



**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**



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1204/01-A

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**Examination copy**

**To be given out at the start of the examination.**

**The pre-release copy must not be used.**

**RESOURCE FOLDER**

1204  
01A.001

#### 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.

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## 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 km<sup>2</sup>, of which 29% is cultivated.

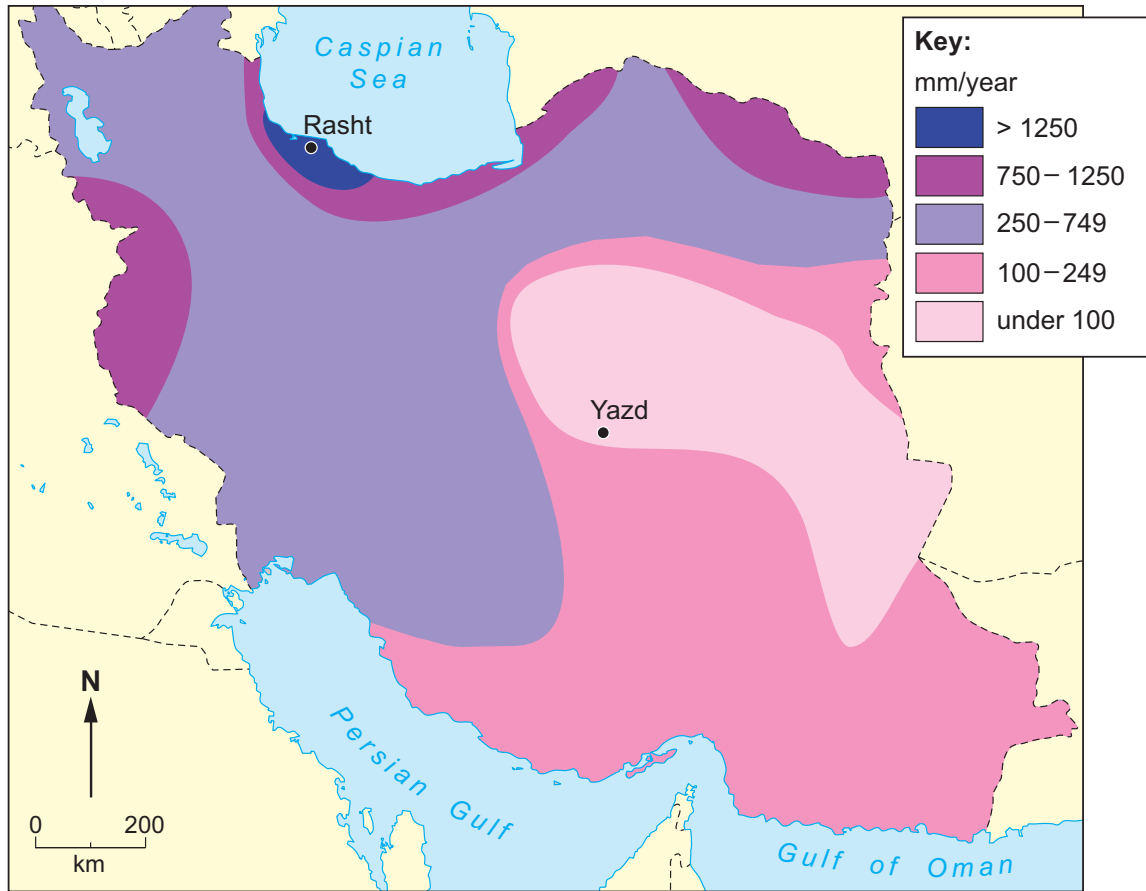
*Source: adapted from www.cia.gov*

**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](http://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](http://www.climate-charts.com)

