



GCE A level

1204/01



S15-1204-01

GEOGRAPHY – G4
Sustainability

P.M. FRIDAY, 19 June 2015

1 hour 45 minutes

ADDITIONAL MATERIALS

In addition to this question paper, you will need the Resource Folder and a pink WJEC 20 page answer book, which has been specifically designed for this examination. No other style of answer book should be used. Should you run out of space, use a standard 4 page continuation book.

INSTRUCTIONS TO CANDIDATES

Use black ink or black ball-point pen. Do not use gel pen or correction fluid.

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.

Answer all questions.

SECTION A

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

- 01** Describe the global pattern of food consumption. [10]
(approximately 13 minutes)
- 02** Outline how human activities influence the demand for water. [10]
(approximately 13 minutes)
- 03** Outline how physical factors influence the supply of water. [10]
(approximately 13 minutes)
- 04** 'Sustainable food supply depends on managing 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** Describe transport problems that **one or more** cities face. [25]
To what extent is it possible to find sustainable solutions to transport problems in cities?
(approximately 33 minutes)

END OF PAPER



GCE A level

1204/01-A



S15-1204-01A

GEOGRAPHY – G4
Sustainability

P.M. FRIDAY, 19 June 2015

Examination copy

To be given out at the start of the examination.

The pre-release copy must not be used.

RESOURCE FOLDER

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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 main focus of the material in this Resource Folder is related 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.

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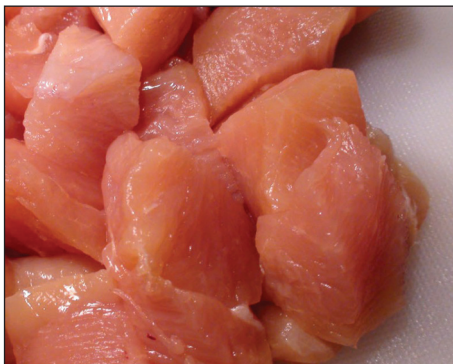
Figure 1: Background data for selected countries and the world

Country	Daily calorie consumption per person (kcal)	Population 2010 millions	Population 2025 millions (estimated)	GDP US\$ (PPP) billions
Belarus	3090	9.5	9.3	150
Burundi	1680	8.1	12.4	6
China	2970	1354	1470.8	12383
India	2300	1210.6	1351.8	4711
Japan	2810	127.3	123.8	4617
UK	3440	63.2	61.2	2316
USA	3770	315.9	346.8	15653
Yemen	2030	24.5	48.2	58
World	2800	6688	8004	82762

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
(3400–3900 calories)
requires 2225 litres of water

1 kilogram meat
(1200–1700 calories)
requires 10000 litres of water



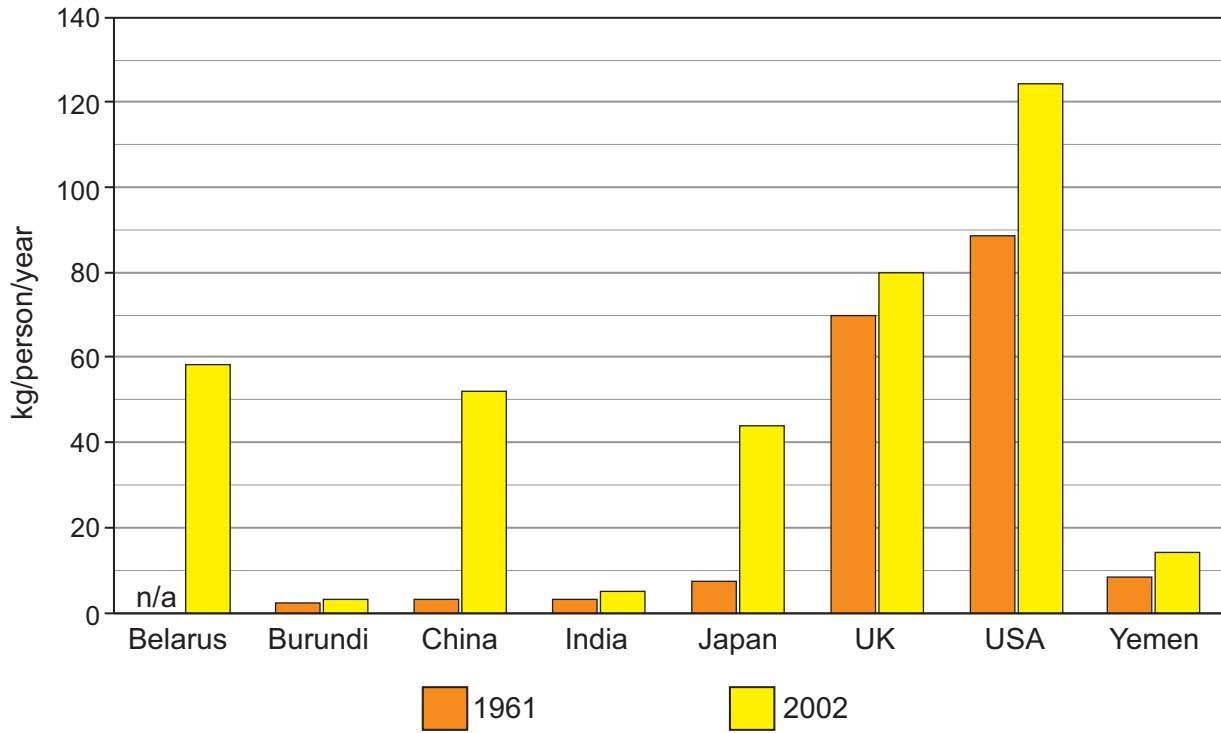
Sources: www.iwmi.cgiar.org and other sources

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

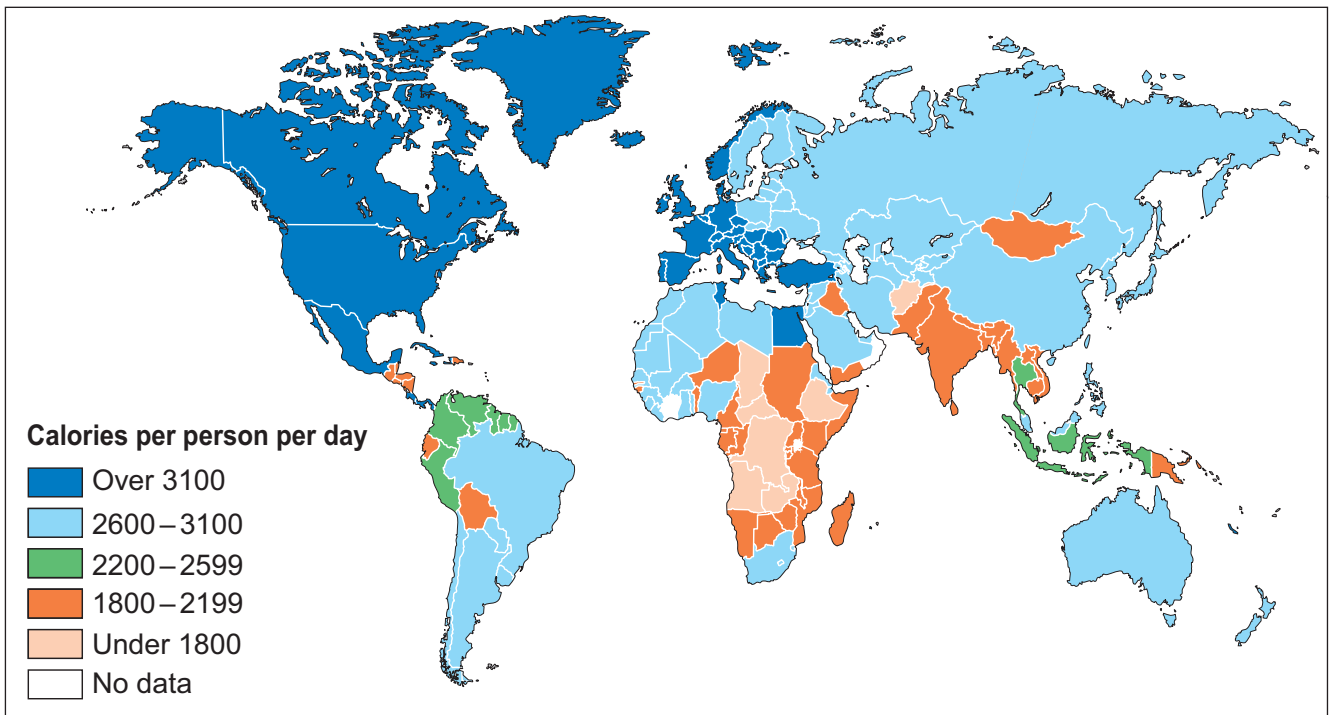
Figure 4: Meat consumption for selected countries 1961 and 2002



Source: www.guardian.co.uk

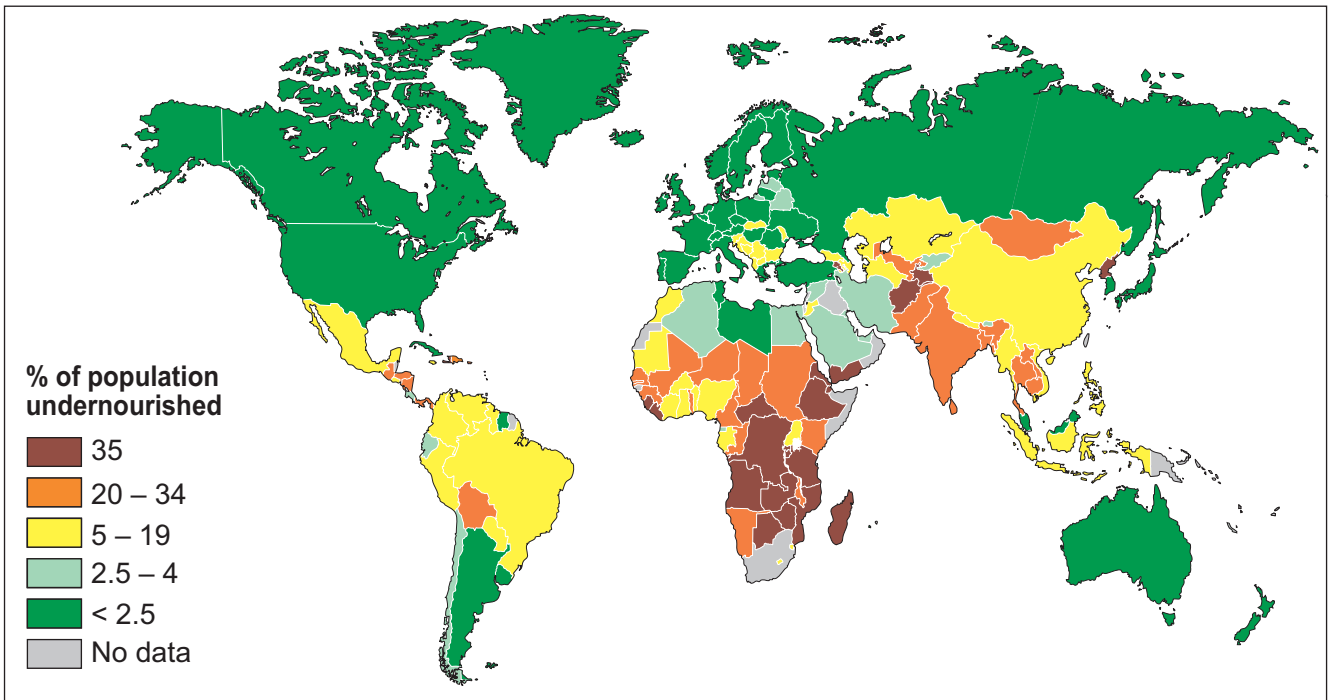
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Figure 5: Average daily calorie intake by country



