



GCE A level

1204/01

GEOGRAPHY – G4
Sustainability

P.M. WEDNESDAY, 22 January 2014

1 hour 45 minutes

ADDITIONAL MATERIALS

In addition to this question paper, you will need the Resource Folder and a 20 page answer book.

INSTRUCTIONS TO CANDIDATES

Use black ink or black ball-point pen.

Answer **all** questions.

Write your answers in the separate answer book provided, following the instructions on the front of the answer book.

INFORMATION FOR CANDIDATES

The number of marks is given in brackets at the end of each question or part-question.

You are reminded that assessment will take into account the quality of written communication used in your answers.

You are reminded that this paper is synoptic and so will assess your ability to draw on your understanding of the connections between the different aspects of the subject represented in the geography specification.

Even where not specifically asked for, you should support your answer with examples and/or case studies.

SECTION A

Answer all questions.

*In this section you may use information from the **Resource Folder** and your own research.*

- 01** Outline the factors determining water supply in **one** country or region. [10]
(approximately 13 minutes)
- 02** For **one or more** countries, outline how energy demands are changing. [10]
(approximately 13 minutes)
- 03** Identify alternative energy sources and suggest how they may help meet demand. [10]
(approximately 13 minutes)
- 04** 'Constructing dams is the only way to ensure sustainable water supplies.'
How far do you agree? [25]
(approximately 33 minutes)

SECTION B

In this section you may use information from any of your studies for AS and A2 Geography as well as from the Resource Folder and your own research.

- 05** Outline how technology affects food production.
How far does the application of technology influence the sustainability of food supplies? [25]
(approximately 33 minutes)

END OF PAPER



GCE A level

1204/01-A

GEOGRAPHY – G4
Sustainability

P.M. WEDNESDAY, 22 January 2014

Examination copy

To be given out at the start of the examination.

The pre-release copy must not be used.

RESOURCE FOLDER

ADVICE TO CANDIDATES

In this synoptic exercise you will be assessed on your ability to **synthesise knowledge and understanding and skills** derived from your A level course.

You are reminded that assessment will take into account the quality of written communication used in your answers.

The materials in this Resource Folder are related to water and energy issues in Iran.

BLANK PAGE

Contents

WATER SUPPLIES IN IRAN		Page
Figure 1	Background information on Iran	4
Figure 2	Simplified population density and major cities of Iran	4
Figure 3	Precipitation distribution in Iran	5
Figure 4	Temperature and precipitation at Rasht and Yazd	5
Figure 5	The six major water supply areas of Iran	6
Figure 6	Area and water supplied by the six major water supply areas	6
Figure 7	Available water per capita in Iran since 2002	7
Figure 8	Sources of water in Iran, 2004 and 2010	7
Figure 9	The <i>qanat</i> system of groundwater extraction	8
Figure 10	Major dams in Iran	8
Figure 11	Main uses of water in Iran, 2004	9
Figure 12	Major uses of irrigated land in Iran	9
Figure 13	Cost, efficiency and problems of water supplies in Iran	9
ENERGY IN IRAN		
Figure 14	Non-renewable energy production in Iran, 1980–2010	10
Figure 15	Location of oilfields and gasfields in Iran	10
Figure 16	The world's five leading oil producers, 2011	11
Figure 17	The world's five leading gas producers, 2011	11
Figure 18	Development indicators for Iran	11
Figure 19	Energy use by sector in Iran	12
Figure 20	United Nations Development report on Iran, 2012	12
Figure 21	Nuclear power in Iran	13
Figure 22	Nuclear sites in Iran, 2012	13
Figure 23	Number of villages with electricity in Iran, 1990–2015	13
Figure 24	The Karun III dam in Iran	14
Figure 25	Key features of the Karun III dam	14
Figure 26	Energy sustainability in Iran	15
Figure 27	Impacts of droughts and floods in Iran, 1910–2010	15
Sources of information and copyright		16

WATER SUPPLIES IN IRAN

Figure 1: Background information on Iran

The Islamic Republic of Iran has a population of 78.7 million people (2011 estimate). 71% of the people live in urban areas. Six cities have a population of over 1 million (see Figure 2) with the capital, Tehran, having 7.2 million inhabitants.

In 2011 the birth rate was 18.5/1000 and the death rate 5.9/1000, and little variation is expected up to 2020. The infant mortality rate was 41.1 deaths/1000 live births. Adult literacy was 77%. GDP/capita (purchasing power parity/PPP) was US\$ 13 100. In 2011 Iran had a HDI of 0.71 with a ranking of 88 in the world.

The country covers 1.65 million km², of which 29% is cultivated.