**Figure 5: The six major water supply areas of Iran**

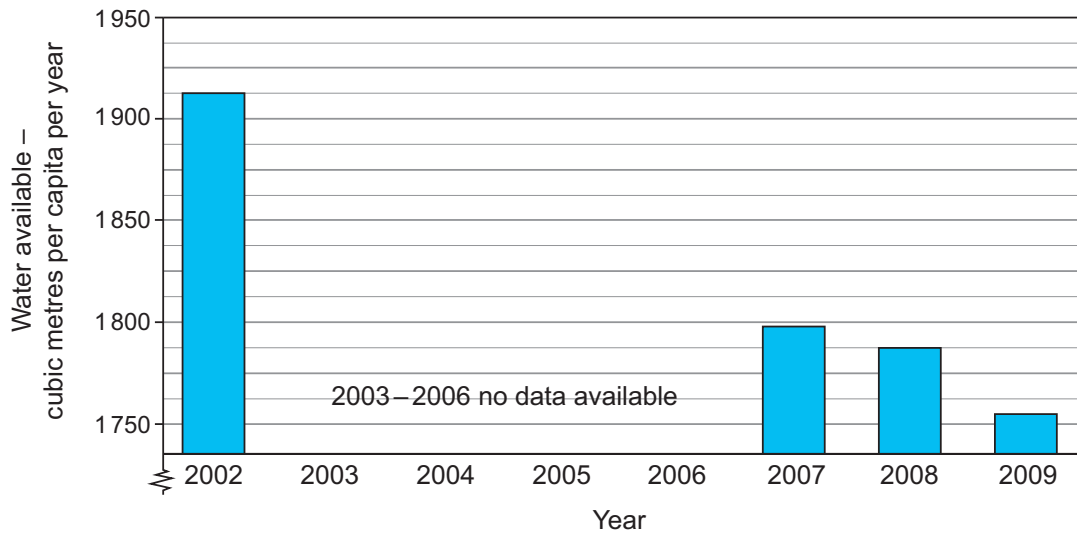


**Figure 6: Area and water supplied by the six major water supply areas**

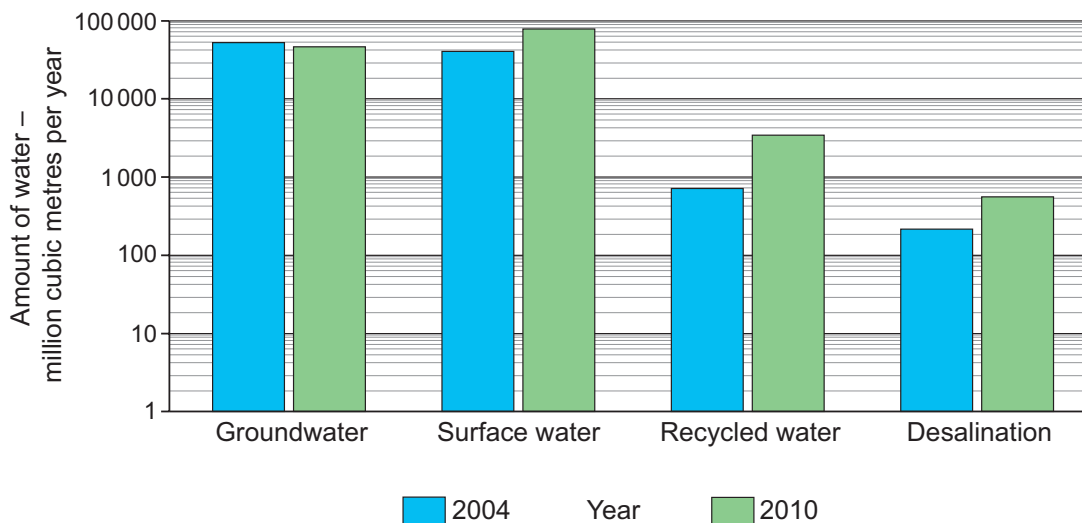
Water supply area	Area of Iran (percentage)	Water supplied to Iran (percentage)
1 Markazi Central Plateau	52	29
2 Persian Gulf and Gulf of Oman	25	46
3 Caspian Sea Basin	10	15
4 Hamoon	7	2
5 Oroomieh	3	5
6 Sarakhs	3	3

Source: [www.fao.org](http://www.fao.org)



**Figure 7: Available water per capita in Iran since 2002**

Source: adapted from [www.fao.org](http://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.

