



GCE A level

1204/01-B



S15-1204-01B

GEOGRAPHY – G4
Sustainability

**Pre-Release Material for examination
on 19 June 2015.**

To be opened on receipt.

**A new copy of this Folder will be
given out in the examination.**

RESOURCE FOLDER

1204
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INSTRUCTIONS TO CANDIDATES

A new copy of this Folder will be given out in the examination. This copy must not be taken into the examination.

Work through this Folder to make sure you understand all the resources. You may seek help from your teachers or any other sources in this context. You have to apply your critical understanding to an unfamiliar situation.

ADVICE TO CANDIDATES

The information in this folder relates to water supplies and their relationship to food production. Much of this information is presented at the global scale. Further information related to food availability and to issues associated with food availability is presented. Information about estimates of the future availability of water supplies is also given.

Guidelines for using the pre-release materials

The contents of the booklet should be studied carefully. The examples given will help in answering some of the questions on the question paper. To give a fuller answer, it is advisable to look at other material before the examination. This could be similar topics, related to information in other countries, or may be the same countries but in greater depth or on closely related topics. It would be particularly useful to note if other case studies seem similar in nature, or if they show contrasting perspectives to those from the material in this Resource Folder.

Some of the resource materials come from Geography textbooks, but others come from companies, pressure groups, research organisations, governments and private individuals. In some cases they are using information to promote their own interests rather than to represent an impartial view. It is worth considering if they are trying to support a particular interest group and persuade readers to agree with them. In finding other materials, it is worth bearing in mind that they might not be presented in an impartial and objective way.

Material in the Resource Folder may often be related to other themes found in G4, and to other units in Geography AS and A2. These links should be noted, as there will be opportunities to refer to such connections with other work in some of your answers. Being able to link together different parts of your Geography studies is important and will be credited. Such linkages are sometimes referred to as 'synopticity'.

Textbooks, journals, good quality newspapers and television and radio programmes are good sources of information. Probably the most accessible source of geographical information is the Internet, but it is also the one which may be most susceptible to bias and lack of impartiality. **Many of the resources are extracted or adapted from sources on the Internet. These sources have the web addresses provided only for copyright reasons. Many are only extracts or shortened versions of fuller documents and some may be inaccessible by the date of the release of this Resource Folder. Following some of these links for greater depth of reading and for more recent updates of material can be helpful but is not essential. It is not the intention that by providing these web addresses every one listed is researched.**

Each candidate will be provided with a copy of the Resource Folder, for use in the examination, at the same time as the question paper is issued at the beginning of the examination on the day set for the paper.

Copies of the Resource Folder with added notes, or notes from research carried out in the previous six weeks, may not be taken into the examination.

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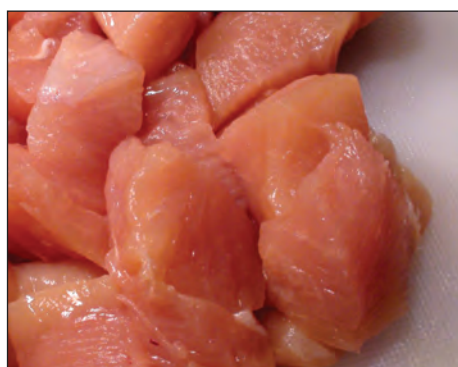
Figure 1: Background data for selected countries and the world

Country	Daily calorie consumption per person (kcal)	Population 2010 millions	Population 2025 millions (estimated)	GDP US\$ (PPP) billions
Belarus	3 090	9.5	9.3	150
Burundi	1 680	8.1	12.4	6
China	2 970	1 354	1 470.8	12 383
India	2 300	1 210.6	1 351.8	4 711
Japan	2 810	127.3	123.8	4 617
UK	3 440	63.2	61.2	2 316
USA	3 770	315.9	346.8	15 653
Yemen	2 030	24.5	48.2	58
World	2 800	6 688	8 004	82 762

Sources: adapted from www.statinfo.biz and other sources

Figure 2: Selected water requirements in food production

As a general rule, to produce 1 calorie of food requires 1 litre of water.



1 kilogram grain
(3 400–3 900 calories)
requires 2 225 litres of water

1 kilogram meat
(1 200–1 700 calories)
requires 10 000 litres of water



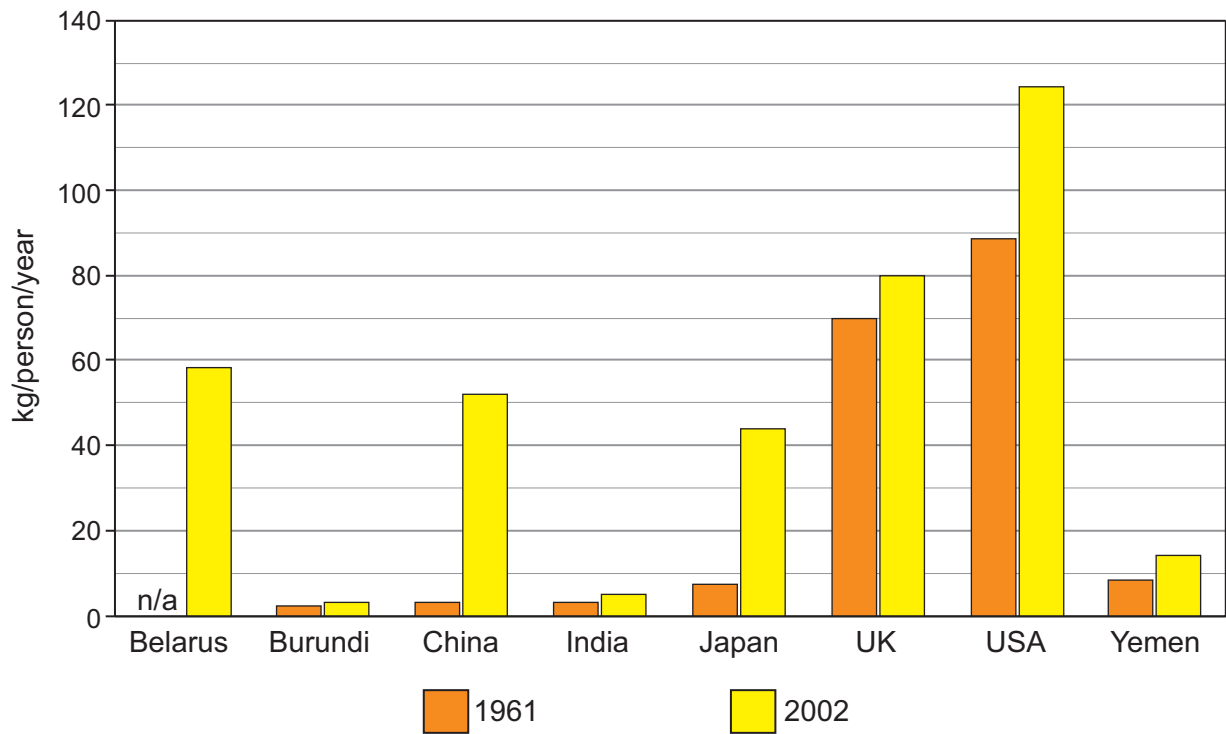
Sources: www.iwmi.cgiar.org and other sources

Figure 3: Change in calorie intake in the world

Daily calorie intake per person has been growing annually throughout the world by 13.75 calories during the last 50 years.