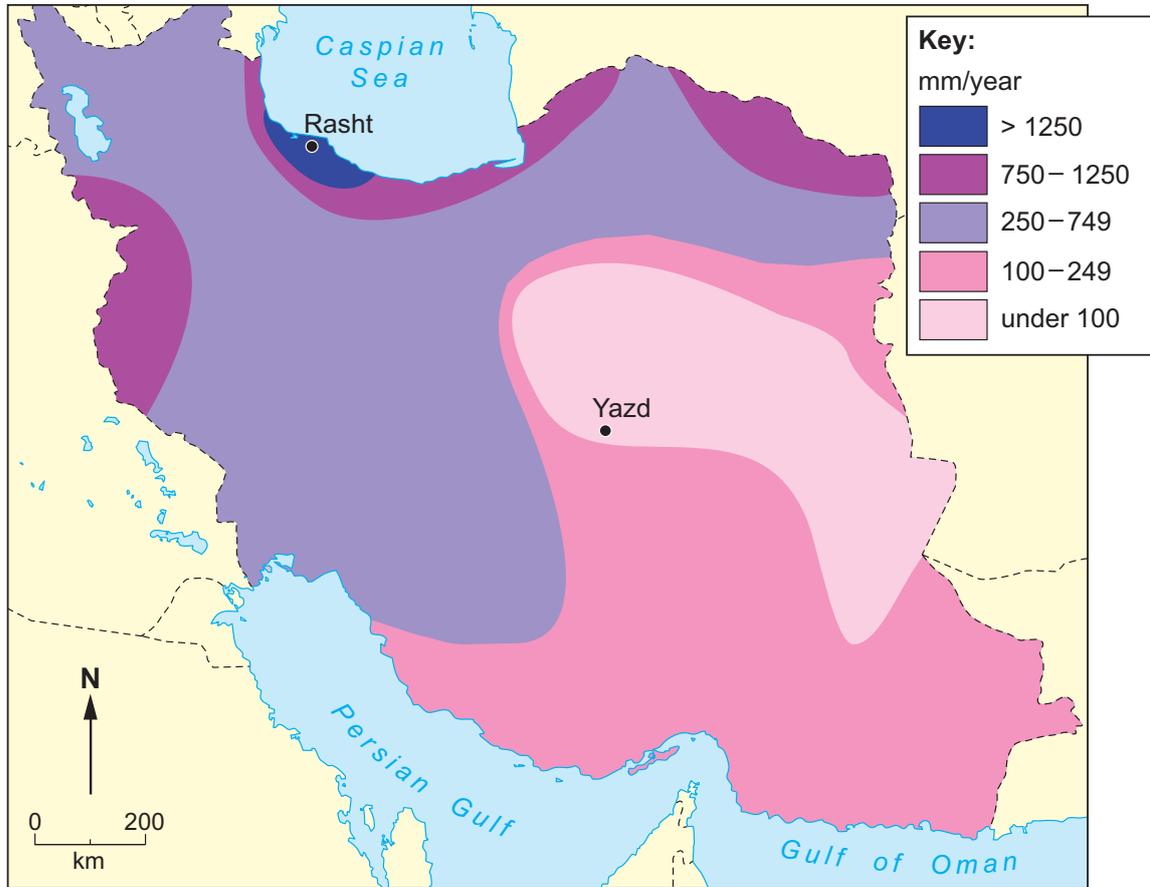
Source: adapted from www.cia.gov

Figure 2: Simplified population density and major cities of Iran



Source: adapted from www.britannica.com

Figure 3: Precipitation distribution in Iran



Source: adapted from www.atozmapsdata.com

Figure 4: Temperature and precipitation at Rasht and Yazd

Rasht	J	F	M	A	M	J	J	A	S	O	N	D	Annual
Temperature °C	6	7	9	14	19	23	26	25	22	17	13	9	mean 16
Precipitation mm	148	119	111	62	53	39	40	74	143	230	171	166	total 1356

Yazd	J	F	M	A	M	J	J	A	S	O	N	D	Annual
Temperature °C	5	9	14	21	26	32	33	31	27	20	13	9	mean 20
Precipitation mm	8	10	8	10	5	0	0	0	0	0	3	3	total 47

Source: www.climate-charts.com

Figure 5: The six major water supply areas of Iran

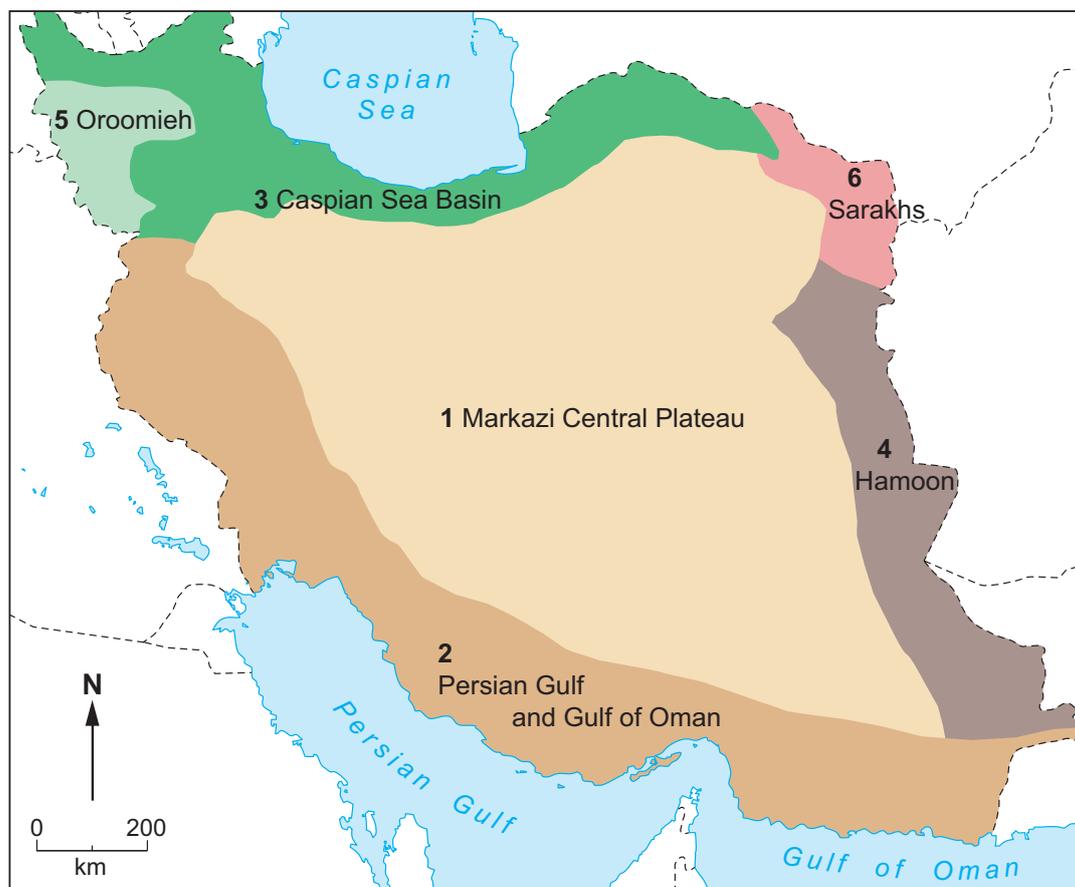
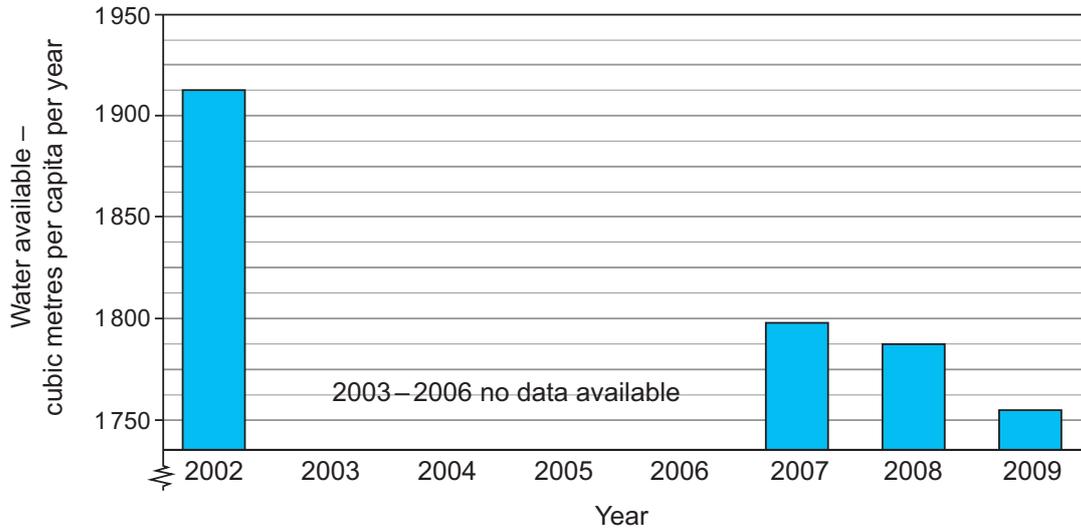