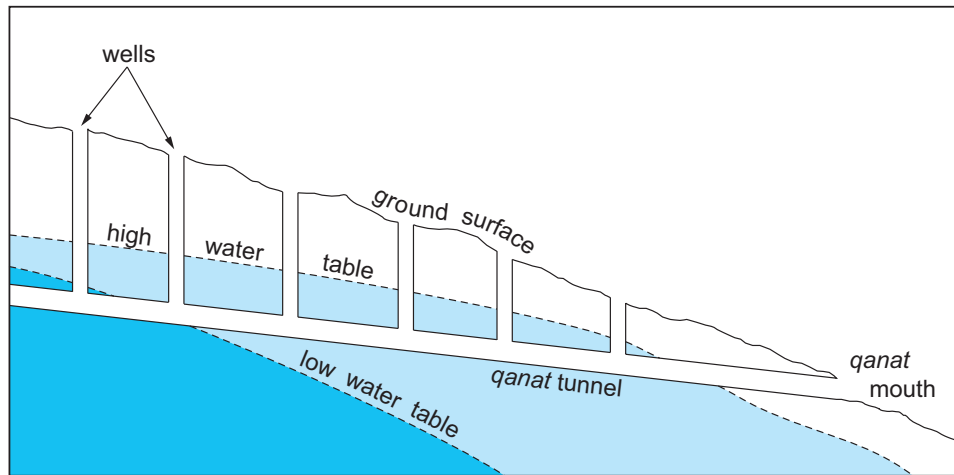
Groundwater is occasionally extracted directly from springs, but most is drawn from wells or from a traditional system called a *qanat*. *Qanats* (see Figure 9, on page 8) are long tunnels dug into hillsides that allow water to be obtained even when the water table is at its lowest after long spells 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  $3.8 \text{ km}^3/\text{year}$ .

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.

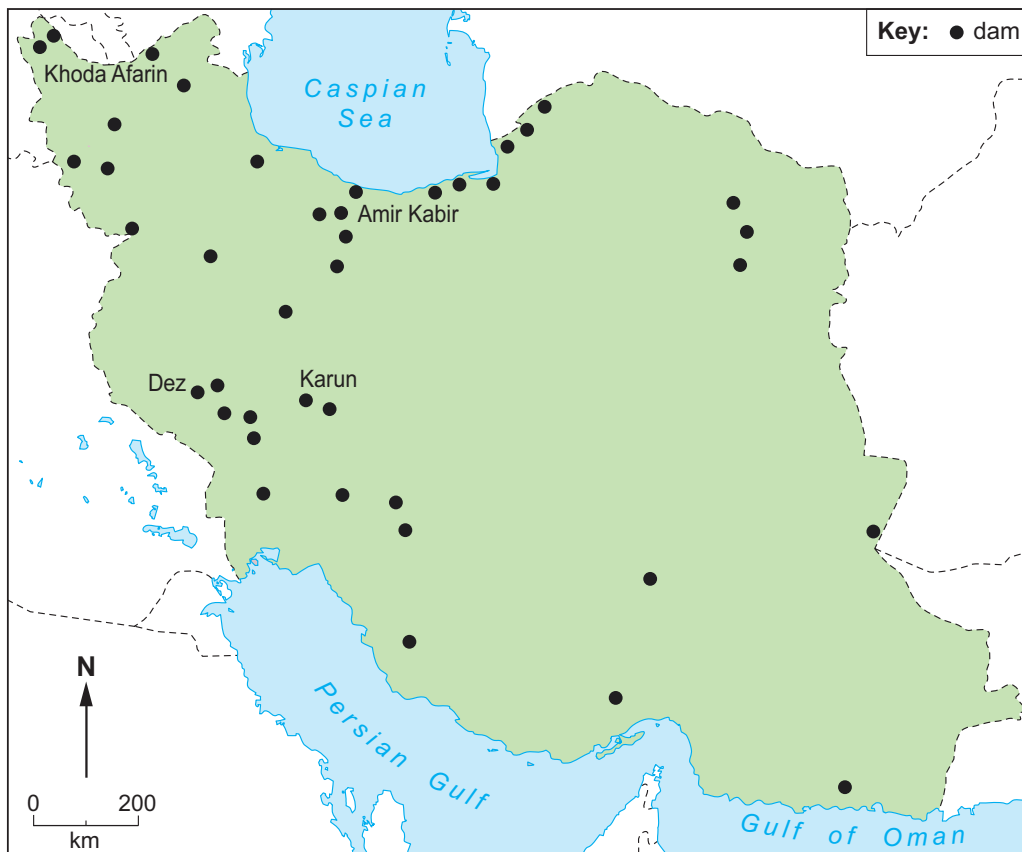
Source: adapted from [www.fao.org](http://www.fao.org)

**Figure 9: The *qanat* system of groundwater extraction**



Source: [www.fao.org](http://www.fao.org)