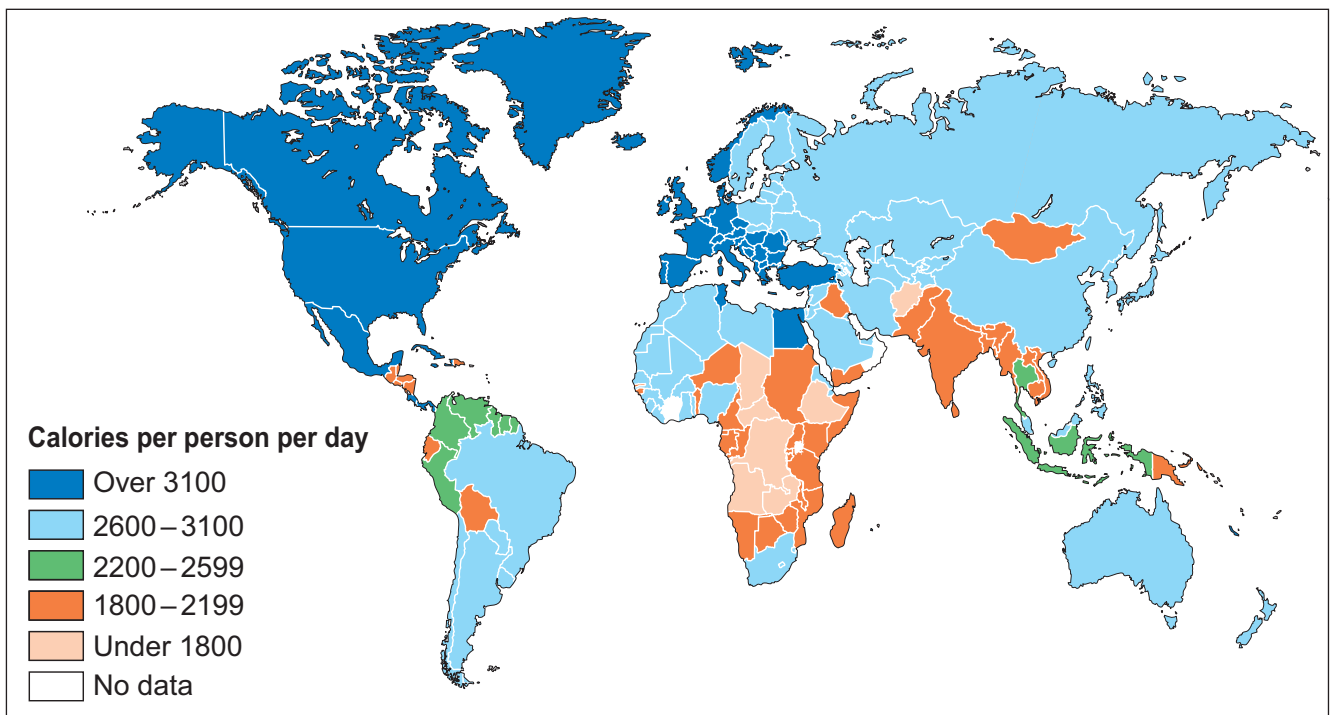
Source: www.iwmi.cgiar.org

Figure 4: Meat consumption for selected countries 1961 and 2002



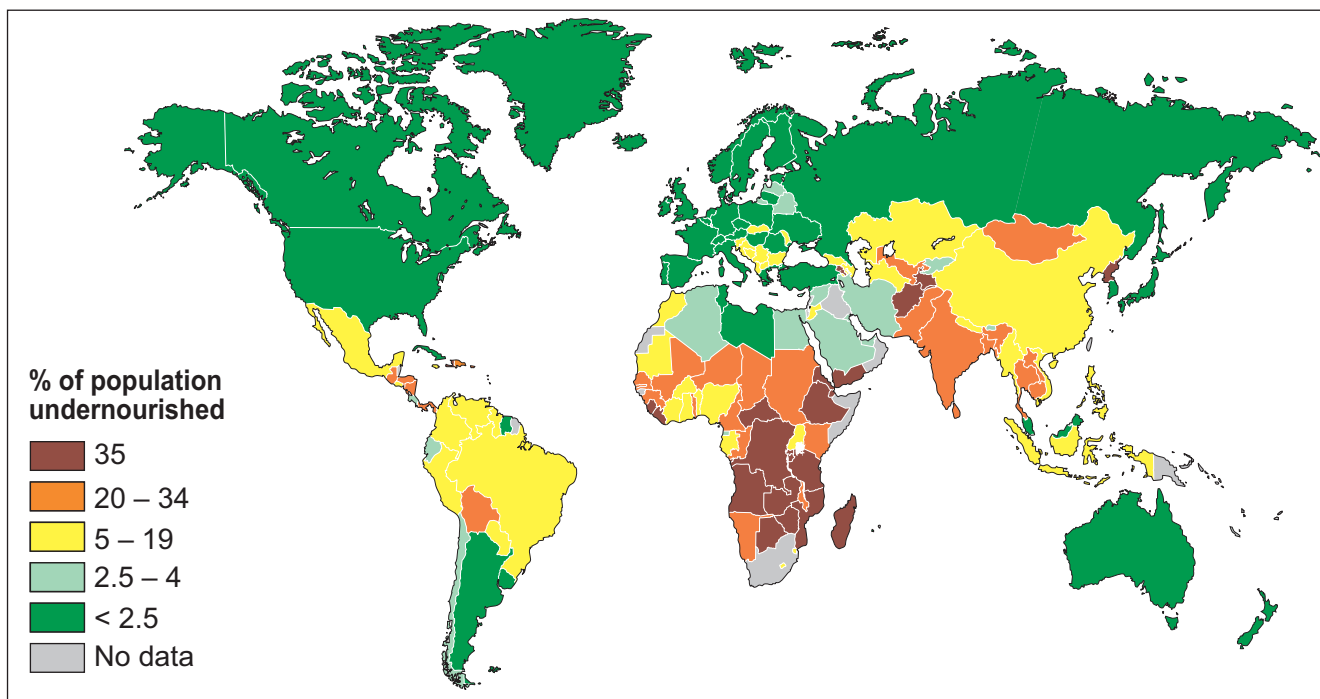
Source: www.guardian.co.uk

Figure 5: Average daily calorie intake by country



