by Greenpeace and the European Renewable Energy Council.
- www.eia.doe.gov and www.energy.gov are the US Government's energy department websites. Both have information and statistics on Mexico and Canada as well as the USA.
- www.nrcan-rncan.gc.ca is the Canadian Government's energy department website.
- www.api.org The website of the American Petroleum Institute representing over 400 energy companies.
- www.nrel.gov The US National Renewable Energy Laboratory has the latest on renewable research.

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