Figure 6: Area and water supplied by the six major water supply areas

Water supply area	Area of Iran (percentage)	Water supplied to Iran (percentage)
1 Markazi Central Plateau	52	29
2 Persian Gulf and Gulf of Oman	25	46
3 Caspian Sea Basin	10	15
4 Hamoon	7	2
5 Oroomieh	3	5
6 Sarakhs	3	3

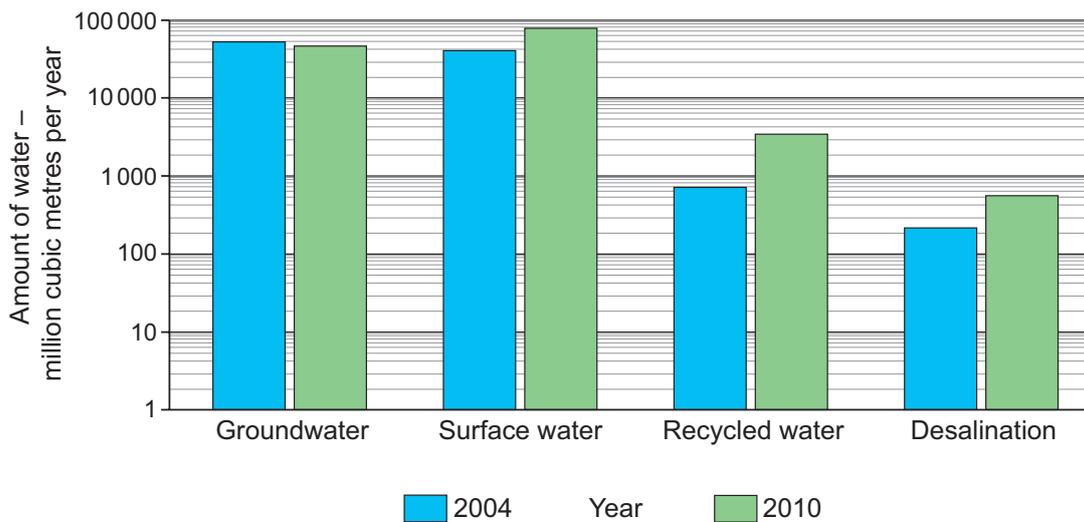
Source: www.fao.org

Figure 7: Available water per capita in Iran since 2002



Source: adapted from www.fao.org

Figure 8: Sources of water in Iran, 2004 and 2010



Surface water is extracted directly from rivers and streams. Dams have been used for thousands of years to hold back the flow of rivers and streams but their number and size have increased over recent years.

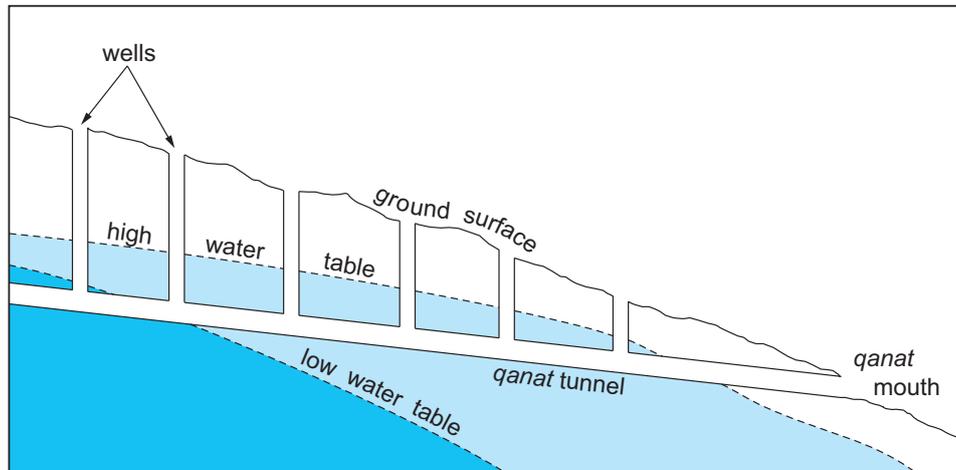
Groundwater is occasionally extracted directly from springs, but most is drawn from wells or from a traditional system called a *qanat*. *Qanats* (see Figure 9, on page 8) are long tunnels dug into hillsides that allow water to be obtained even when the water table is at its lowest after long spells without rain. During wetter periods, water can be drawn from wells when the water table is higher. Groundwater is being used at a faster rate than it is being replenished by 3.8 km³/year.