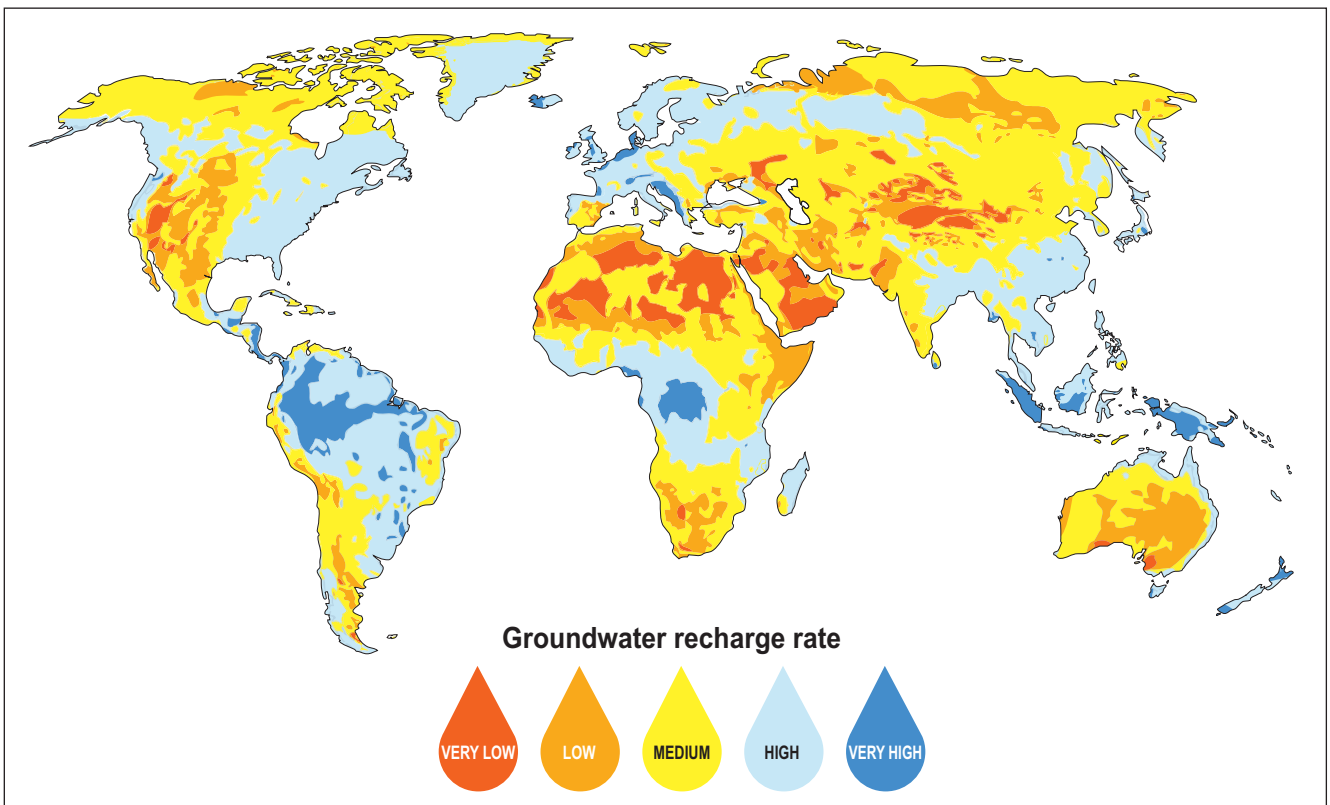
Source: globalist.org.ua

Figure 6: Percentage of population undernourished in each country



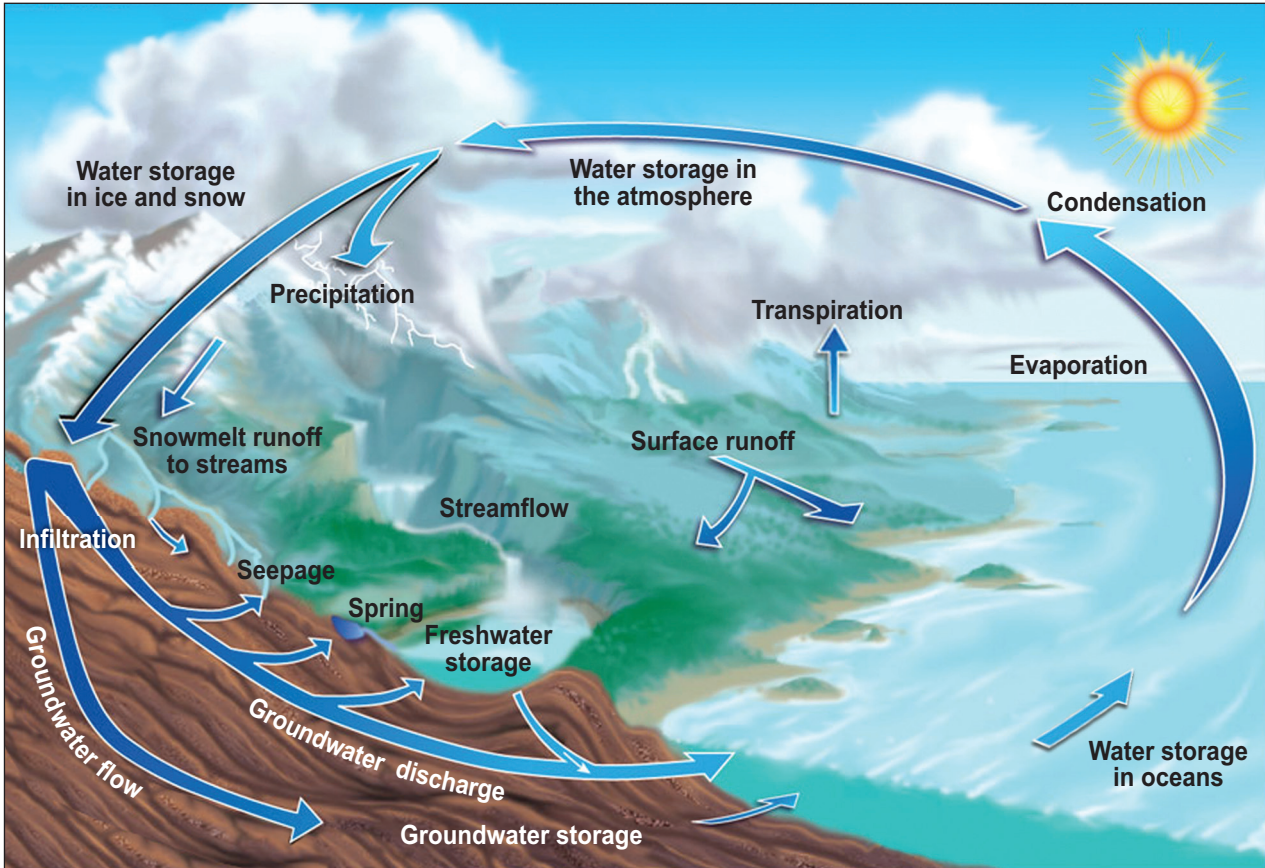
Source: www.smithheggumreport.com

Figure 7: Global groundwater recharge rates



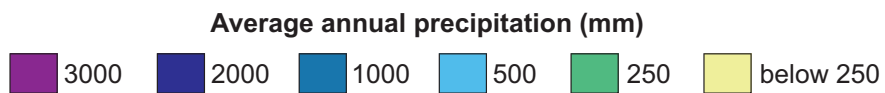
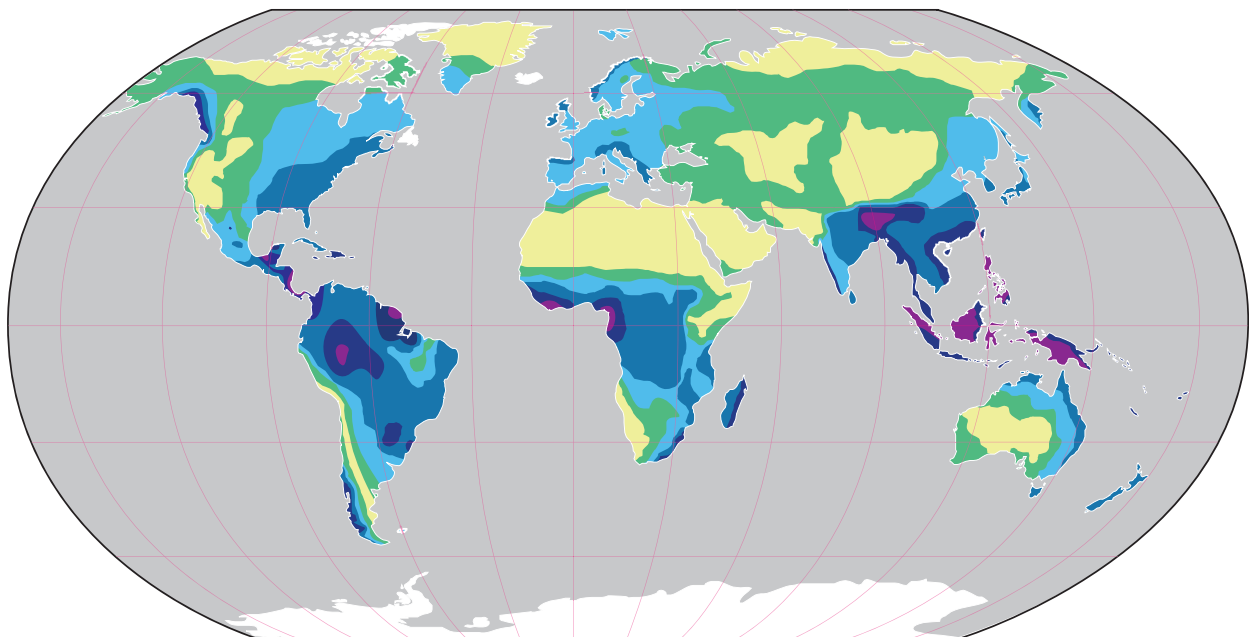
Source: *adapted from ensia.com*