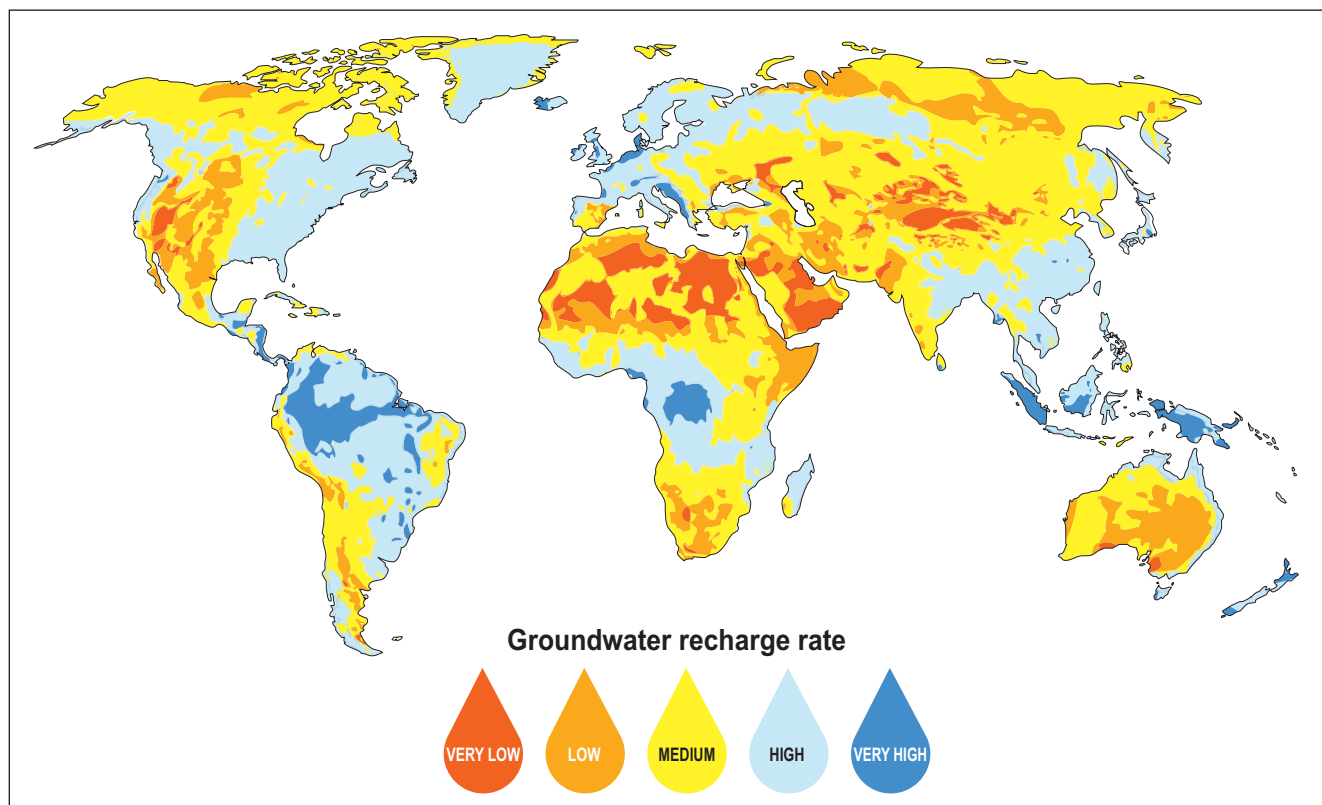
Source: globalist.org.ua

Figure 6: Percentage of population undernourished in each country



Source: www.smithheggumreport.com

Figure 7: Global groundwater recharge rates