Water that has been initially used in irrigation is the main source of recycled water.

Desalination is a newly introduced source of water. The Persian Gulf and Gulf of Oman may offer plentiful supplies of desalinated water in the future.

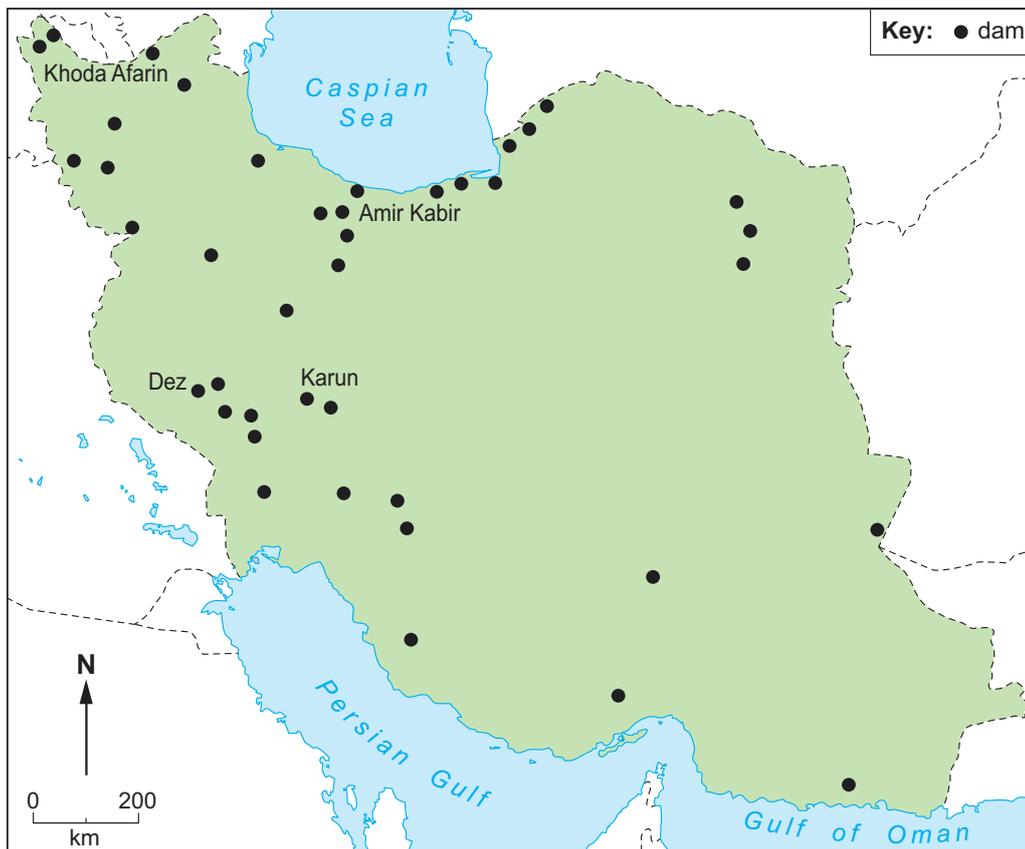
Source: adapted from www.fao.org

Figure 9: The *qanat* system of groundwater extraction



Source: www.fao.org

Figure 10: Major dams in Iran



By 2011 Iran had completed building 100 large dams able to hold 35 km^3 of water. Amongst the largest are those at DeZ (3.3 km^3), Karun (2.2 km^3), Amir Kabir (2.0 km^3) and Khoda Afarin (1.6 km^3).

In the same year, 79 more large dams were under construction. These add up to another 10 km^3 of storage.

Not only do the dams store water but they also help control flooding. Further, almost all of them can generate hydro-power, and the more recent dams have been built primarily for this reason.