Figure 8: The water cycle



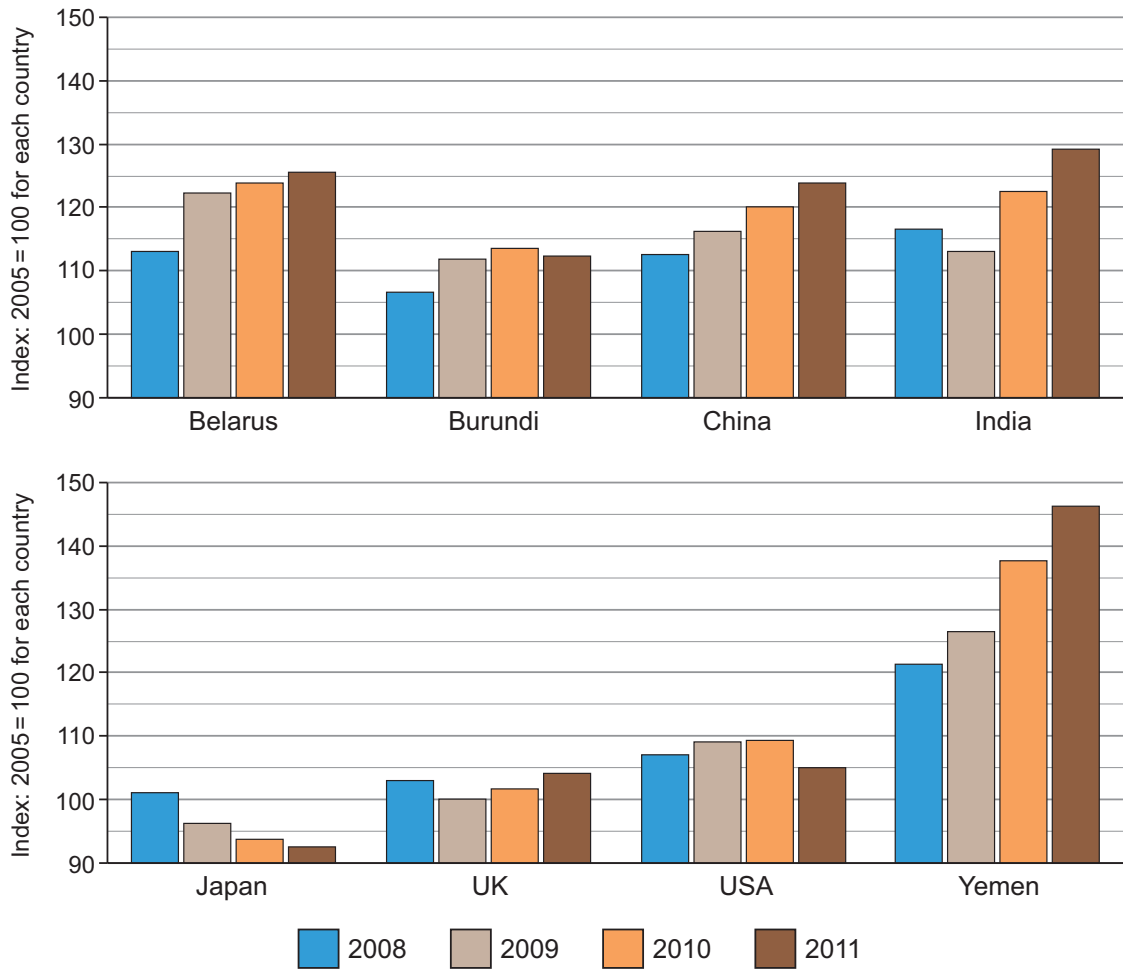
Source: adapted from www.learnnc.org

Figure 9: The global rainfall pattern



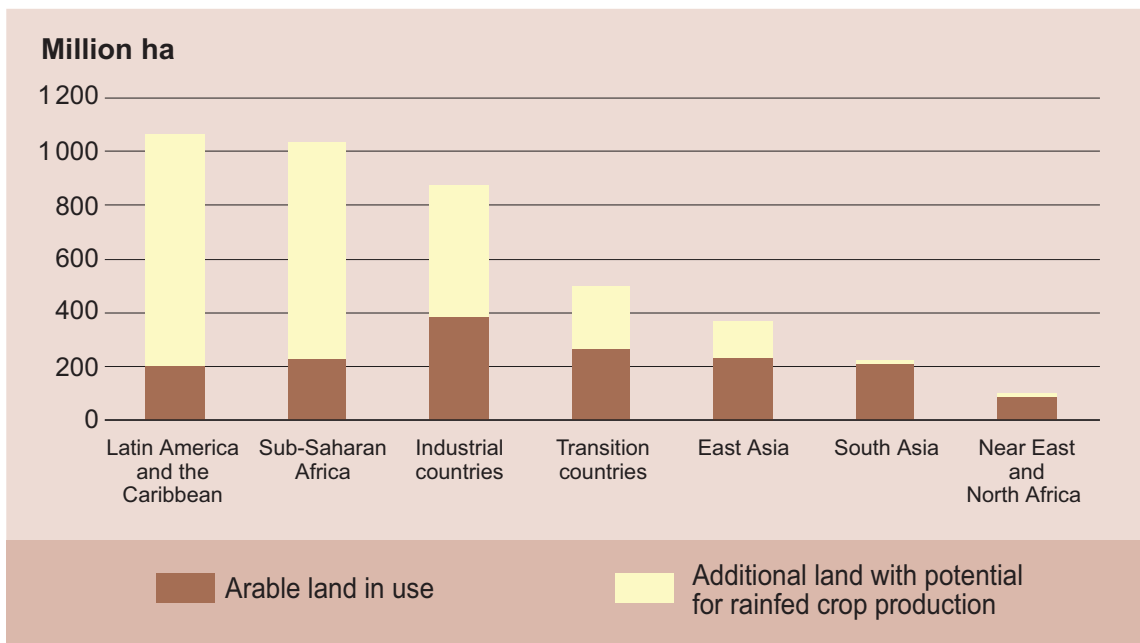
Source: adapted from Open University

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



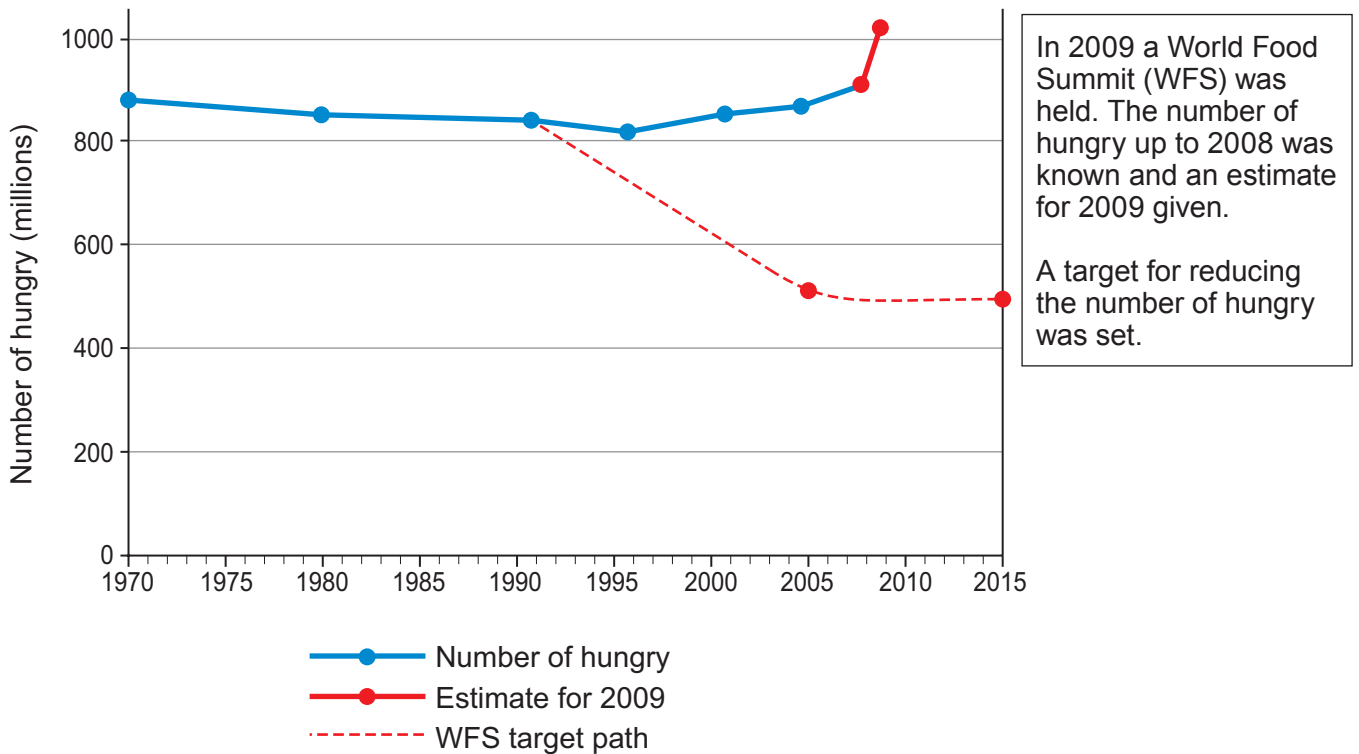
Source of data: data.worldbank.org

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



Source: www.fao.org

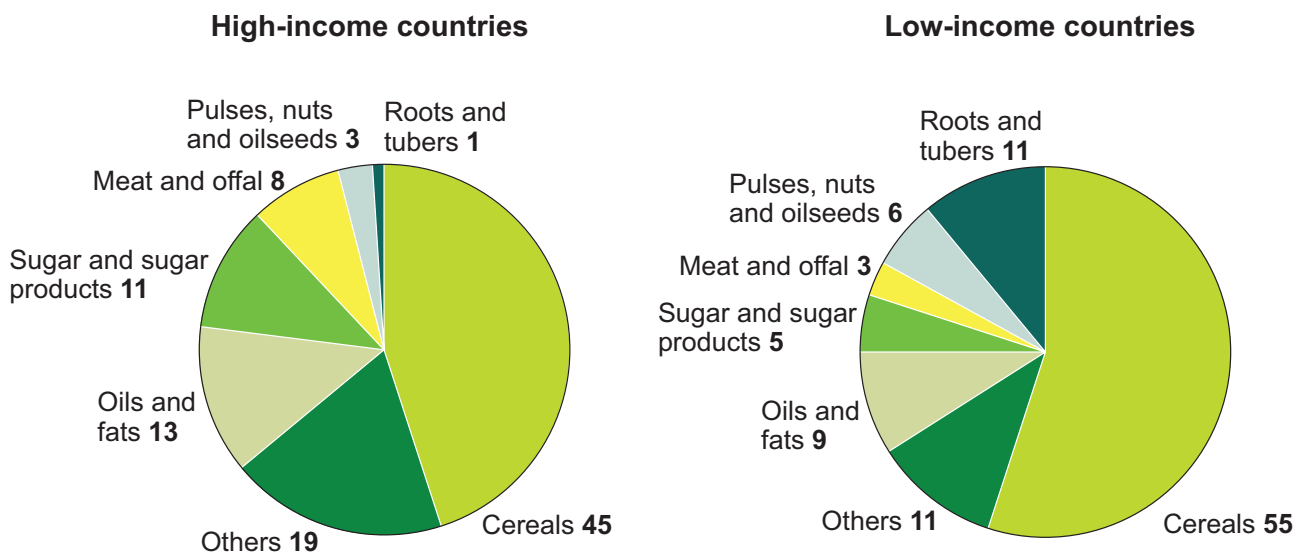
Figure 12: Progress towards reducing number of hungry in the world



Source: www.fao.org

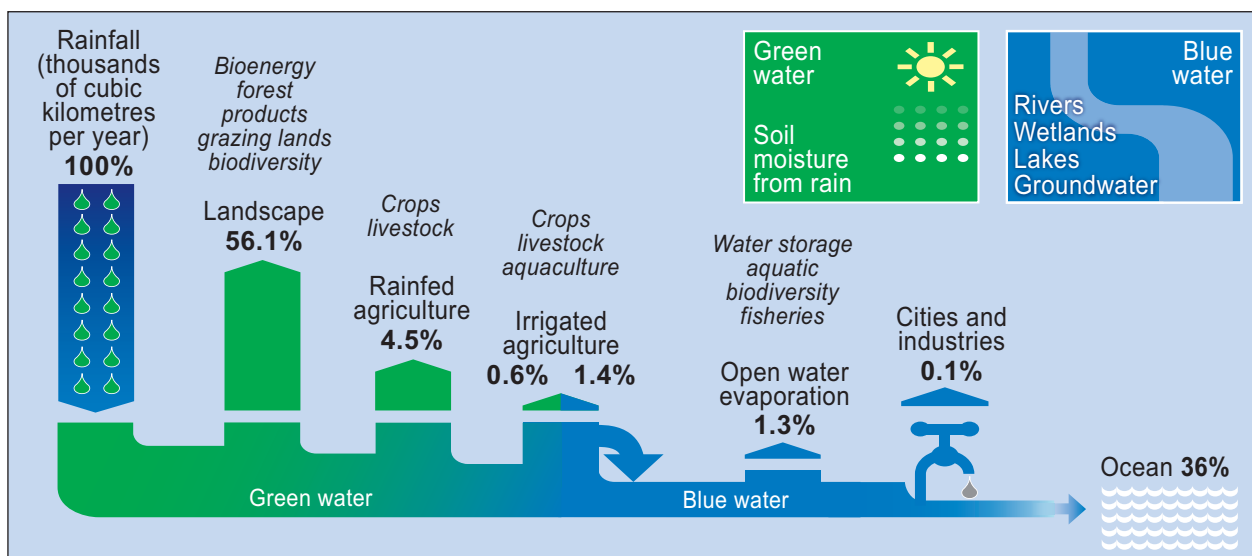
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Figure 13: Sources of dietary energy in high-income and low-income countries by percentage