Source: adapted from ensia.com

Figure 8: The water cycle

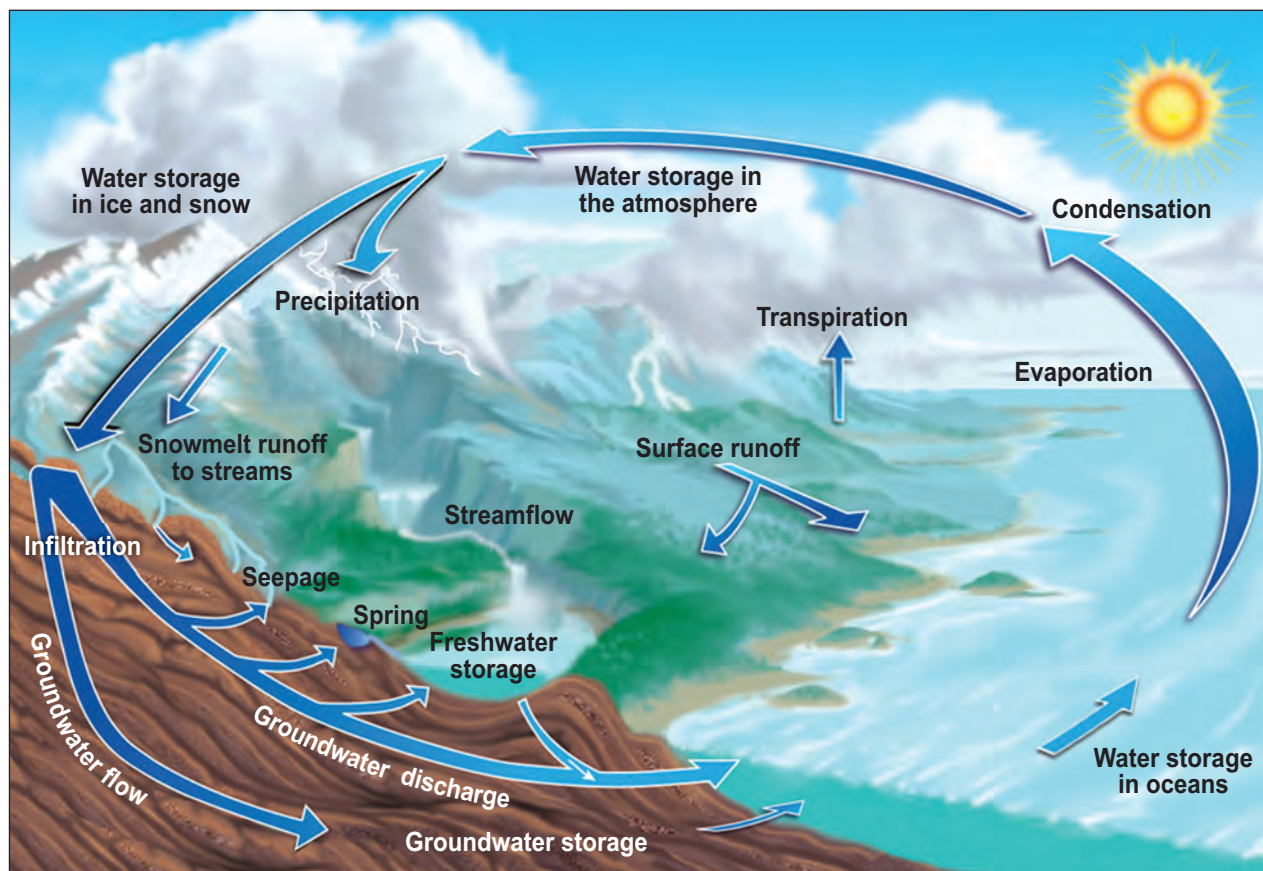
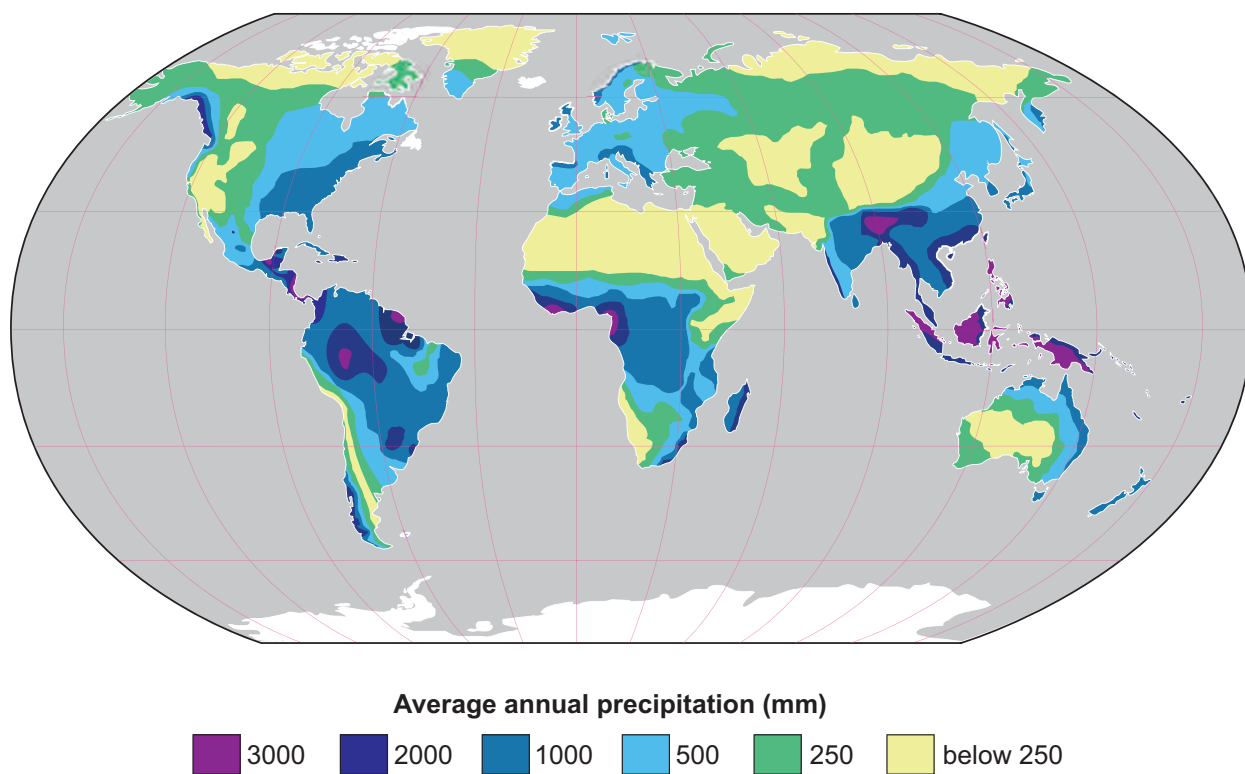
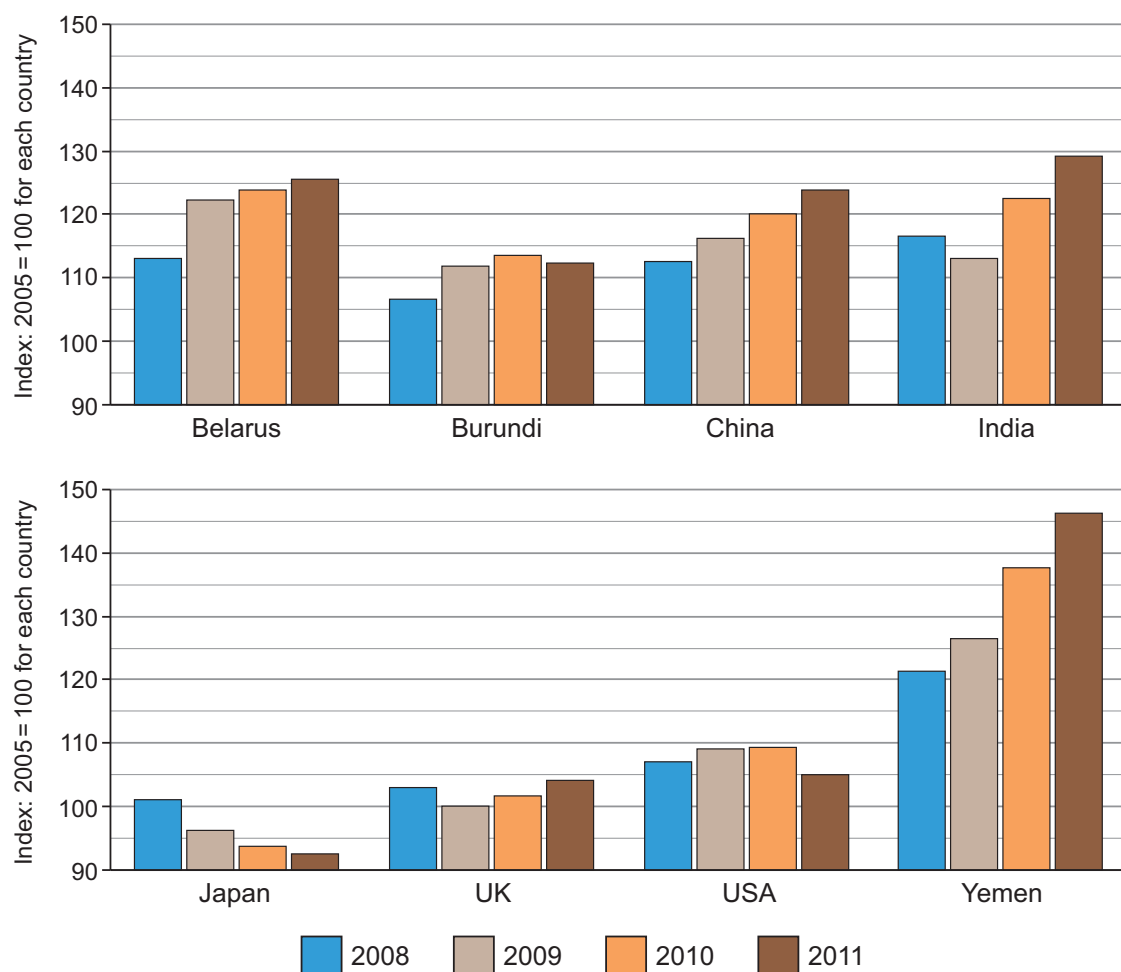
Source: adapted from www.learnnc.org