Source: adapted from www.iranicaonline.org

Figure 11: Main uses of water in Iran, 2004

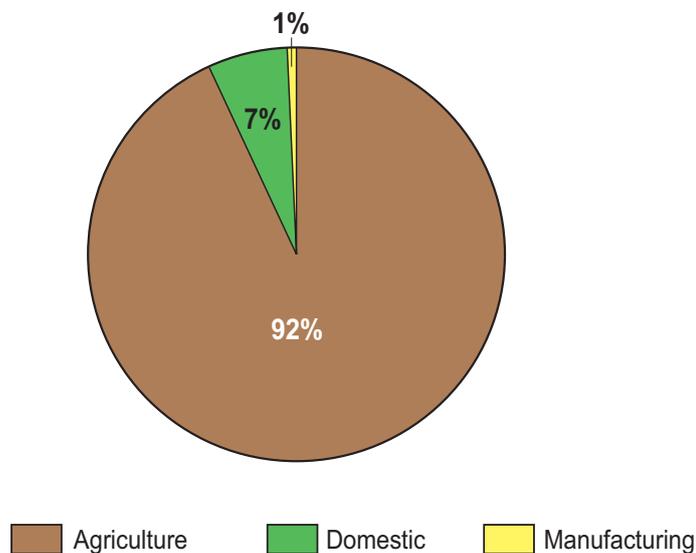


Figure 12: Major uses of irrigated land in Iran

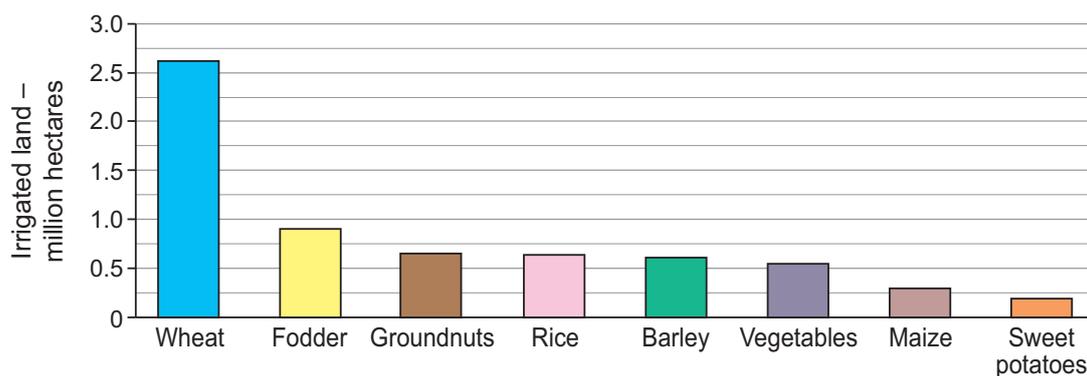


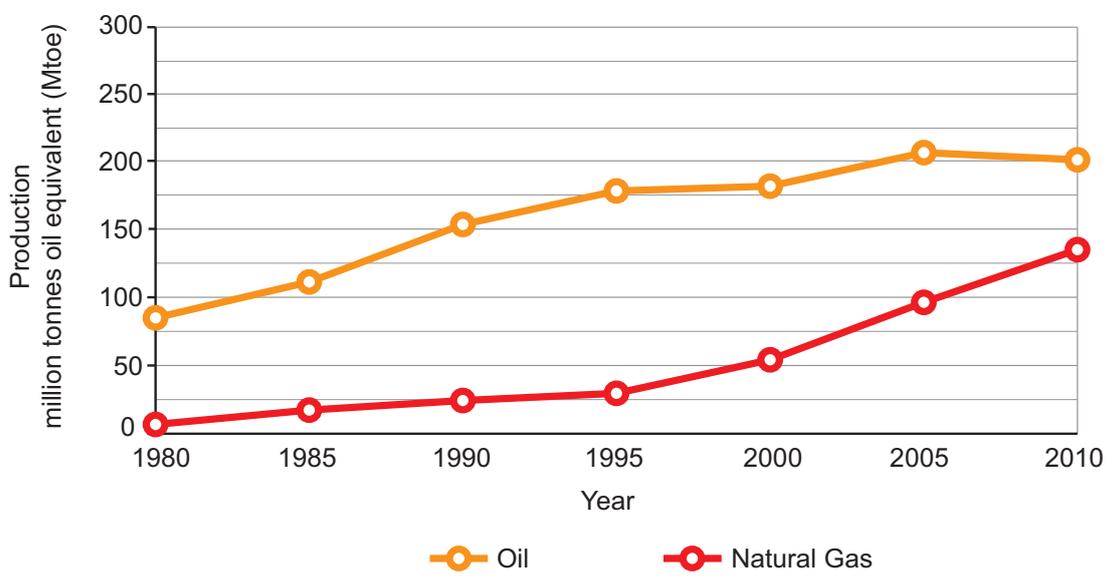
Figure 13: Cost, efficiency and problems of water supplies in Iran

Water source	Cost US\$ per 1 000m ³	Efficiency (% usable)	Problems
Surface water	3 – 5	90	silting
Groundwater	5 – 9	95	depletion
Irrigation water	10 – 15	33	waterlogging, salinisation