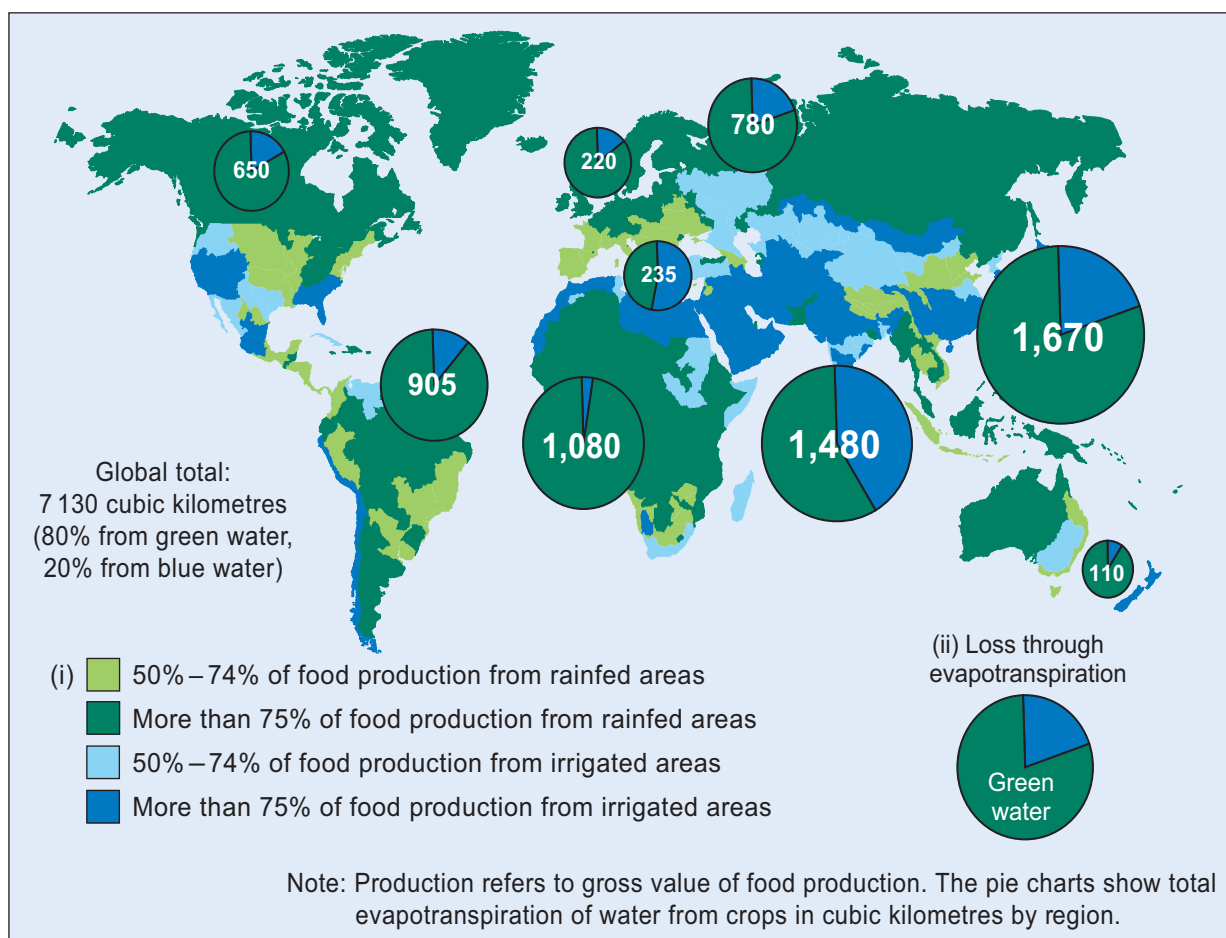
Source: fao.org

Figure 14: World usage of water including food production



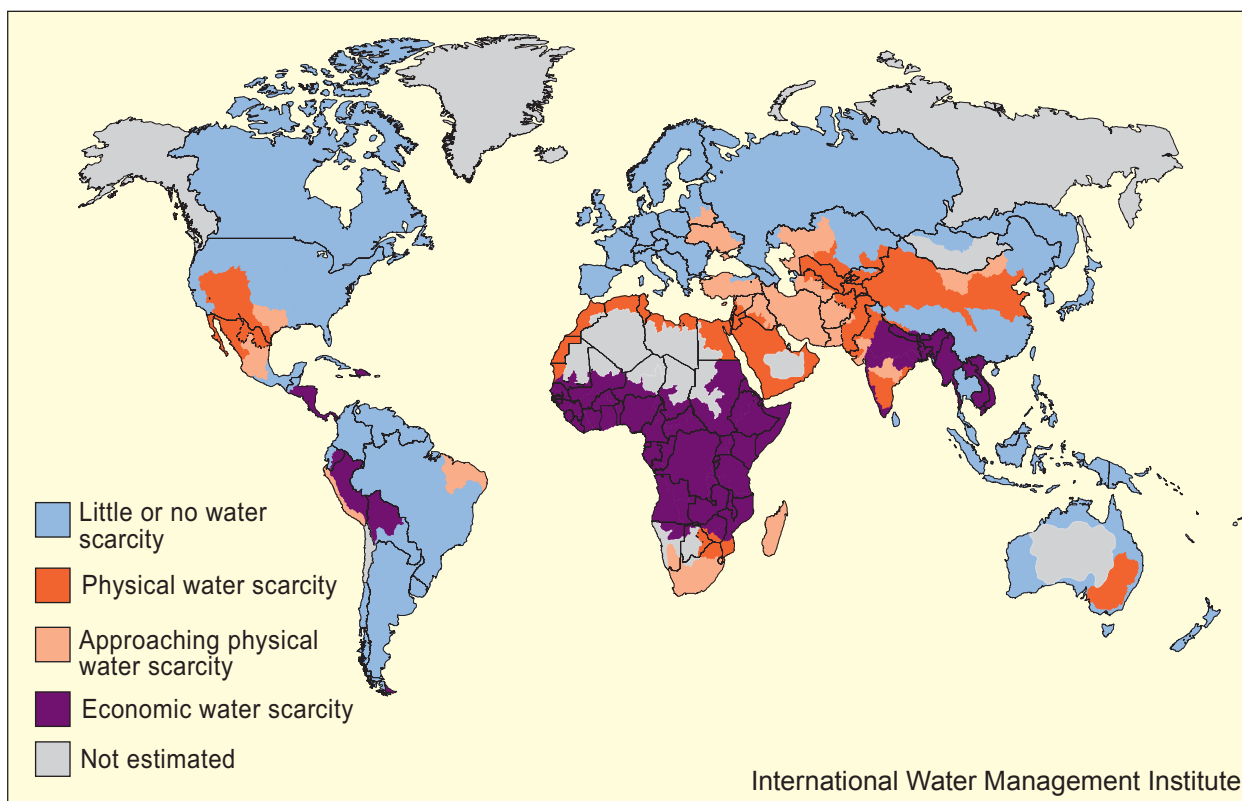
Source: www.iwmi.cgiar.org

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.

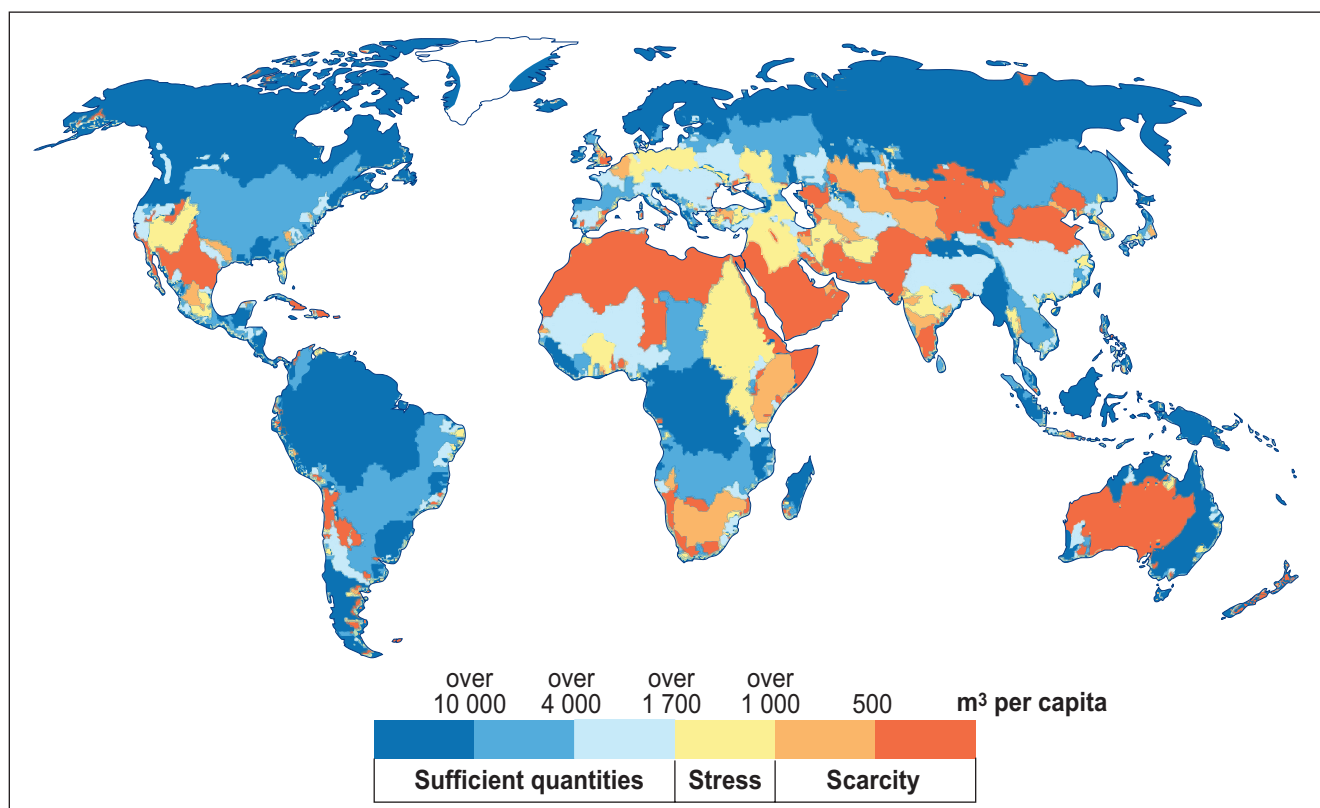
Source: news.bbc.co.uk

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**

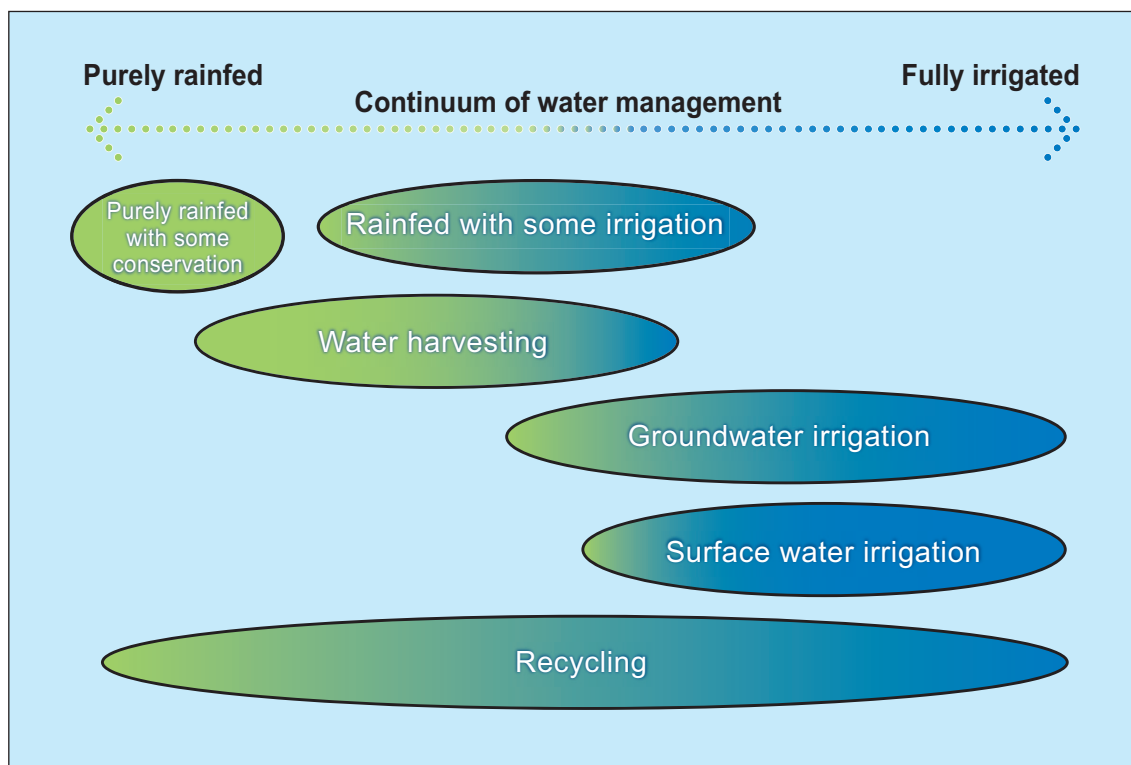
Source: adapted from news.bbc.co.uk

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

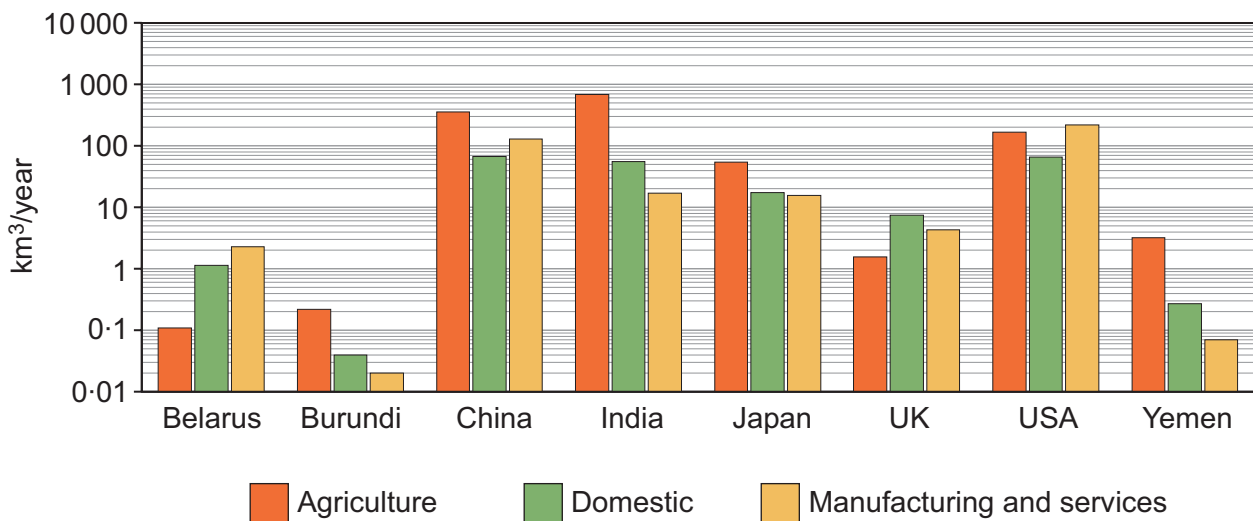
Figure 20: Water statistics for selected countries

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

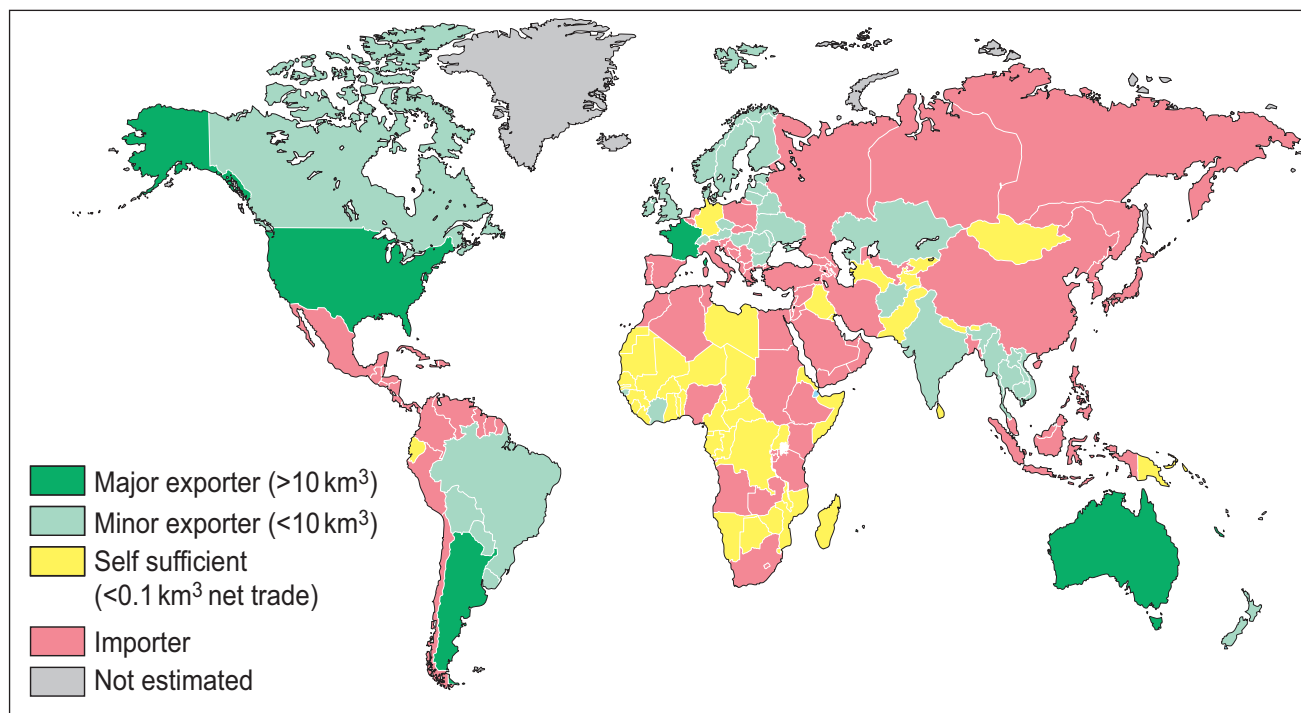
Source: news.bbc.co.uk

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_imscp/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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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
01B001