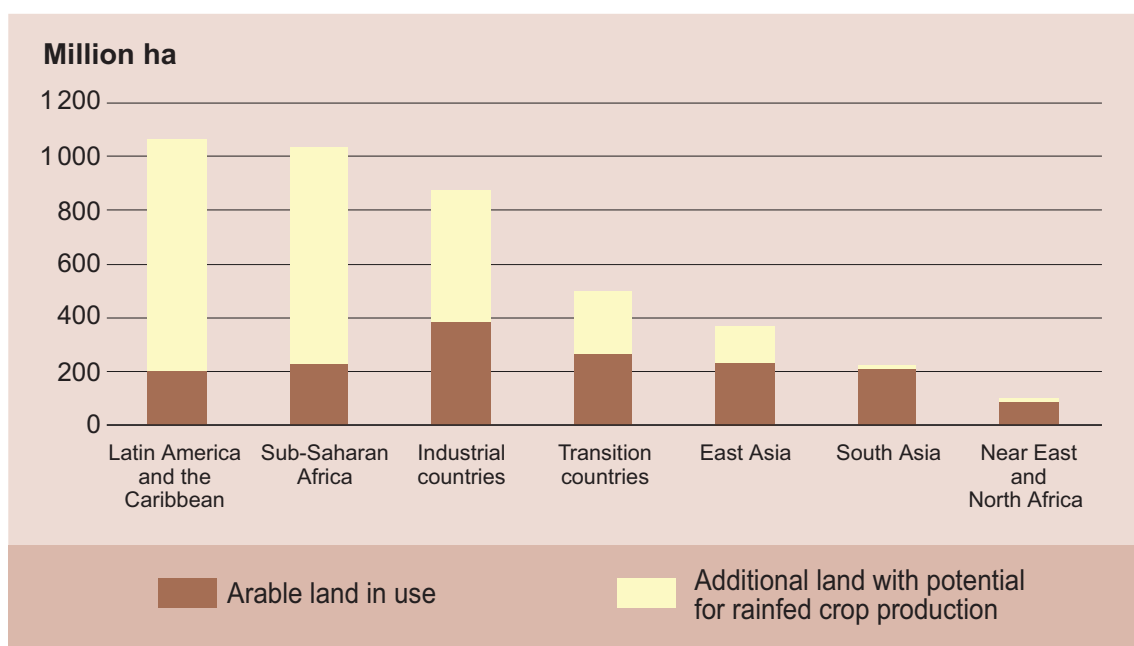
Figure 9: The global rainfall pattern



Source: adapted from Open University

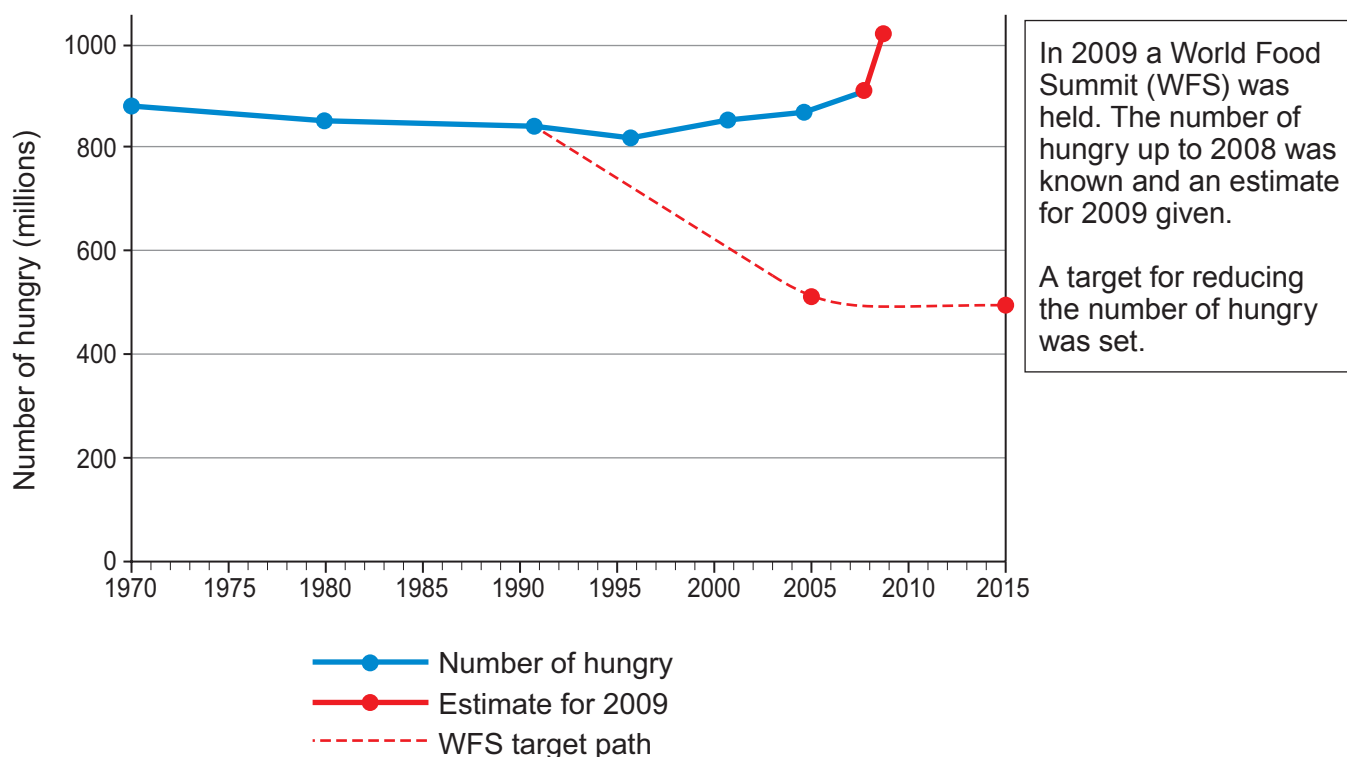
Figure 10: Index of food production for selected countries 2008–2011

Source of data: data.worldbank.org

Figure 11: Food and Agriculture Organization's (FAO) estimate for potential cropland expansion throughout the world

Source: www.fao.org

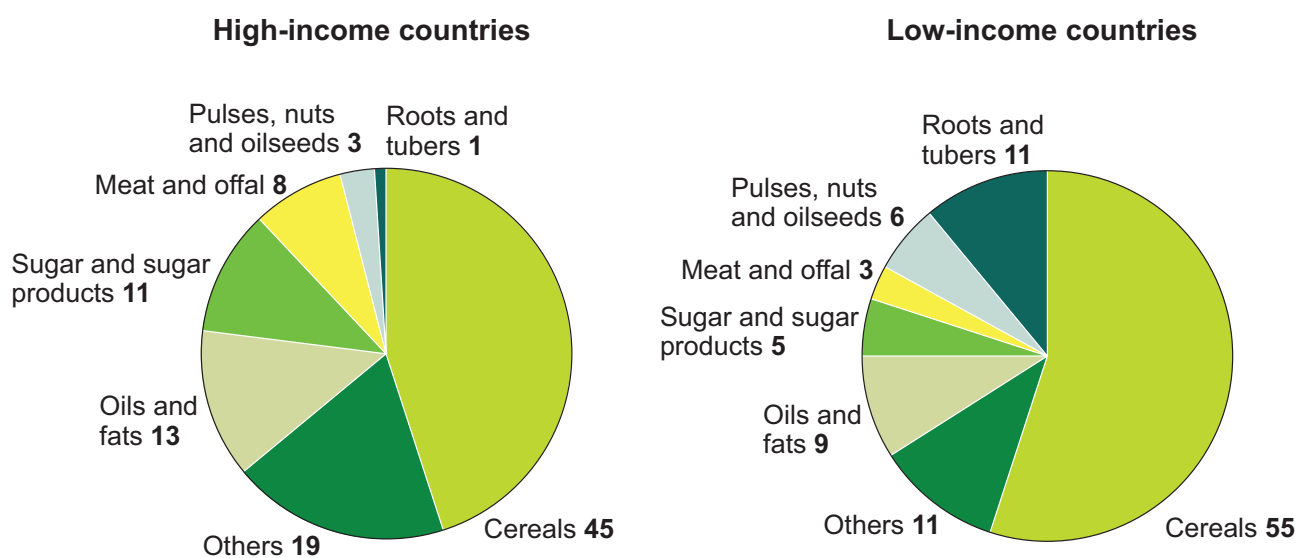
Figure 12: Progress towards reducing number of hungry in the world



Source: www.fao.org

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Figure 13: Sources of dietary energy in high-income and low-income countries by percentage