Source: www.fao.org

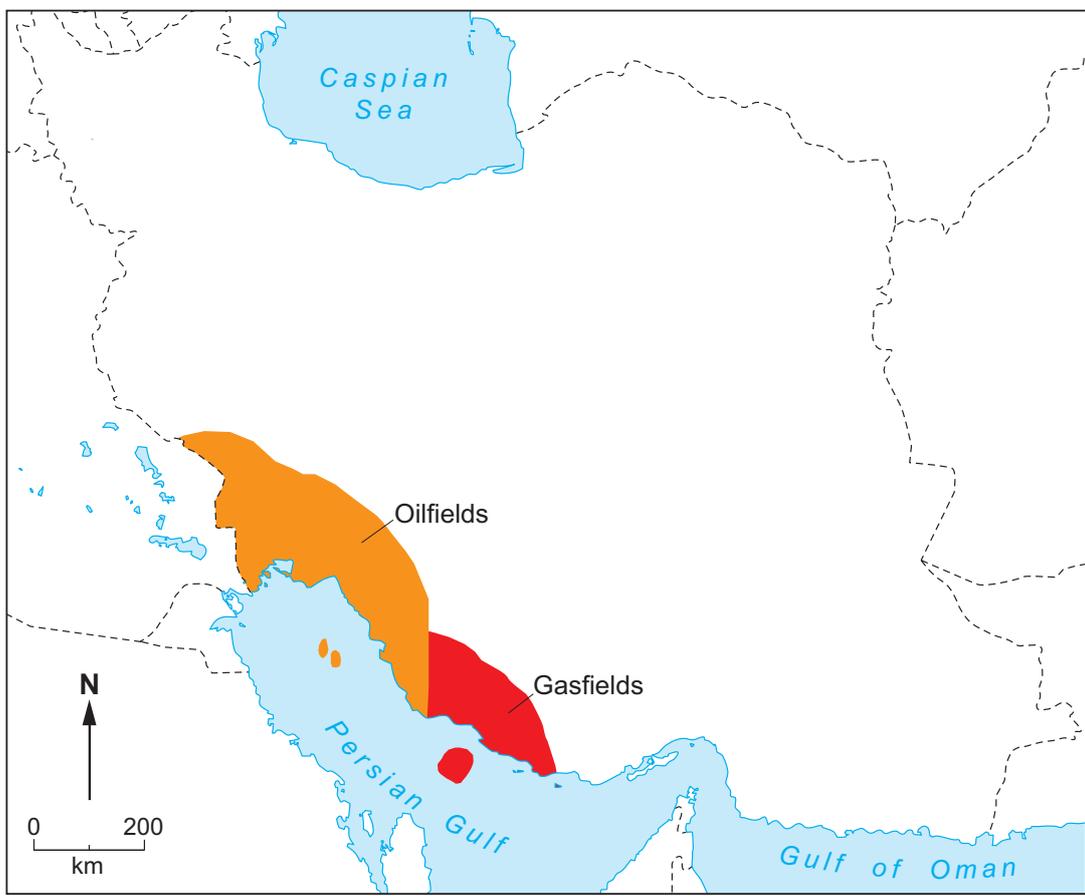
ENERGY IN IRAN

Figure 14: Non-renewable energy production in Iran, 1980–2010

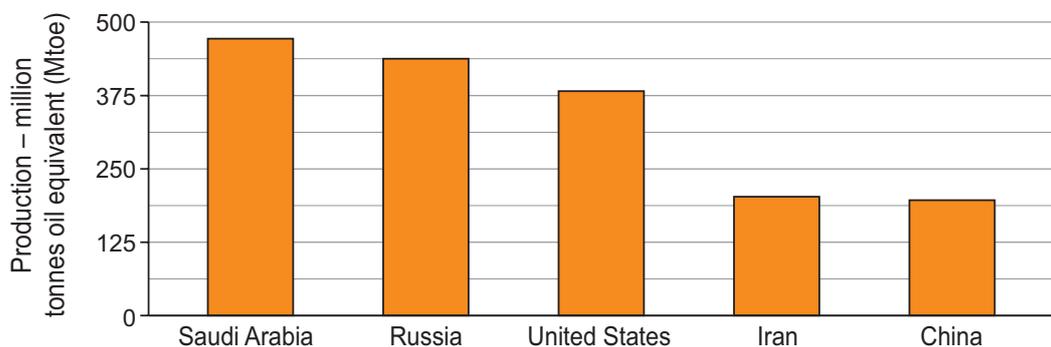
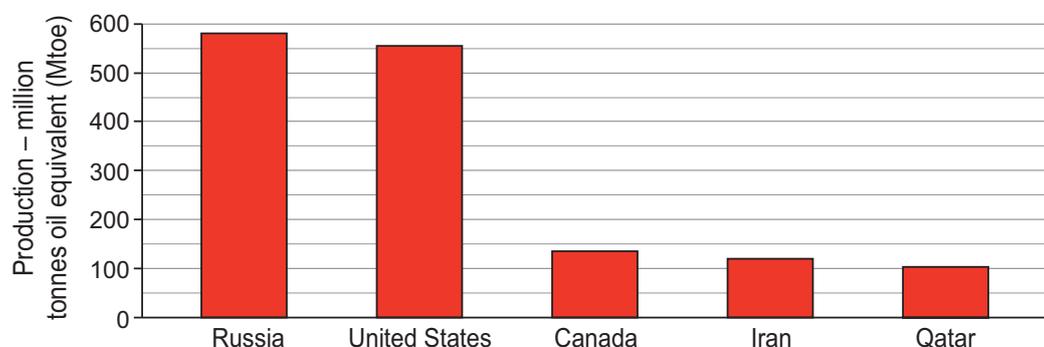


Source: adapted from www.iea.org

Figure 15: Location of oilfields and gasfields in Iran



Source: adapted from parstimes.com

Figure 16: The world's five leading oil producers, 2011**Figure 17: The world's five leading gas producers, 2011**

Source: www.bp.com

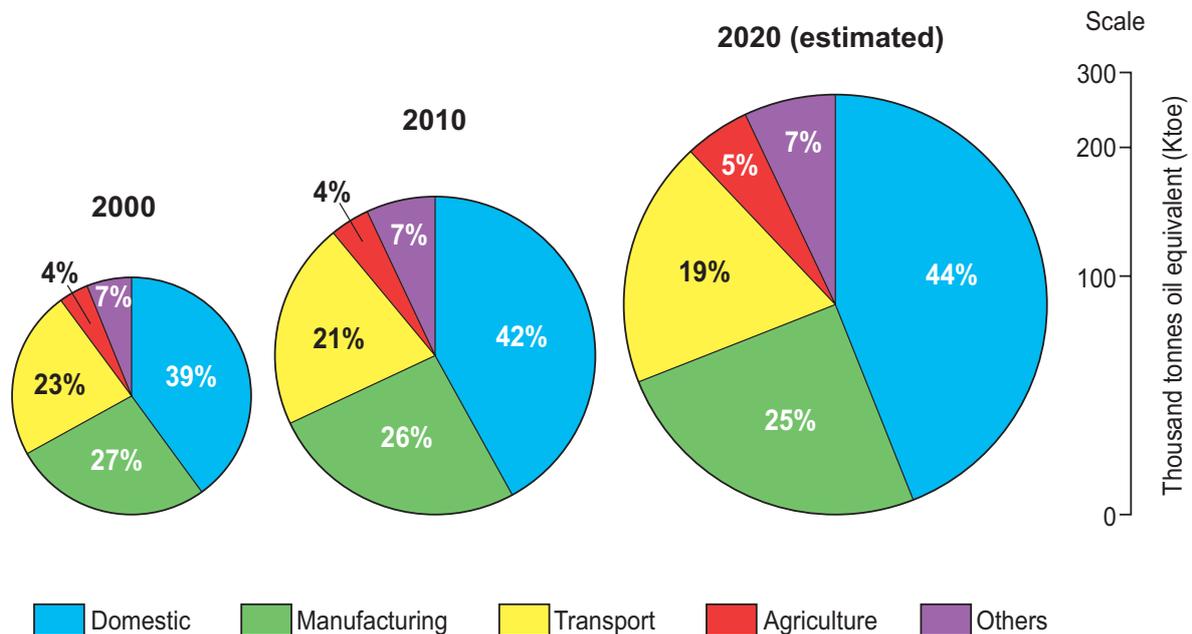
Figure 18: Development indicators for Iran