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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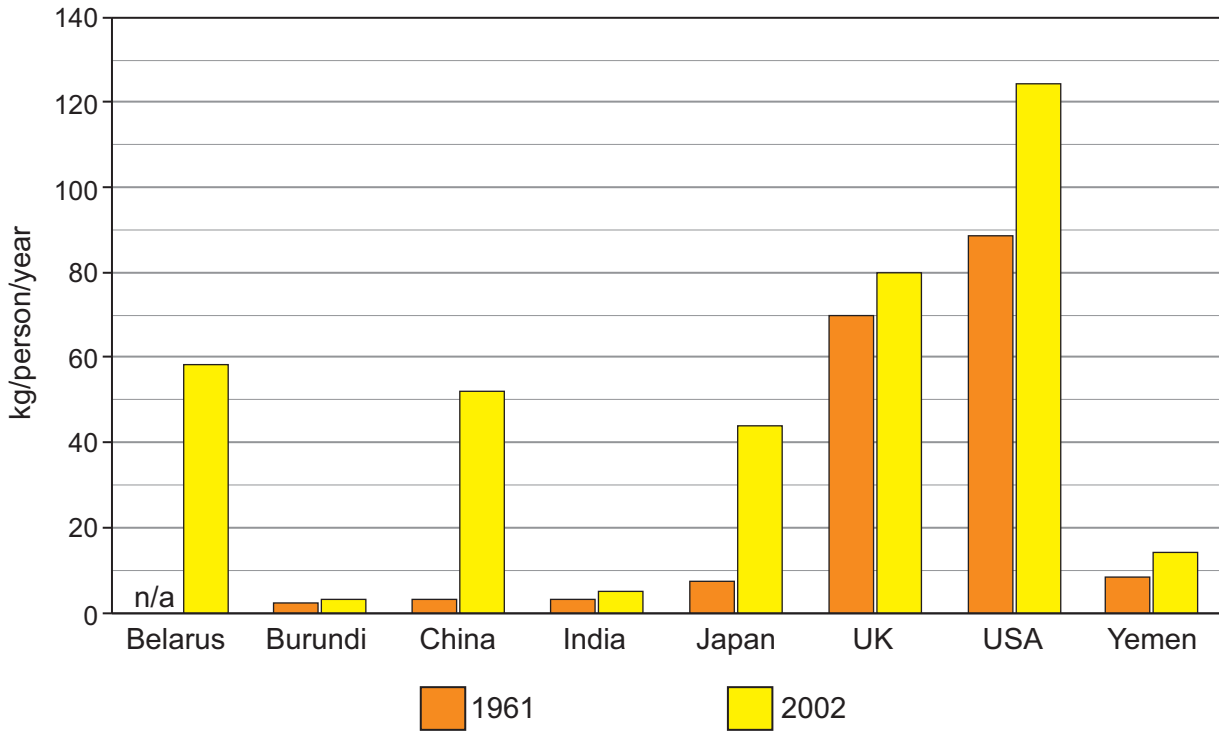
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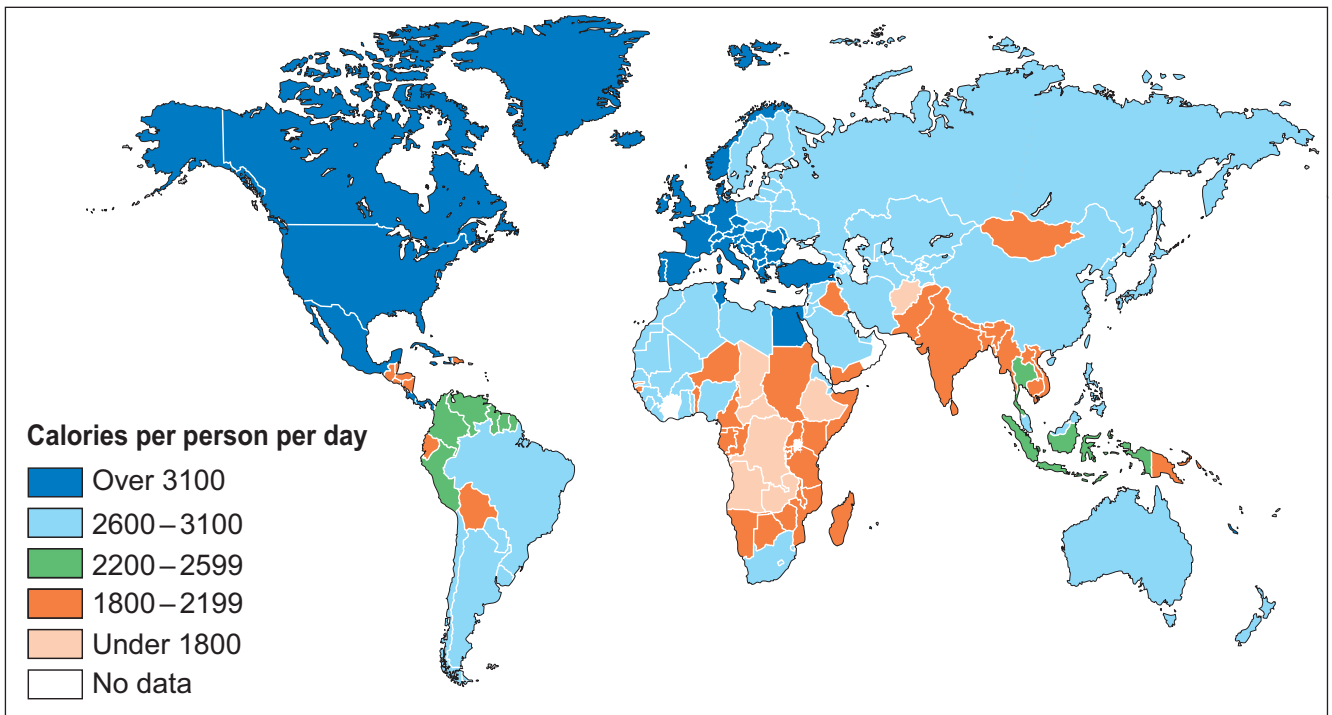
Figure 4: Meat consumption for selected countries 1961 and 2002



Source: www.guardian.co.uk

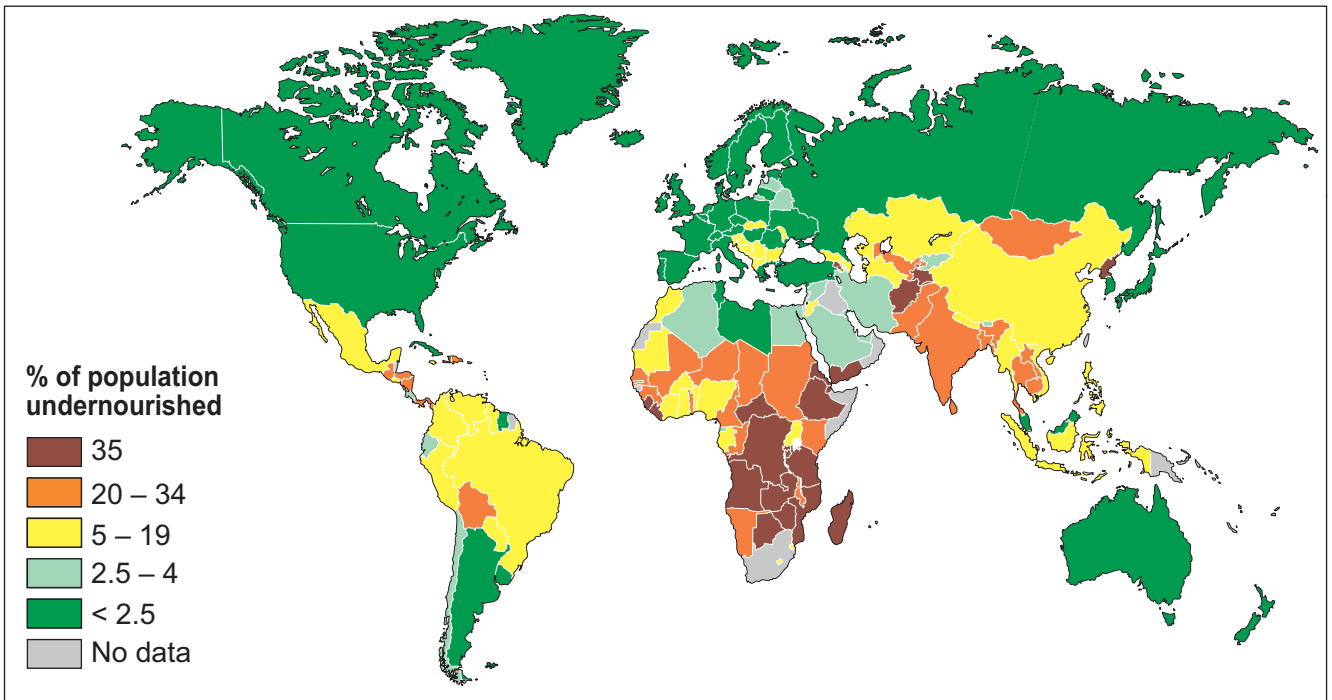
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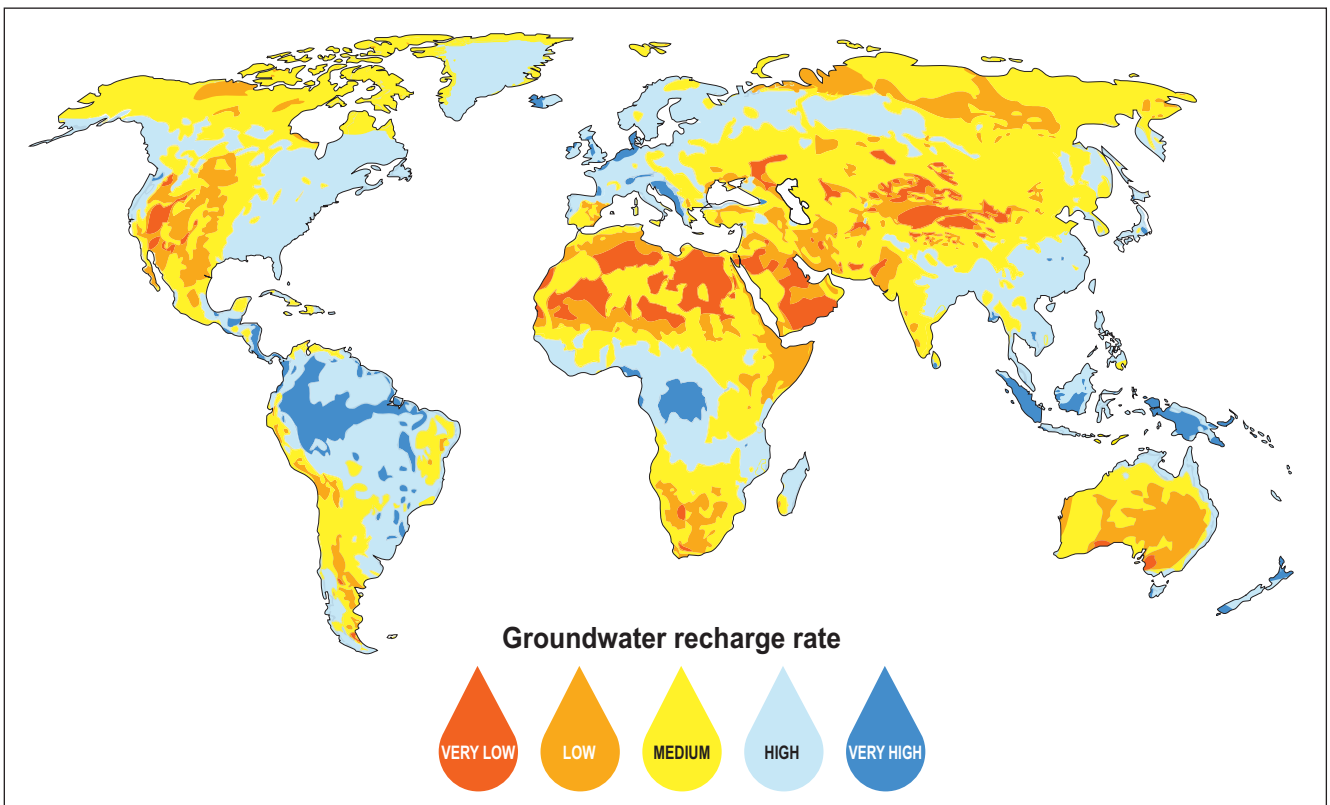
Source: globalist.org.ua