**Figure 10: Major dams in Iran**



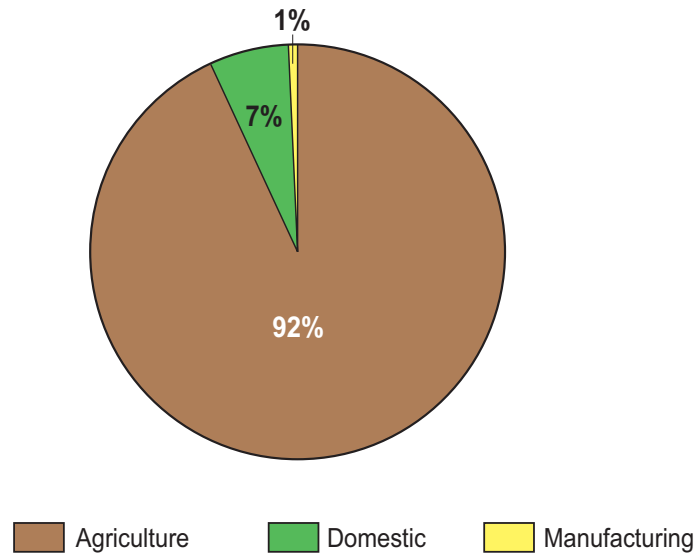
By 2011 Iran had completed building 100 large dams able to hold  $35\text{ km}^3$  of water. Amongst the largest are those at DeZ ( $3.3\text{ km}^3$ ), Karun ( $2.2\text{ km}^3$ ), Amir Kabir ( $2.0\text{ km}^3$ ) and Khoda Afarin ( $1.6\text{ km}^3$ ).

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

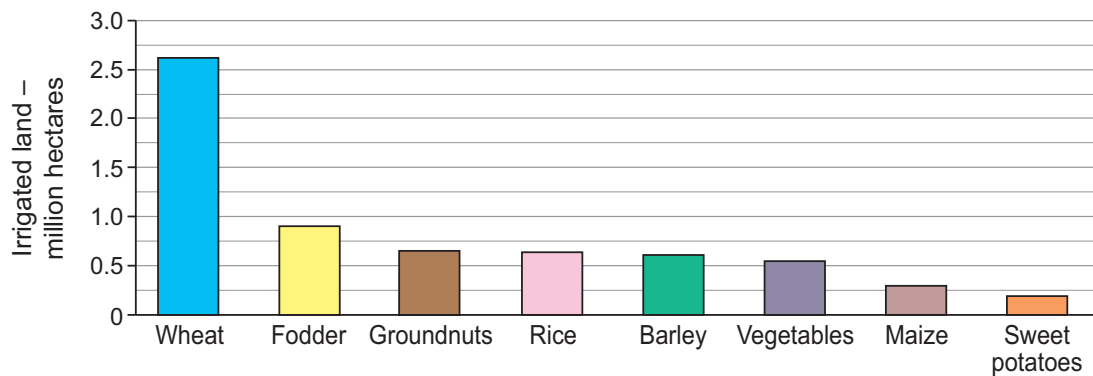
Not only do the dams store water but they also help control flooding. Further, almost all of them can generate hydro-power, and the more recent dams have been built primarily for this reason.

Source: adapted from [www.iranicaonline.org](http://www.iranicaonline.org)

**Figure 11: Main uses of water in Iran, 2004**



**Figure 12: Major uses of irrigated land in Iran**



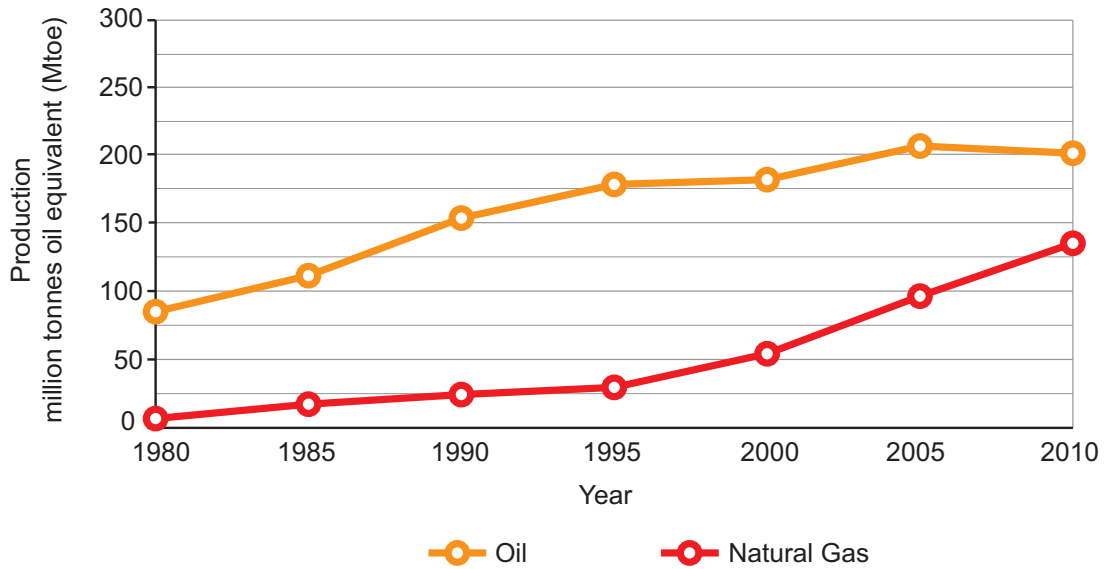
**Figure 13: Cost, efficiency and problems of water supplies in Iran**