	Actual				Projected	
	1980	1990	2000	2010	2020	2030
HDI	0.44	0.53	0.64	0.71	0.87	0.92
HDI % change	-	20.5	20.8	10.9	22.5	5.7
GDP/capita US\$ PPP	2974	4489	6799	10865	17609	25533
GDP % change	-	50.9	51.5	59.8	62.1	43.9

For comparison, UK GDP/Capita US\$ 36 090 (2011)

Source: adapted from www.ifs.dv.edu and www.pwc.com

Figure 19: Energy use by sector in Iran



Source: adapted from www.bioline.org

Figure 20: United Nations Development report on Iran, 2012

Overview

The Islamic Republic of Iran is a middle income country. The country as a whole is not considered to be fully developed. The United Nations has set a programme to try to achieve greater development within the country.

The UN country programme is organised around issues in four main areas:

poverty reduction,

environmentally sustainable management,

health especially for HIV/AIDS, tuberculosis and malaria, and

natural disaster management.

The cross-cutting issues of South–South cooperation and sharing of knowledge and expertise through science and technology transfer are included across all programme components.

As a middle income country, Iran is well placed to play a leading role in exchanging knowledge and technical expertise through South–South cooperation, both in the region and globally. UNDP will continue to support Iran in these endeavours, drawing on its vast global knowledge network and established best practices.

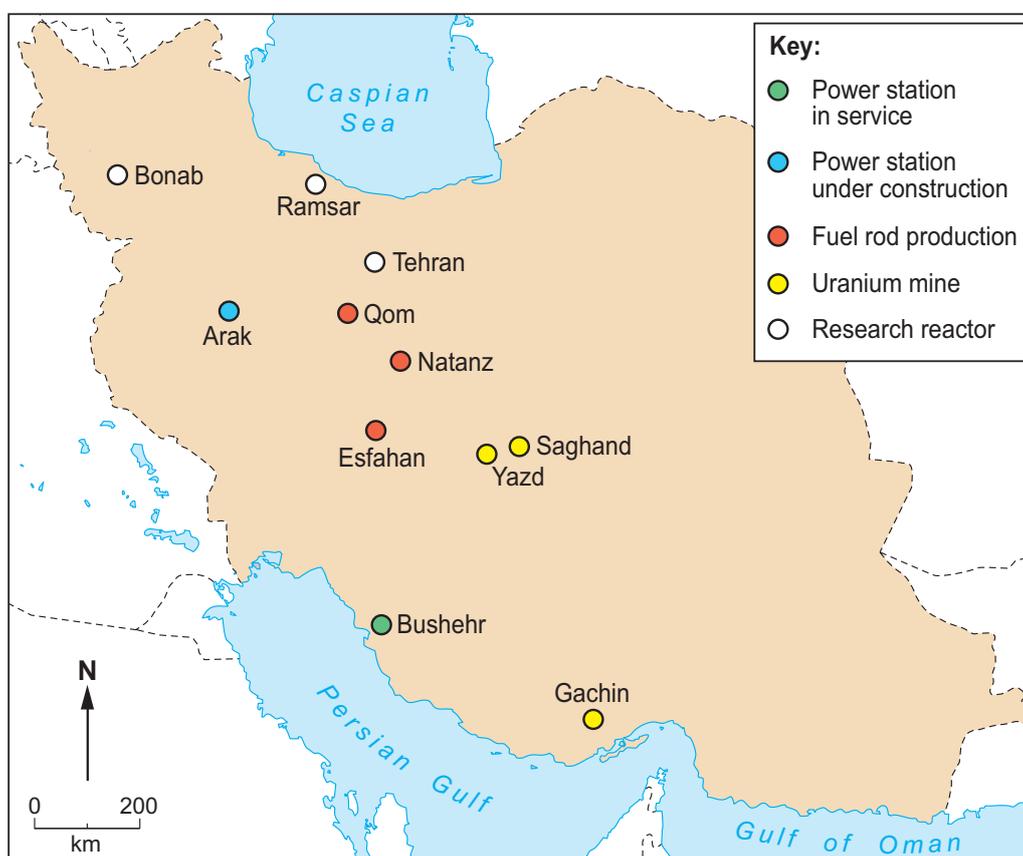
Source: undp.org.ir

Figure 21: Nuclear power in Iran

To help towards the future development of the country, Iran plans to develop nuclear power plants to generate electricity. Below are some of the points to consider for nuclear power.

- Iran is tectonically active
- Power stations have a long life
- Uranium is expensive to import
- CO₂ emissions are very low
- Encourages high-level education
- Uranium can be used for weapons
- Reduces reliance on fossil fuels
- Waste is difficult to dispose of

Source: adapted from www.world-nuclear.org

Figure 22: Nuclear sites in Iran, 2012

Source: www.bbc.co.uk

Figure 23: Number of villages with electricity in Iran, 1990–2015

1990	1995	2000	2005	2010	2015 (estimated)
23 550	32 710	44 204	51 134	68 988	91 305