Source: fao.org

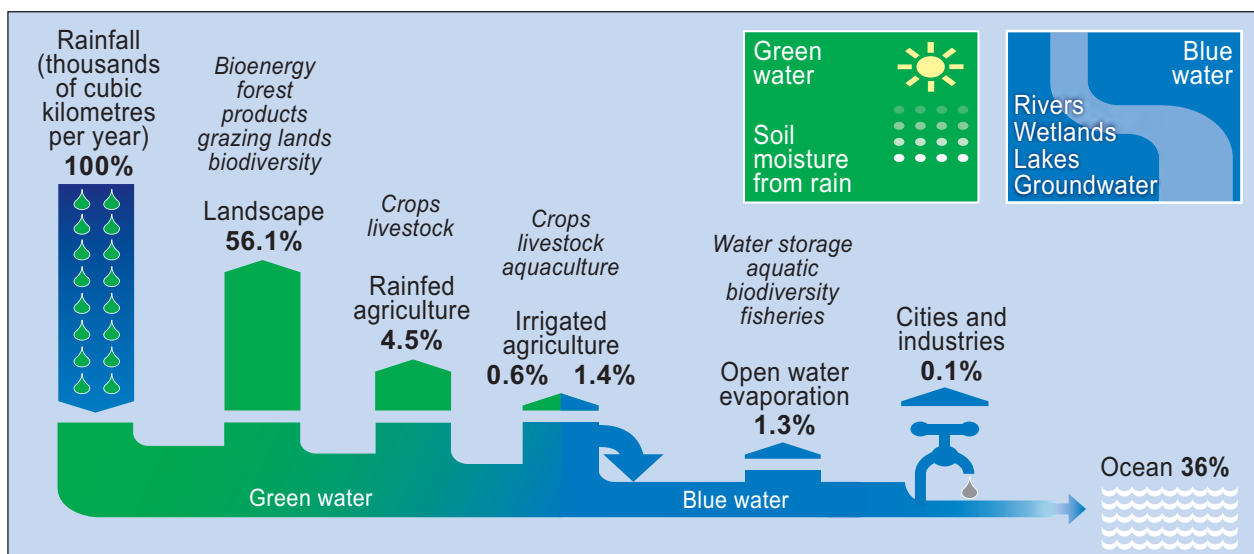
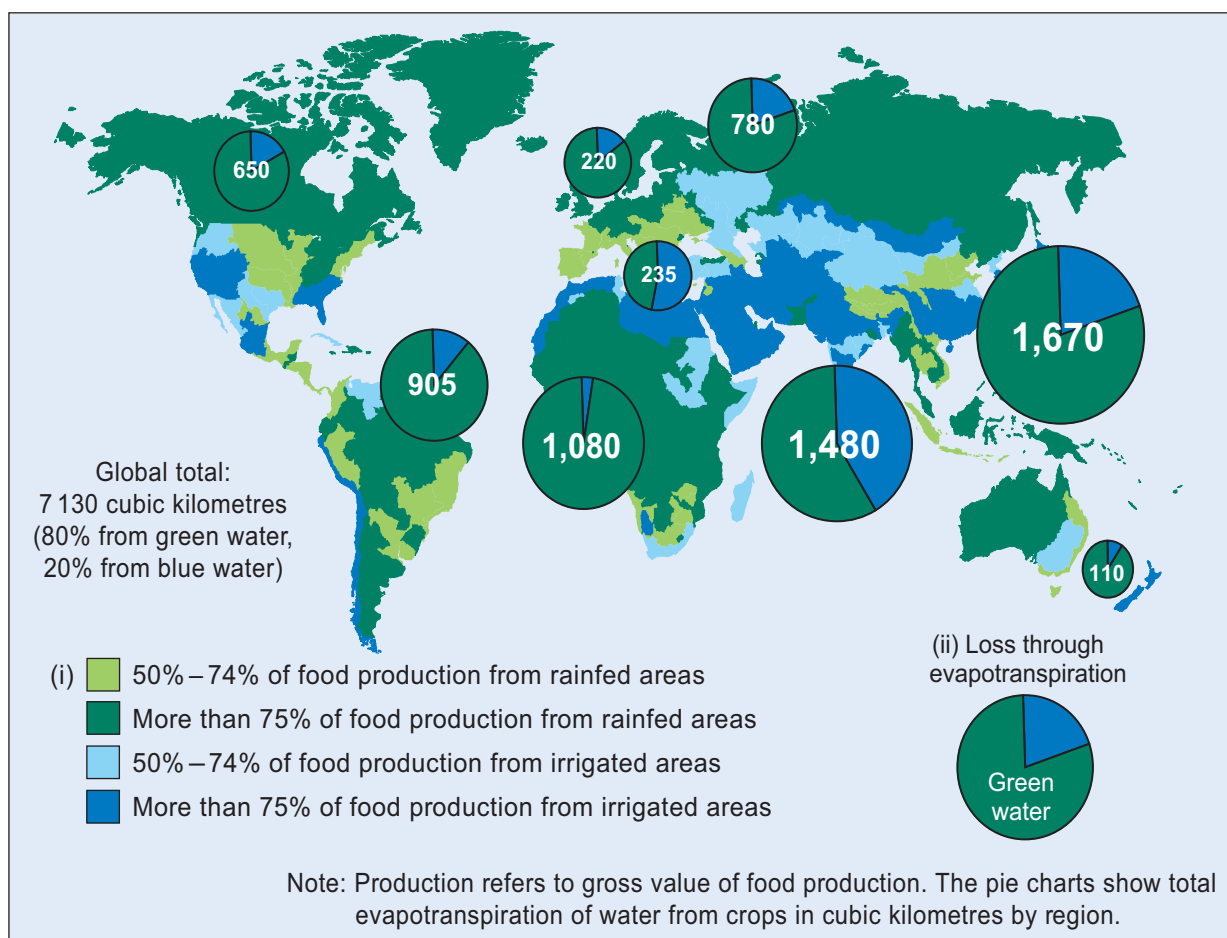
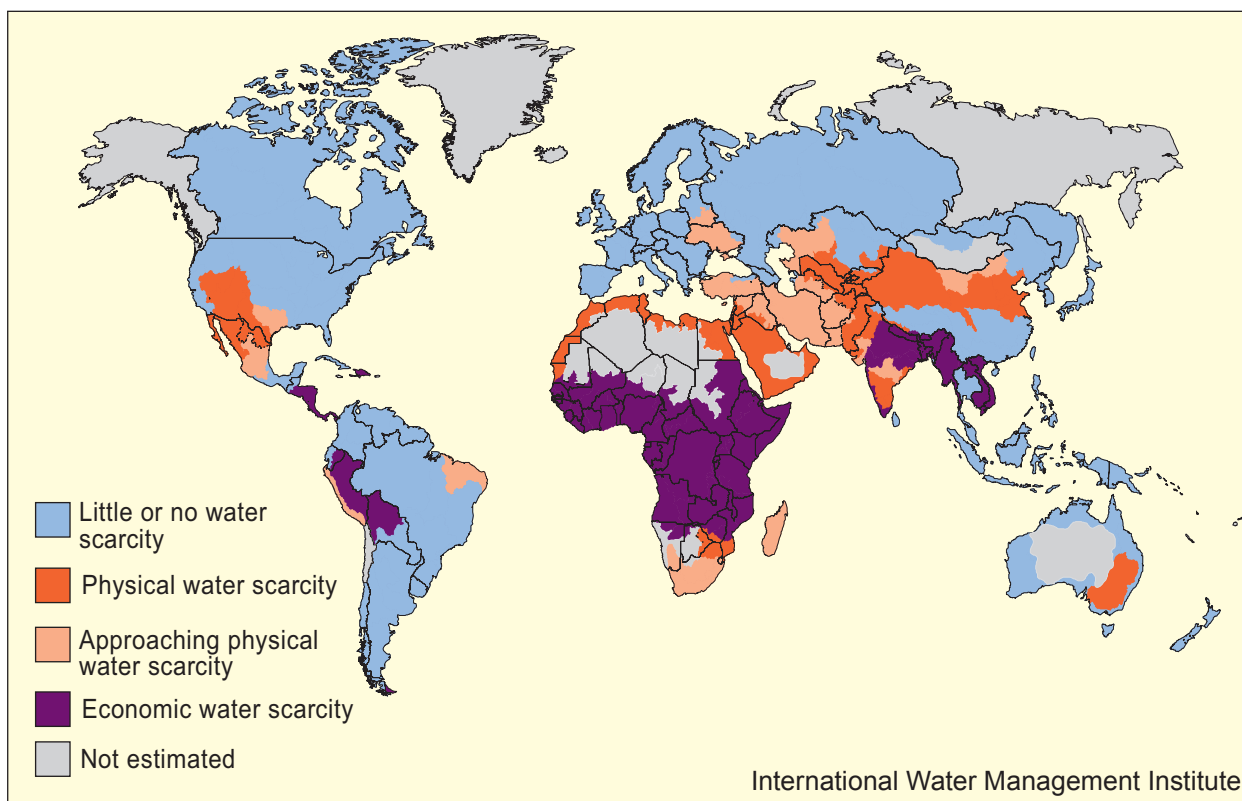
Figure 14: World usage of water including food productionSource: www.iwmi.cgiar.org**Figure 15: Use of green water and blue water (i) and losses through evapotranspiration (ii)**Source: www.iwmi.cgiar.org

Figure 16: Global water scarcity



Definitions and indicators

- **Little or no water scarcity.** Abundant water resources relative to use, with less than 25% of water from rivers withdrawn for human purposes.
- **Physical water scarcity (water resources development is approaching or has exceeded sustainable limits).** More than 75% of river flows are withdrawn for agriculture, industry, and domestic purposes (accounting for recycling of return flows).
- **Approaching physical water scarcity.** More than 60% of river flows are withdrawn. These basins will experience physical water scarcity in the near future.
- **Economic water scarcity (human, institutional, and financial capital limit access to water even though water in nature is available locally to meet human demands).** Water resources are abundant relative to water use, with less than 25% of water from rivers withdrawn for human purposes, but malnutrition exists.