Water source	Cost US\$ per 1 000m <sup>3</sup>	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](http://www.fao.org)

**ENERGY IN IRAN**

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

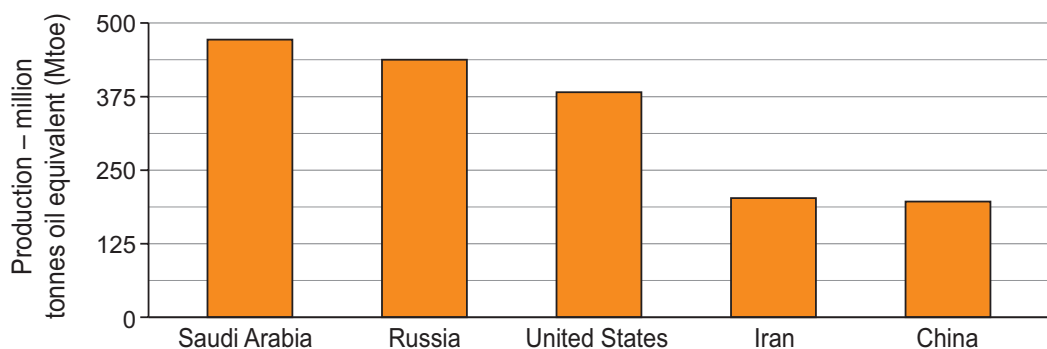
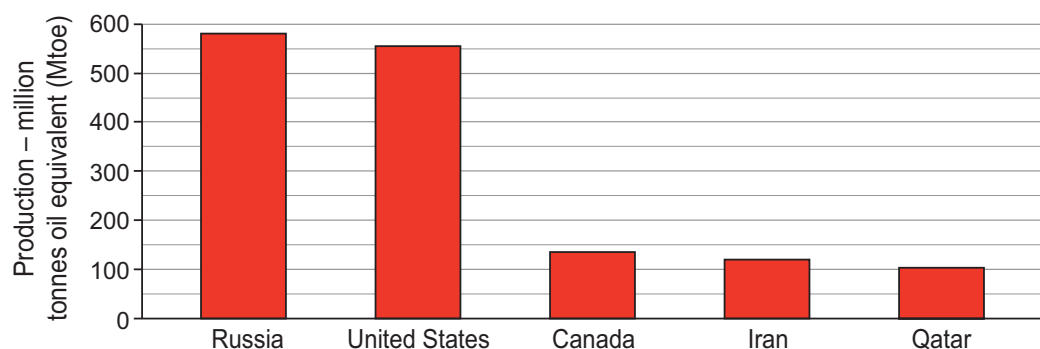


Source: adapted from [www.iea.org](http://www.iea.org)

**Figure 15: Location of oilfields and gasfields in Iran**



Source: adapted from [parstimes.com](http://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](http://www.bp.com)