Source: www.helio-international.org

Figure 24: The Karun III dam in Iran

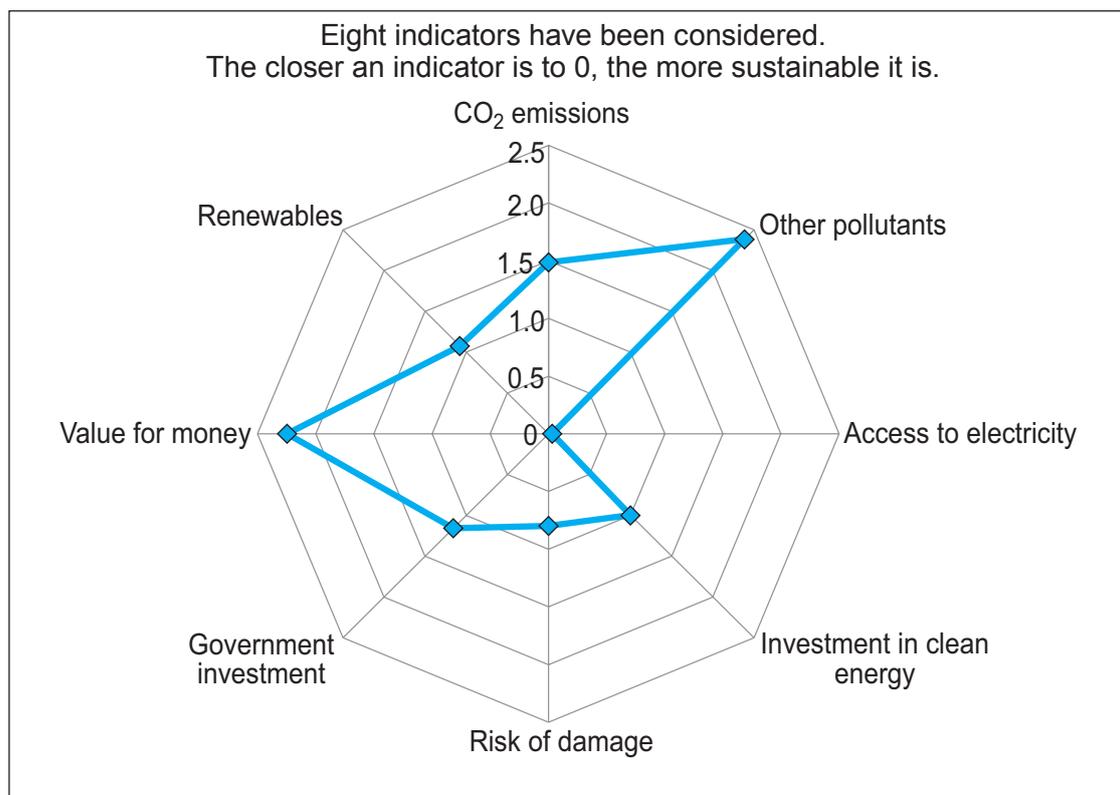


Source: upload.wikimedia.org

Figure 25: Key features of the Karun III dam

- Completed in 2006
- 39 villages lost land
- Flood control downstream
- *Imamzadeh Shair* Shrine relocated
- Supplies 3 million m³ irrigation water per day
- Rock joints and faults sealed with concrete
- Cost US\$ 1.7 billion
- 205 metres high
- Generates 2 280 MW electricity
- Located in earthquake zone
- Supplies 6 000 m³ drinking water per day
- Built on permeable limestone
- Limestone sealed to prevent percolation
- Lake for recreation
- Earthquake tolerance adds extra cost

Source: www.canadianconsultingengineer.com

Figure 26: Energy sustainability in Iran

Source: www.helio-international.org

Figure 27: Impacts of droughts and floods in Iran, 1910–2010

	Number of events	Direct deaths	Indirect deaths	Number made homeless	Total number of people affected	Damage US\$ thousand
Droughts	4	48	6 173	21	62 625 000	9 500 000
Average per drought	-	12	1 543	5	15 656 250	2 375 000
Flood events	61	7 576	582	194 620	3 362 901	3 733 220
Average per flood	-	124	10	3 191	55 130	61 200
Worst drought	2000/2001	14	2 142	8	37 000 000	3 572 220
Worst flood	2001	2 962	798	5 141	1 200 000	225 300

Source: adapted from feweb.vu.nl

Sources of information and copyright

Figure 1	https://www.cia.gov/library/publications/the-world-factbook/geos/ir.html
Figure 2	http://www.britannica.com/EBchecked/media/73655/Population-density-of-Iran
Figure 3	http://www.atozmapsdata.com/zoomify.asp?name=Country/Modern/Z_Iran_Precip
Figure 4	http://www.climate-charts.com/Locations/i/IR40821.php
Figures 5 to 9	http://www.fao.org/nr/water/aquastat/countries_regions/iran/iran_cp.pdf
Figure 10	http://www.iranicaonline.org/articles/ab-iii-the-hydrology-and-water-resources-of-the-iranian-plateau
Figures 11 to 13	http://www.fao.org/nr/water/aquastat/countries_regions/iran/iran_cp.pdf
Figure 14	http://www.iea.org/stats/gasdata.asp?COUNTRY_CODE=IR http://www.iea.org/stats/oildata.asp?COUNTRY_CODE=IR
Figure 15	http://parstimes.com/loil.html
Figures 16 and 17	http://www.bp.com/assets/bp_internet/globalbp/globalbp_uk_english/reports_and_publications/statistical_energy_review_2011/STAGING/local_assets/pdf/statistical_review_of_world_energy_full_report_2012.pdf
Figure 18	http://www.ifs.du.edu http://www.pwc.com
Figure 19	http://www.bioline.org.br/pdf?st04007
Figure 20	http://undp.org.ir/doccenter/mdgs/Country%20Programme%20Presentation%20Document%20Layout.pdf
Figure 21	http://www.world-nuclear.org/info/inf119_nucleariran.html
Figure 22	http://www.bbc.co.uk/news/world-middle-east-11927720
Figure 23	www.helio-international.org/reports/pdfs/Iran-EN.pdf
Figure 24	http://upload.wikimedia.org/wikipedia/commons/thumb/6/69/Karun-3_Dam.JPG/1280px-Karun-3_Dam.JPG
Figure 25	http://www.canadianconsultingengineer.com/news/karun-iii-hydroelectric-development/1000224749/
Figure 26	http://www.helio-international.org/reports/pdfs/Iran_EN.pdf
Figure 27	http://www.feweb.vu.nl/ersa2005/final_papers/563.pdf