Figure 6: Percentage of population undernourished in each country



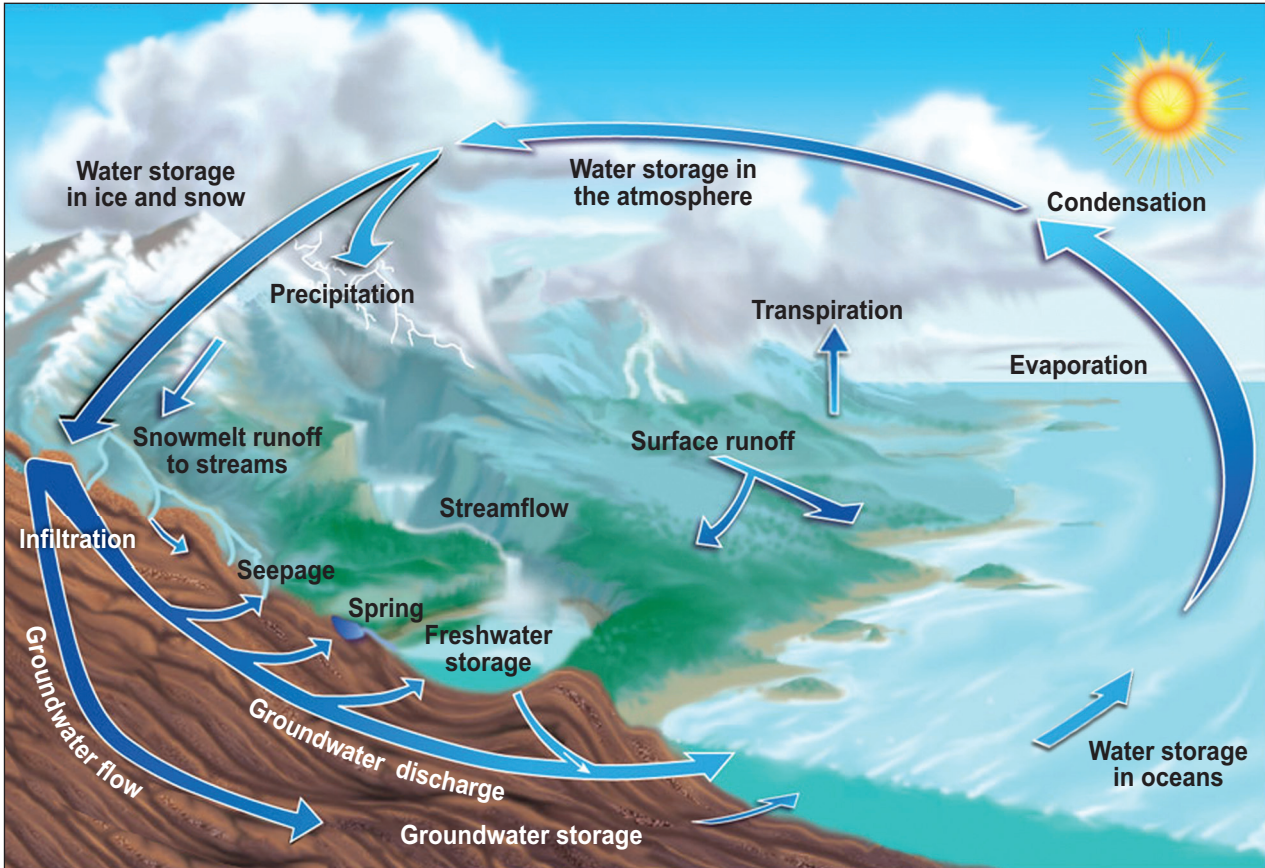
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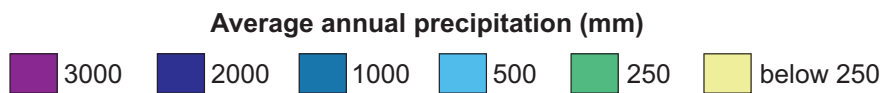
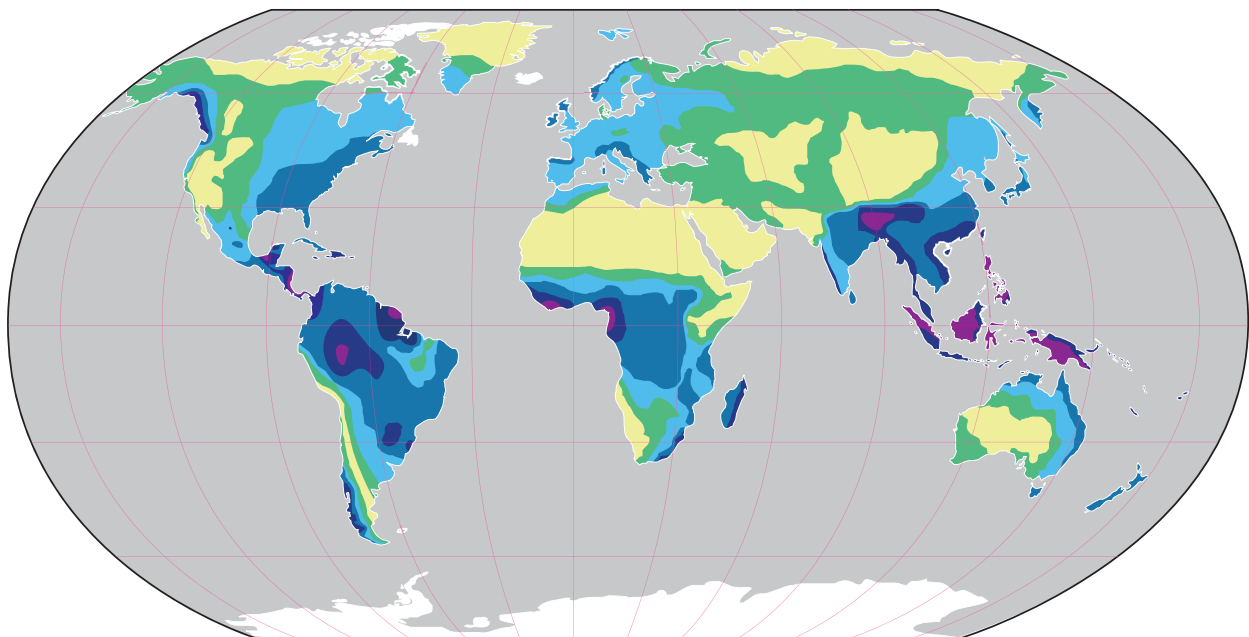
Source: *adapted from ensia.com*

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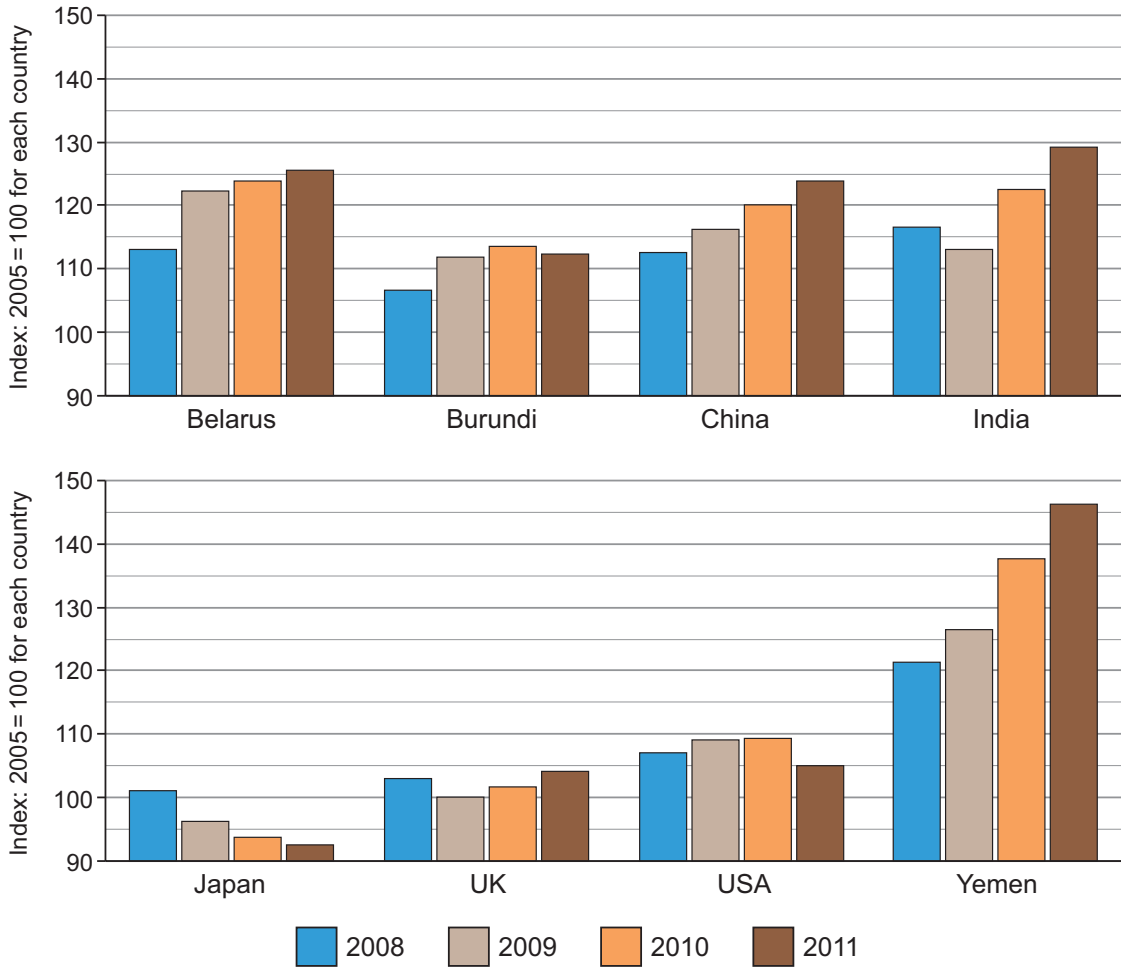
Source: adapted from www.learnnc.org