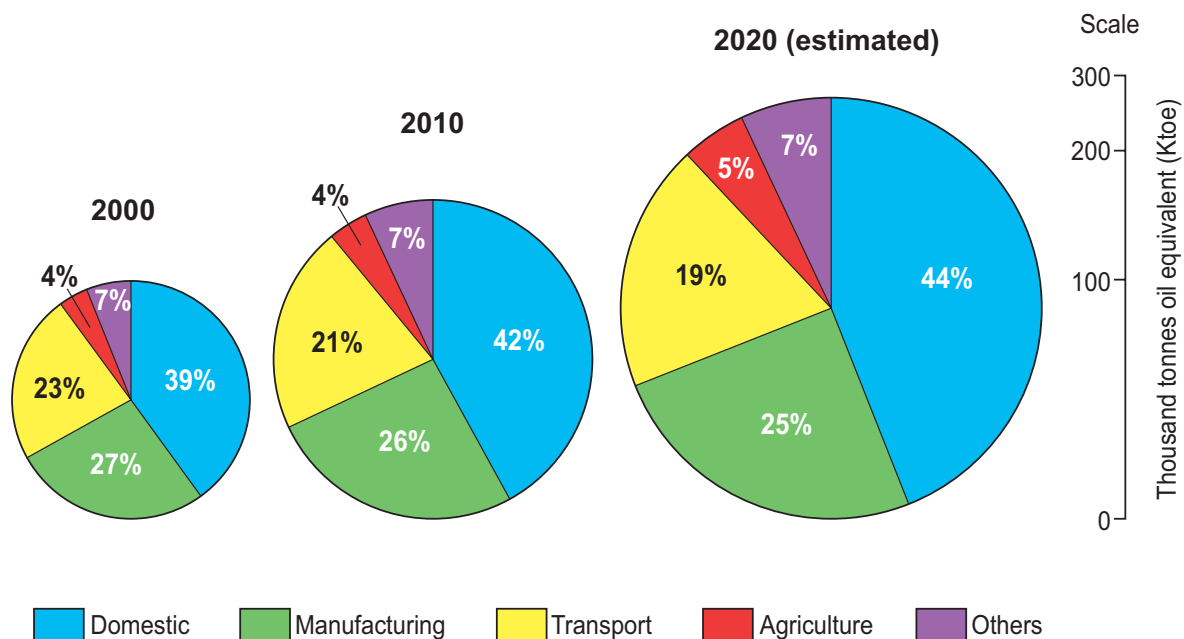
**Figure 18: Development indicators for Iran**

	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](http://www.ifs.dv.edu) and [www.pwc.com](http://www.pwc.com)

**Figure 19: Energy use by sector in Iran**



Source: adapted from [www.bioline.org](http://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.

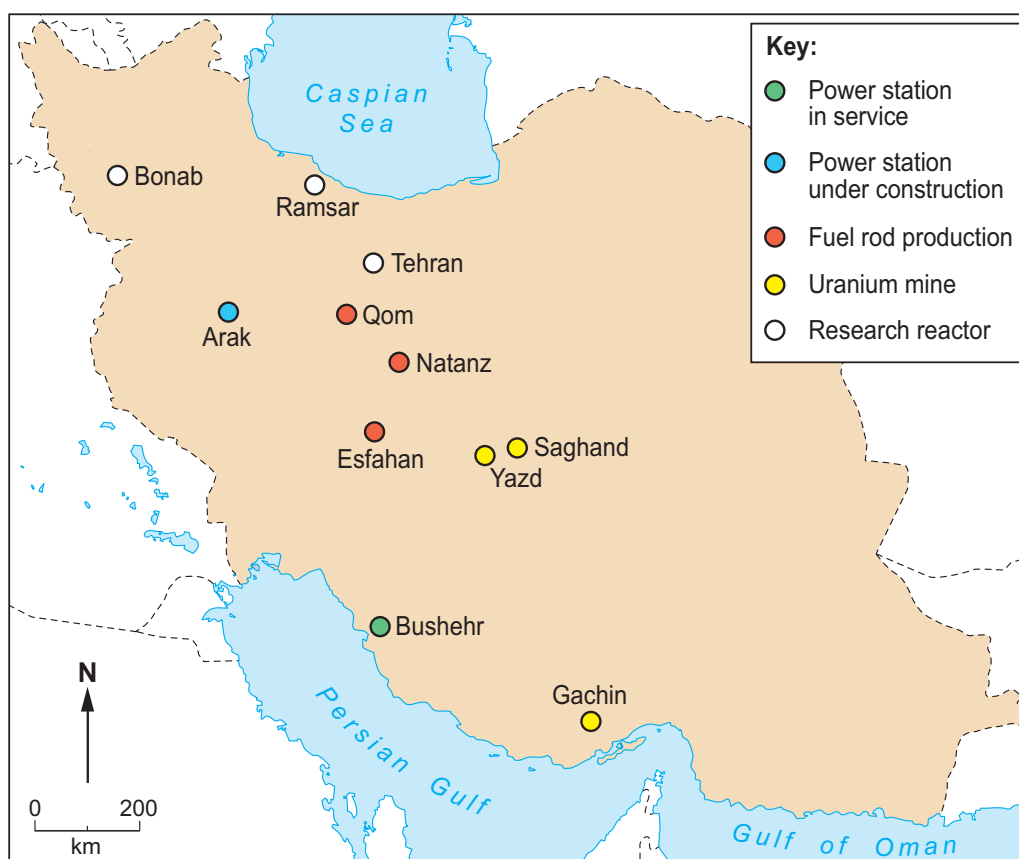
Source: [undp.org.ir](http://undp.org.ir)