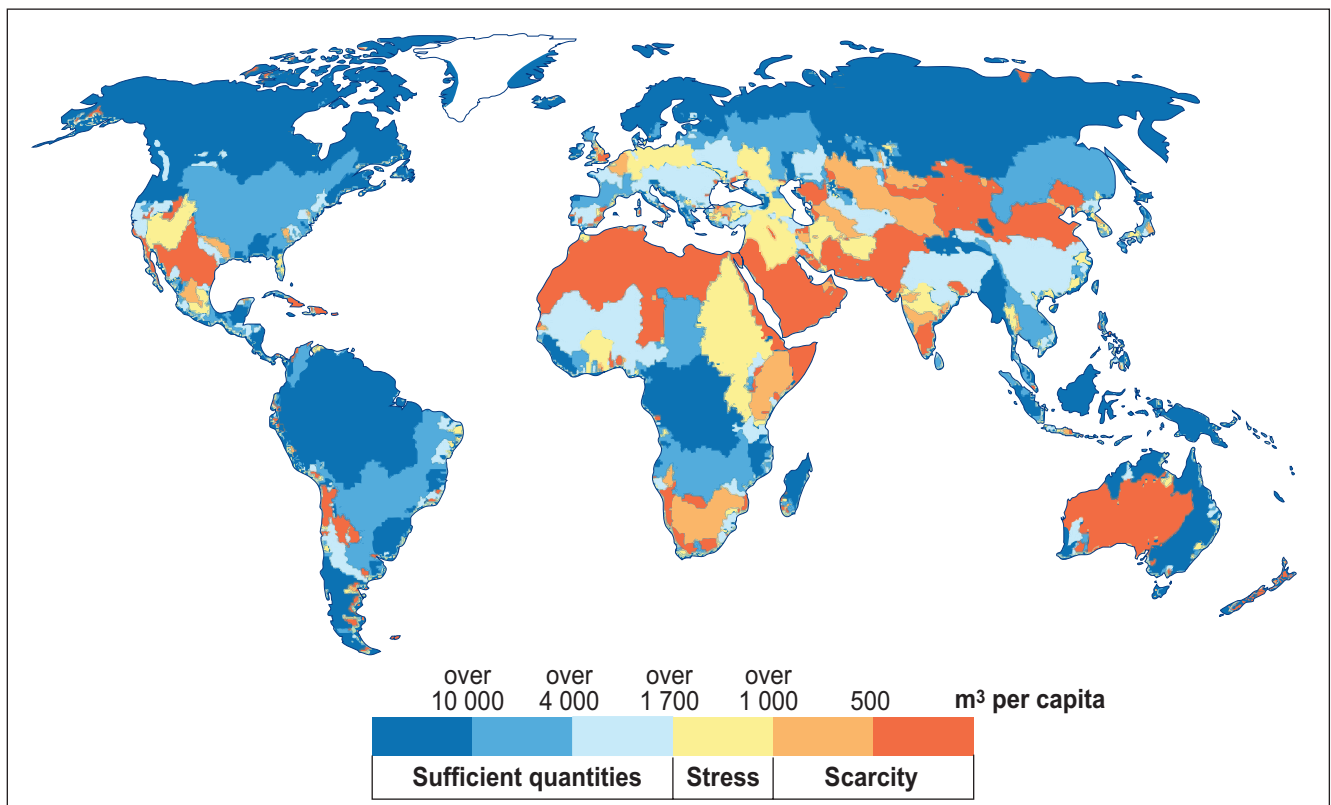
Source: [news.bbc.co.uk](https://www.bbc.com/news/science-environment-2016-05)

Figure 17: Other challenges to water supply

- Change from fossil fuels to biofuels – will increase evapotranspiration
- Urbanisation – urban lifestyles are more demanding in terms of washing, cleaning and heating/cooling
- Climate change
 - 1 rising temperatures will increase evapotranspiration
 - 2 water requirements of crops and animals will increase
 - 3 patterns of rainfall distribution are likely to change

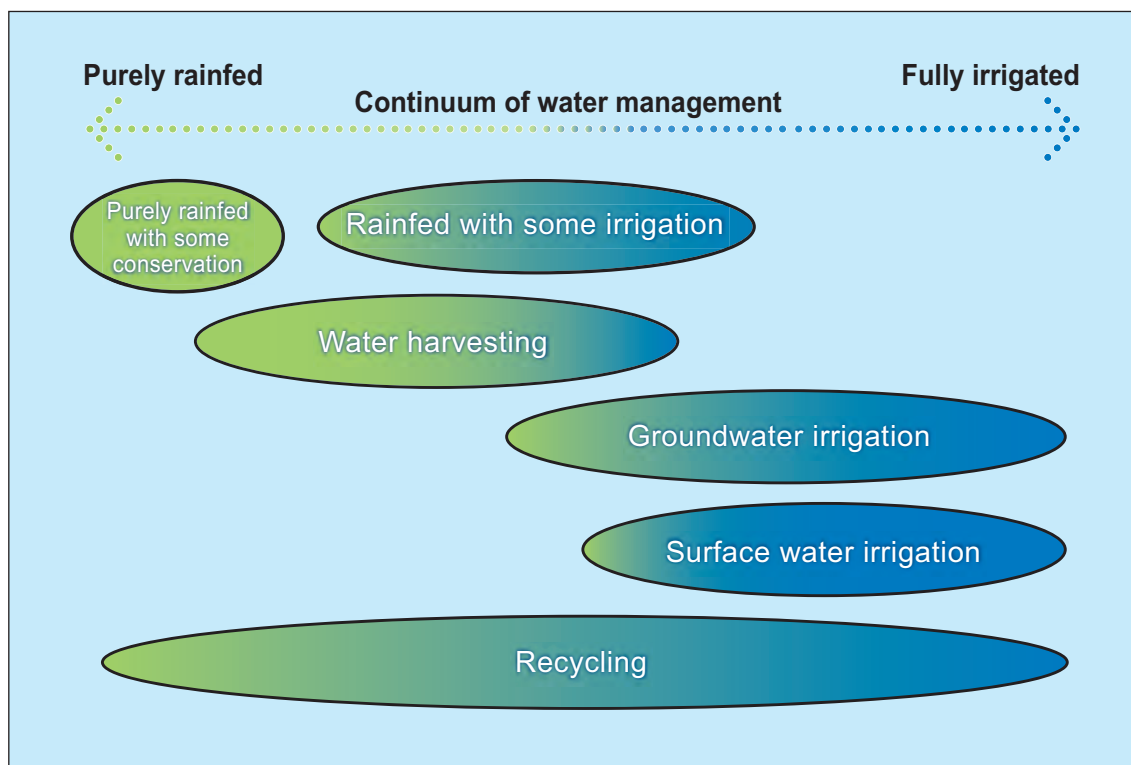
Source: adapted from news.bbc.co.uk

Figure 18: Freshwater availability predicted for 2025



Source: pm22100.net

Figure 19: Options for agricultural water management



Managing water for agriculture includes a spectrum of options – from producing under fully irrigated to purely rainfed conditions in order to support livestock, forestry, and fisheries, and to interact with important ecosystems. The continuum of water management practices starts with fields or grazing land entirely dependent on rainwater. On-farm conservation practices focus on storing water in the soil. Moving along the continuum, more surface water or groundwater is added to enhance crop production. This additional freshwater provides opportunities for multiple uses, including aquaculture and livestock within the production system.

Source: adapted from www.iwmi.cgiar.org

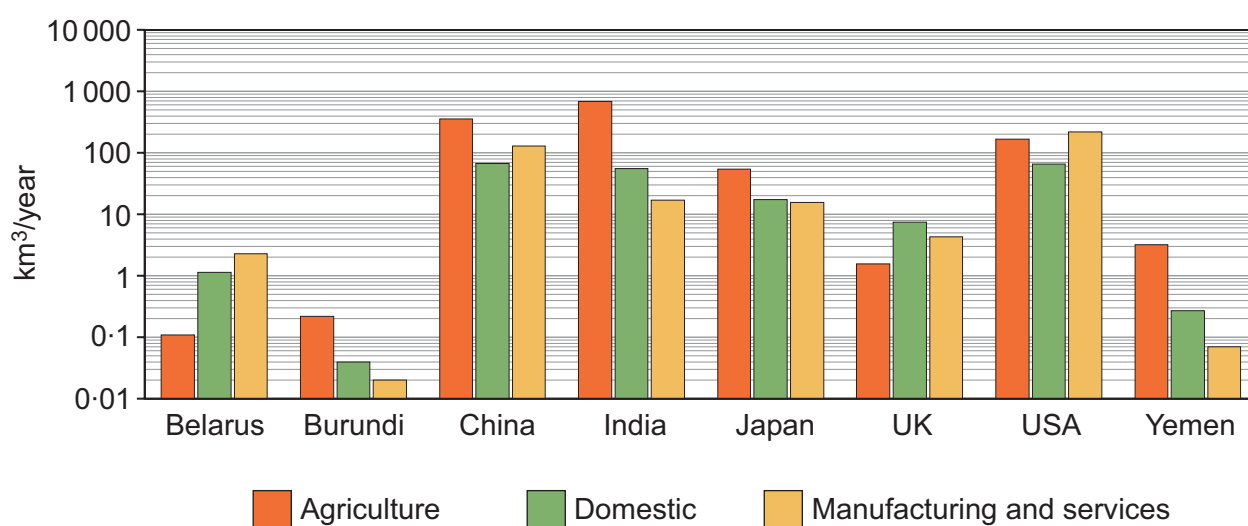
Figure 20: Water statistics for selected countries