Figure 9: The global rainfall pattern



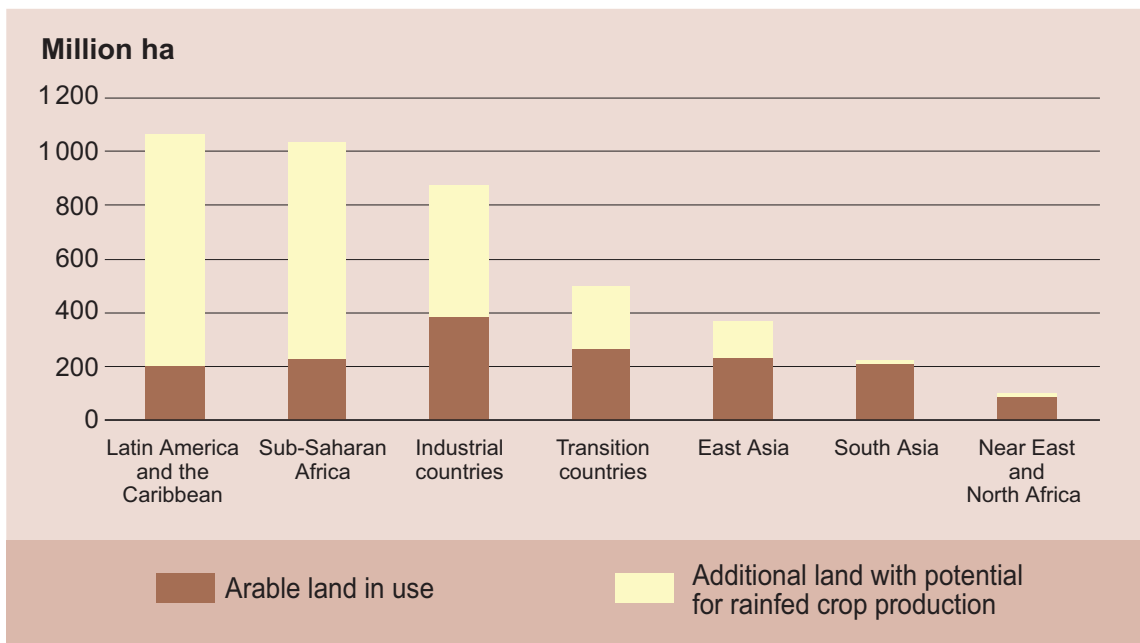
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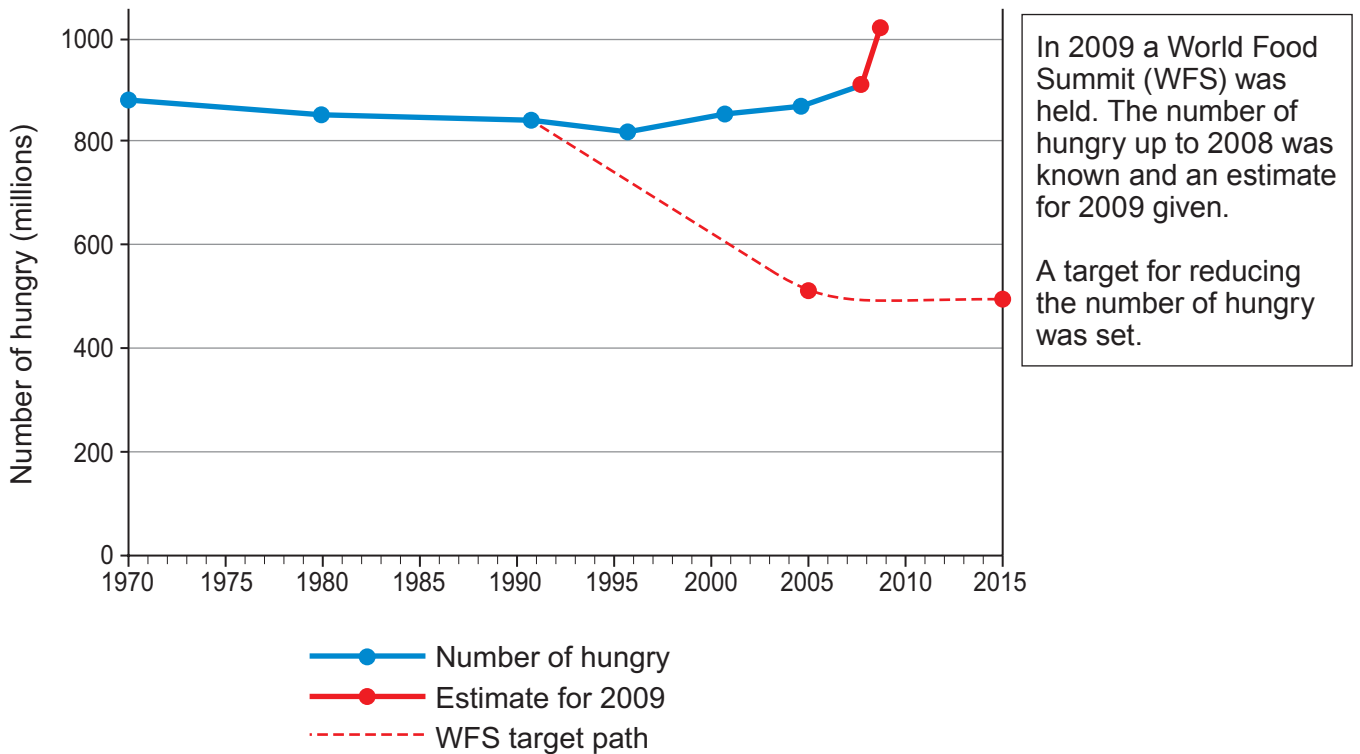
Source of data: data.worldbank.org

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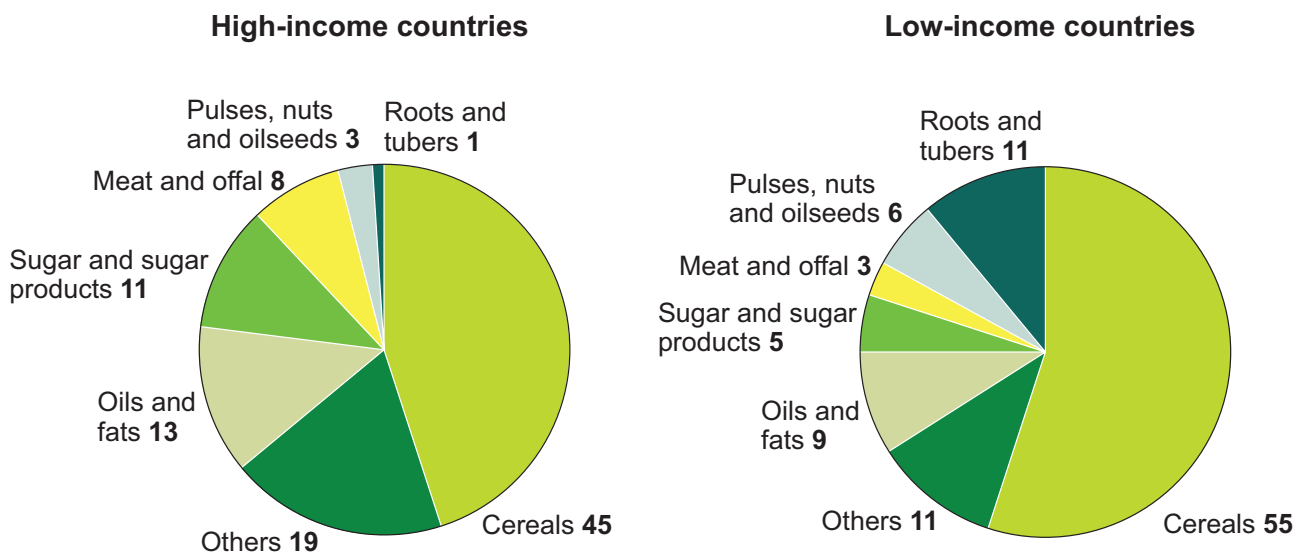
Figure 12: Progress towards reducing number of hungry in the world



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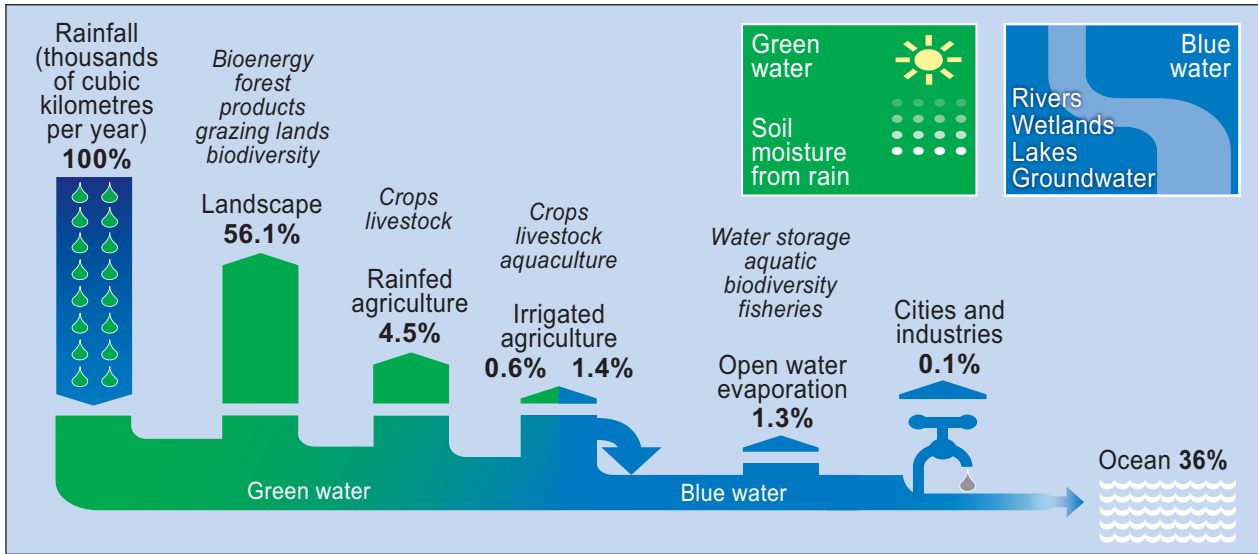
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Figure 13: Sources of dietary energy in high-income and low-income countries by percentage



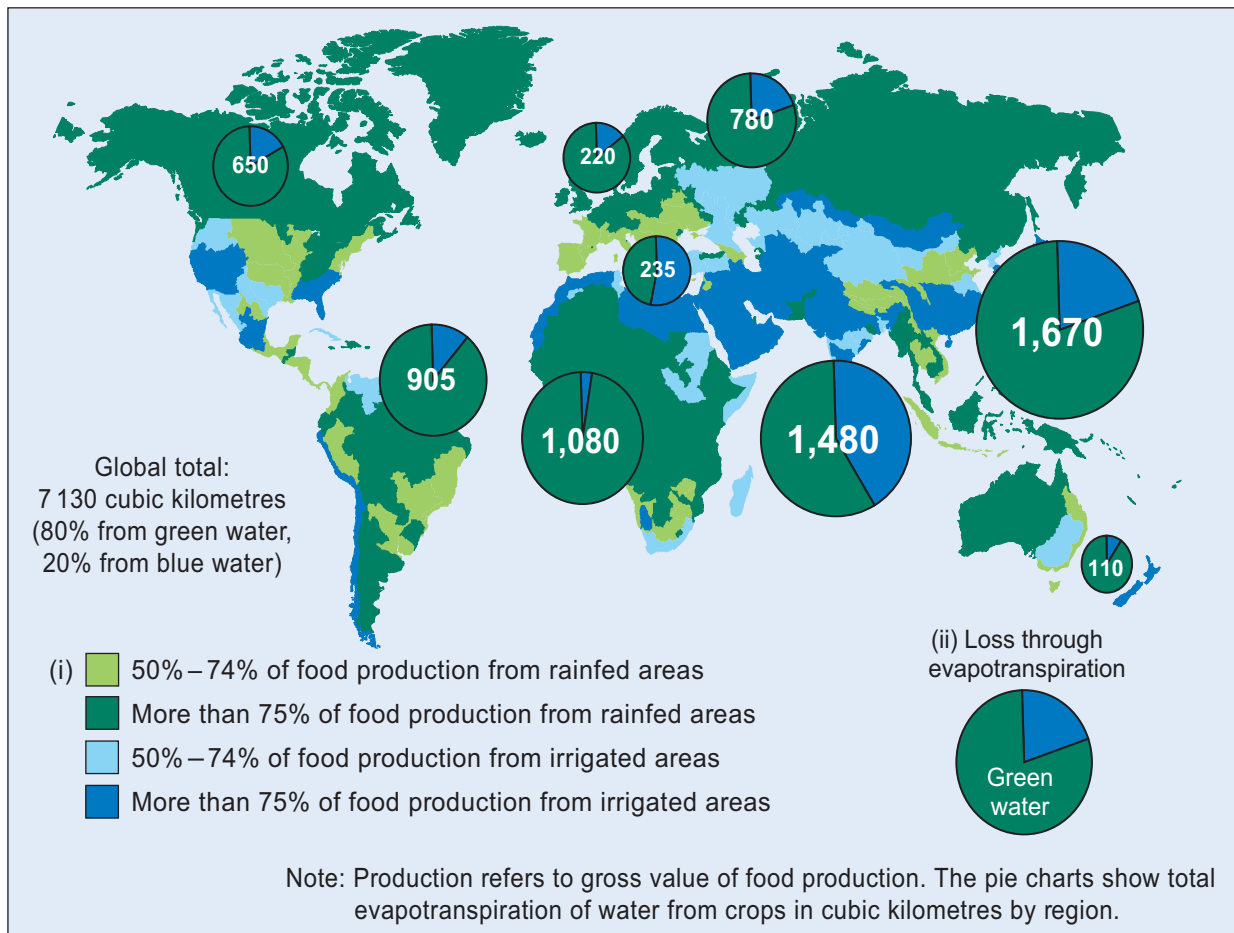
Source: fao.org

Figure 14: World usage of water including food production



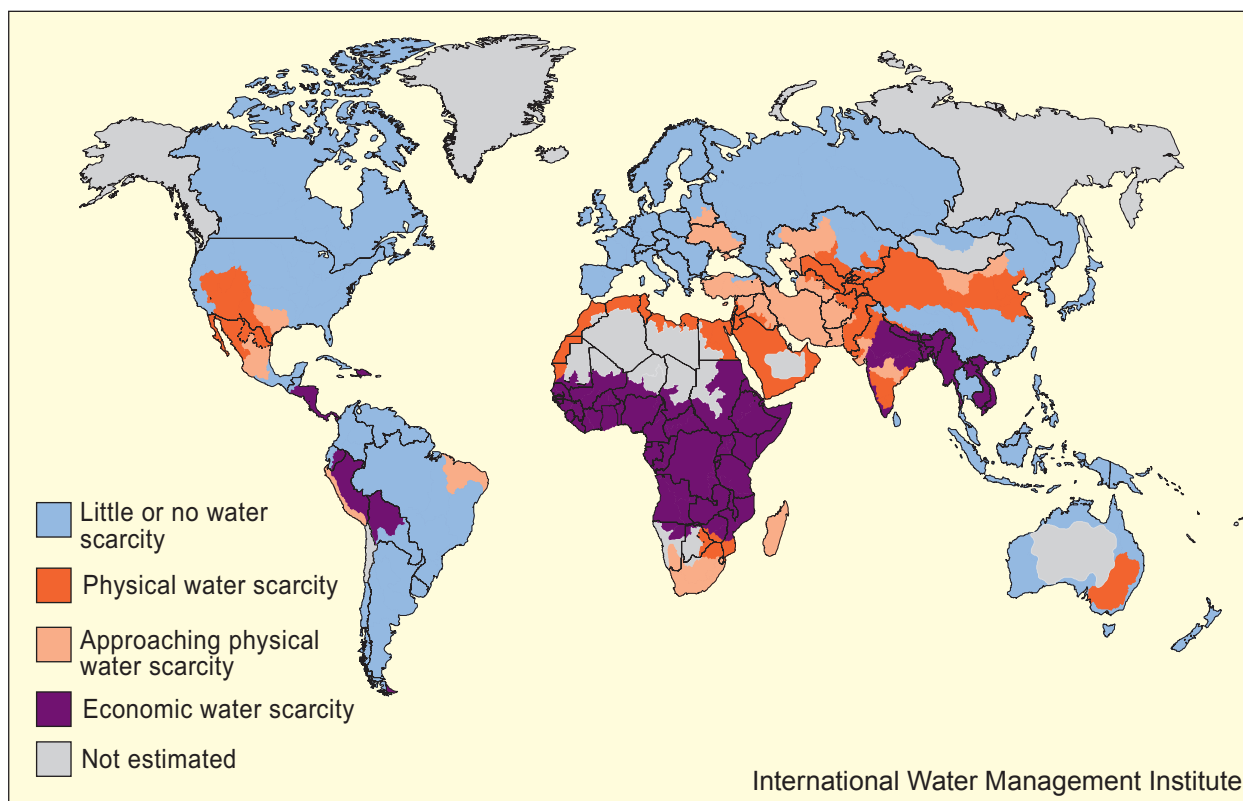
Source: www.iwmi.cgiar.org

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.