**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
- CO<sub>2</sub> 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](http://www.world-nuclear.org)

**Figure 22: Nuclear sites in Iran, 2012**

Source: [www.bbc.co.uk](http://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](http://www.helio-international.org)

**Figure 24: The Karun III dam in Iran**



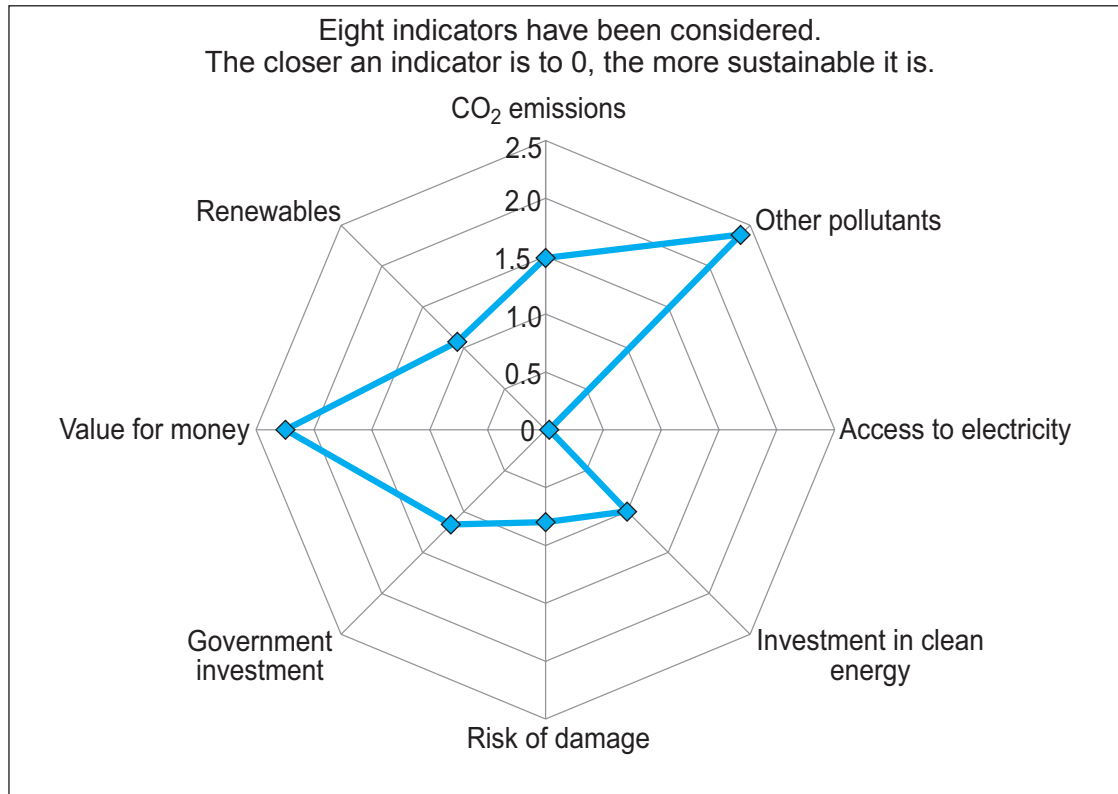
Source: [upload.wikimedia.org](https://upload.wikimedia.org)

**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 m<sup>3</sup> 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 m<sup>3</sup> 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](http://www.canadianconsultingengineer.com)



**Figure 26: Energy sustainability in Iran**

Source: [www.helio-international.org](http://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](http://feweb.vu.nl)

### Sources of information and copyright

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