Country	Total water availability from natural sources (km ³ /yr)	Total water use (km ³ /yr)	Total reusable water available (m ³ /person/yr)	Total water withdrawals (m ³ /person/yr)	Annual average precipitation (mm)
Belarus	58	4.3	5992	435.7	618
Burundi	12.5	0.3	1553	42.6	1274
China	2840	554.1	2112	414.6	645
India	1991	761	1618	644.1	1083
Japan	430	90.9	3378	708.4	1668
UK	147	13	2392	212.5	1220
USA	3069	478.4	9847	1550	715
Yemen	2.1	3.6	92	160.1	167

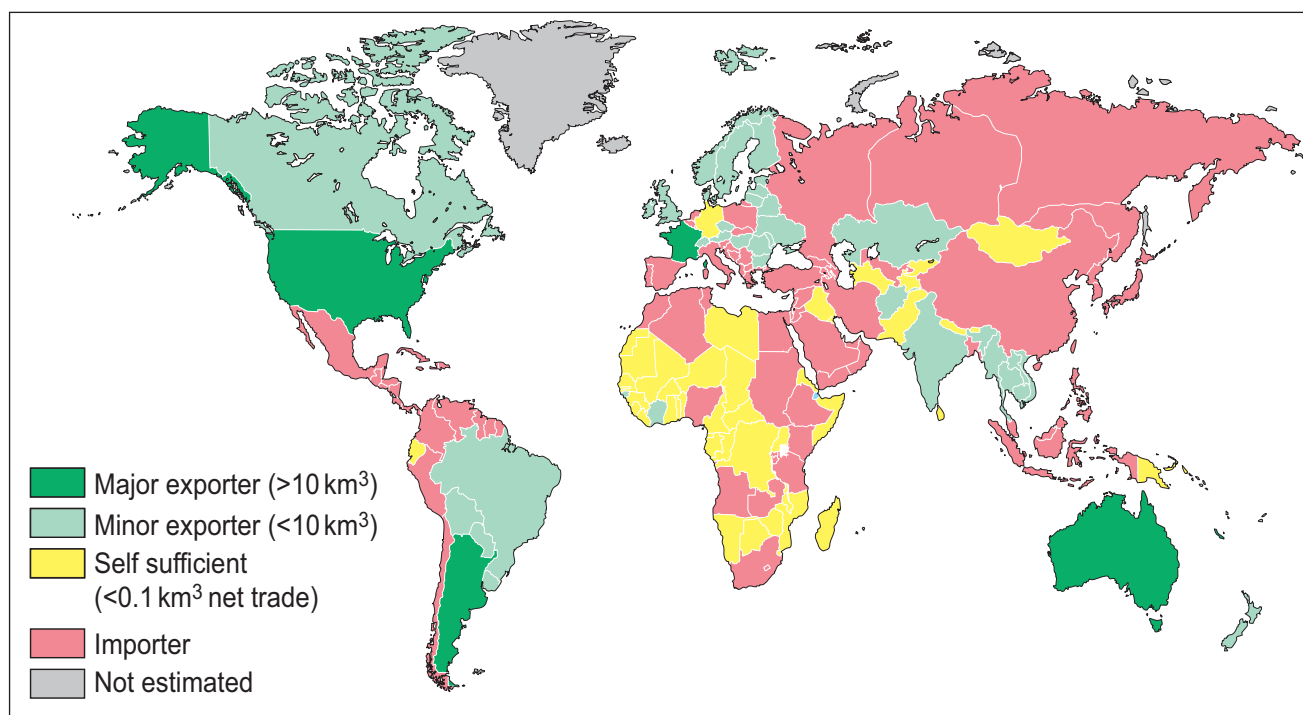
1 km³ = 1 000 000 000 m³

Source: news.bbc.co.uk

Figure 21: Usage of water by sector for selected countries



Source: fao.org

Figure 22: Movements of virtual water

Data is given for individual countries.

One way to alleviate water scarcity is to grow food where water is abundant, and trade it to water-short areas. Instead of using over 2000 litres of water to produce a kilogram of wheat, a country could simply import that kilogram of wheat, importing over 2000 litres of virtual water.

International food trade could reduce scarcity. Instead of striving for food self-sufficiency, water-short countries would import food from water-abundant countries. Egypt, a highly water-stressed country, imported 8 million tonnes of grain from the United States in 2000. By importing grain it 'saved' some 8.5 billion cubic metres of irrigation water, which is the equivalent of one sixth of the annual releases from the High Aswan Dam.

Global food trade has the potential to meet all demands without worsening water scarcity or requiring additional irrigation. Water-abundant Latin America, Europe, the United States, Canada and Russia can increase food production to export food to water-short countries.

However, many countries remain wary of depending on imports to meet basic food needs, despite growing water problems. Least developed countries lacking hard currency may not be able to afford food imports and may be fearful of consequences in case of devaluation or financial crisis. Many rural poor whose livelihoods depend on locally grown crops may be affected by cheap (often subsidised or dumped) imports from Europe or the United States.

Source: news.bbc.co.uk

Sources of information and copyright

Figure 1	http://www.statinfo.biz/Data.aspx?act=7753&lang=2
Figure 2	http://www.iwmi.cgiar.org/assessment/files_new/synthesis/Summary_SynthesisBook.pdf http://www.buywholefoodsonline.co.uk/images/P/wheat-flakes-1kg-1000.jpg http://trivandrumgrocery.com/media/catalog/product/cache/1/image/800x800/9df78eab33525d08d6e5fb8d27136e95/e/v/evenly-cut-cubed-fresh-chicken.jpg
Figure 3	http://www.iwmi.cgiar.org/assessment/files_new/synthesis/Summary_SynthesisBook.pdf
Figure 4	http://www.guardian.co.uk/environment/datablog/2009/sep/02/meat-consumption-percapita-climate-change
Figure 5	globalist.org.ua/eng/14467-world-food-consumption-in-calories-per-day-the-map
Figure 6	http://www.smithheggumreport.com/wp-content/uploads/2011/01/undernourished_world_map.png
Figure 7	http://ensia.com/features/groundwater-wake-up/
Figure 8	http://www.learnnc.org/lp/media/uploads/2012/03/1_8.jpg
Figure 9	http://school.demo.moodle.net/pluginfile.php/2402/mod_imsccp/content/2/items/x_sdk125_1_thumbnail_id400049013219.html
Figure 10	http://data.worldbank.org/indicator/AG.PRD.FOOD.XD
Figure 11	http://www.fao.org/docrep/011/i0100e/i0100e00.htm
Figure 12	http://www.fao.org/fileadmin/templates/wsfs/docs/expert_paper/How_to_Feed_the_World_in_2050.pdf
Figure 13	ftp://ftp.fao.org/docrep/fao/011/i0291e/i0291e00.pdf
Figure 14	http://www.iwmi.cgiar.org/assessment/files_new/synthesis/Summary_SynthesisBook.pdf
Figure 15	http://www.iwmi.cgiar.org/assessment/files_new/synthesis/Summary_SynthesisBook.pdf
Figure 16 and Figure 17	http://news.bbc.co.uk/1/hi/sci/tech/526296.stm#graphic
Figure 18	http://pm22100.net/pages/enercoop/01_dossiers/unep-water/11-watavail-1995-2025.jpg
Figure 19	http://www.iwmi.cgiar.org/assessment/files_new/synthesis/Summary_SynthesisBook.pdf

- Figure 20 http://news.bbc.co.uk/1/shared/bsp/hi/pdfs/21_08_06_world_water_week.pdf
- Figure 21 fao.org/nr/water/aquastat/data/query/results.html
- Figure 22 http://news.bbc.co.uk/1/shared/bsp/hi/pdfs/21_08_06_world_water_week.pdf

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