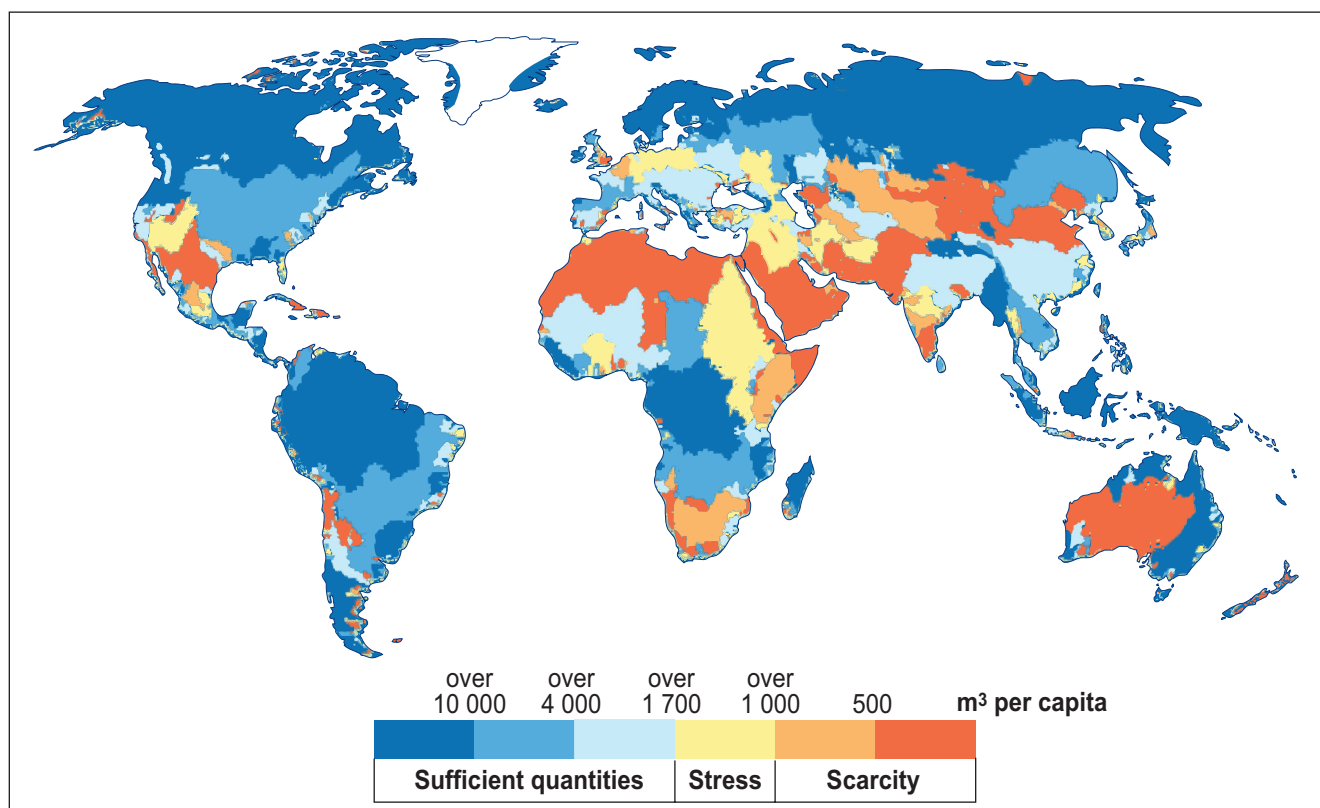
Source: news.bbc.co.uk

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**

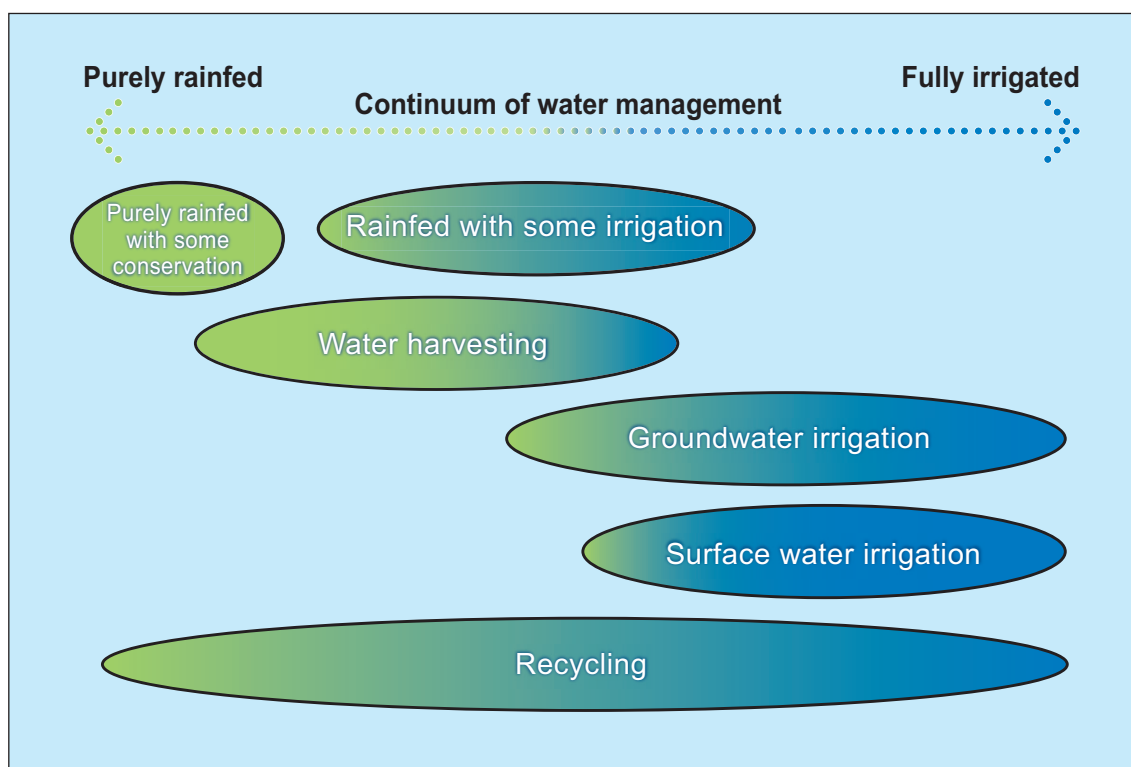
Source: adapted from news.bbc.co.uk

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

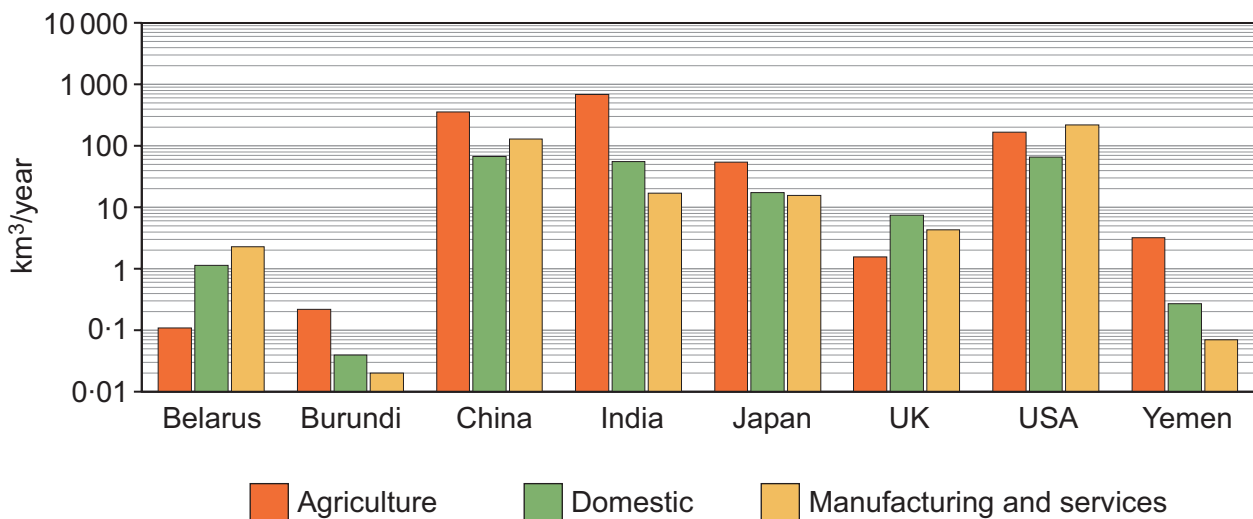
Figure 20: Water statistics for selected countries

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

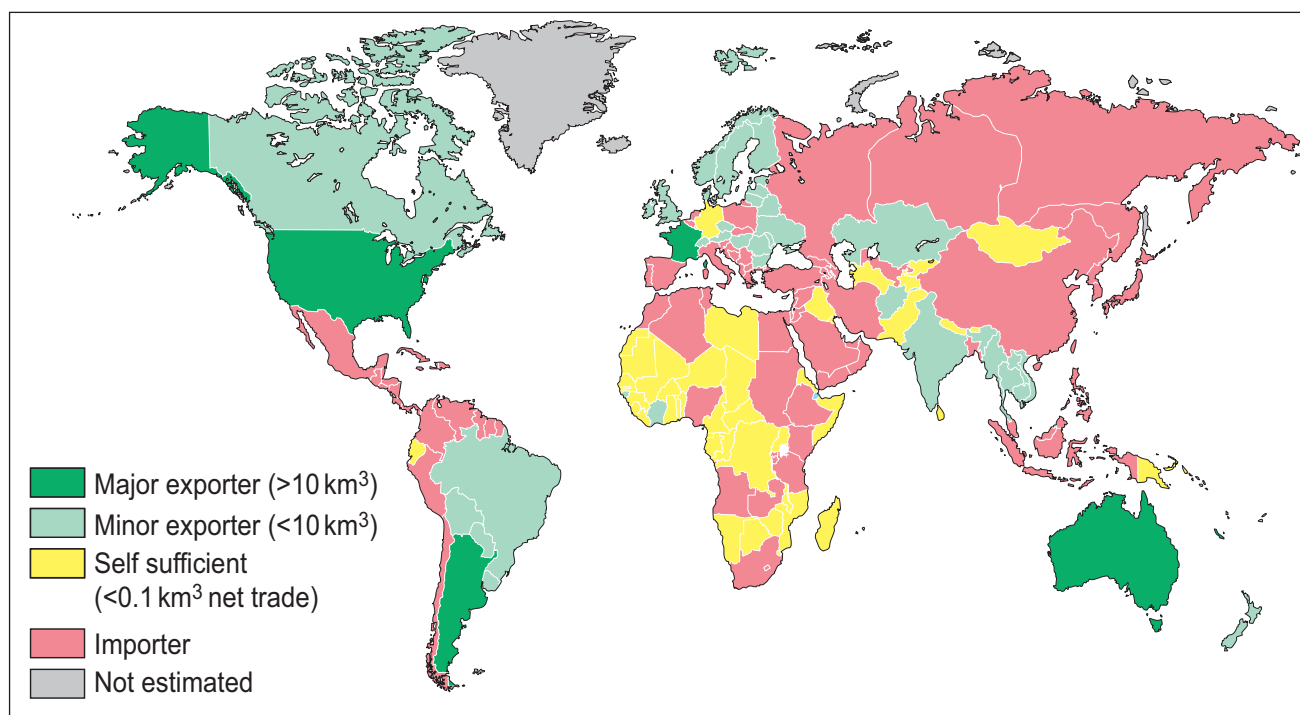
1 km³ = 1 000 000 000 m³

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
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- 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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