

Water insecurity in Cape Town, South Africa

By Dominic Atkinson

This unit looks at the increasing concerns associated with water insecurity, with reference to the city of Cape Town in South Africa. Water insecurity is due to a combination of both human and physical factors and is becoming more of an issue due to climate change. The unit covers:

- the reasons for the water shortages in Cape Town
- the impacts of the water shortages
- the management strategies used
- the longer-term solutions to water shortages in Cape Town.

Key vocabulary

Water insecurity: when an area lacks a suitable quantity and quality of water for the needs of the population of that area.

Sustainable Development Goals: 17 goals set out by the UN in 2015 for the world to achieve by 2030, including making water accessible and safe for all. They followed the earlier 8 Millennium Development Goals.

Irrigation: the application of water to crops to help them grow. Used in areas that suffer from low rainfall.

Virtual water: water that is not seen to be consumed but which is used within the growing and processing of food and other goods.

Water management: methods used to reduce the consumption of water and to better manage the use of water.

Learning outcome

In this unit you will learn about:

- the key reasons for water shortages in Cape Town
- the impacts, management strategies and longer-term water management solutions that could be used in the future.

Relevance to GCSE specifications

AQA	3.2.3 Section C The challenge of resource management, 3.2.3.1, pages 22–23 Click here
Edexcel A	Topic 5 Global development, Key ideas 5.1–5.3, page 20 Click here
Edexcel B	Topic 9 Consuming energy resources, pages 35–36 Click here
OCR A	No subject-specific link
OCR B	Topic 8 Resource reliance, page 15 Click here
Eduqas A	Core theme 6 Development and resource issues, Key idea 6.3 Water resources and their management, page 18 Click here
Eduqas B	Theme 3 Environmental challenges, Key idea 3.3 Water resources and management, page 16 Click here
Cambridge IGCSE	Theme 3 Economic development, 3.6 Water, page 14 Click here
Edexcel IGCSE	Topic 9 Development and human welfare, Key idea 9.1, page 33 Click here

Water insecurity in Cape Town, South Africa

Water security is a global measure relating to the percentage of any given population in terms of its access to clean and abundant drinking water. **Water insecurity** is when an area lacks a suitable amount and quality of water for the needs of the population (Figure 1).

There are increasing concerns about water insecurity. As the world population is increasing and become wealthier, more water is being used. This is having huge social, economic and environmental problems around the world, and they are getting worse. In 2015 the **Sustainable Development Goals** were introduced. One of those goals is to ensure that all people in the world have access to safe and affordable drinking water by 2030.

Cape Town, South Africa

In the last three years South Africa and especially Cape Town have experienced severe water shortages. This has been due to a number of environmental and human factors which have had a major impact on the local economy, population and environment.

The term ‘Day Zero’ was created in 2018 to indicate the day when the city might become completely ‘dry’,

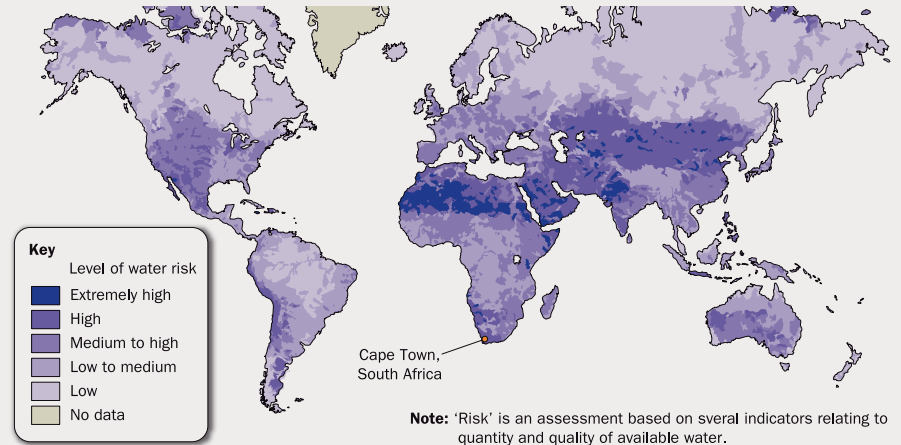


Figure 1 Water insecurity across the world

Source: World Resources Institute, Aqueduct, 2014

with no available drinking water. Since then several solutions have been attempted to reduce the impacts of the shortages. Fortunately higher rainfall returned to the area in the middle of 2018.

Cape Town is an important city. It is located in the southwest of South Africa and has a population of over 4 million people (Figure 2). It has grown significantly in recent years, from 171 000 in 1901 and 803 000 in 1960 to its current population.



Figure 2 The location of Cape Town in southern Africa

	J	F	M	A	M	J	J	A	S	O	N	D
Temp (°C)	21	21	20	18	15	14	13	13	15	16	18	20
Rainfall (mm)	24	25	30	74	117	143	131	126	70	55	31	27

Figure 3 Average climate data for Cape Town

Source: <https://en.climate-data.org/africa/south-africa/western-cape/cape-town-788/#climate-graph>

Water is sourced from a series of dams in the Cape Fold Mountains. Six large dams store 99% of Cape Town’s water and their levels are monitored each week for volume.

Approximately a third of Cape Town’s water is used for agriculture and two-thirds for industrial and domestic uses.

Reasons for shortages

Since 2015 the levels in the dams have declined to drastically low levels, between 15% to 30% of storage capacity. There were several reasons for the water shortages facing Cape Town.

Natural reasons

Drought Cape Town has a Mediterranean climate (Figure 3) with annual average rainfall of 700–800mm. However, over the last 10 years there have been periods of very low precipitation creating drought conditions. 2017 was the driest year for 84 years.

Human reasons

Supply and demand Cape Town’s population has grown significantly in size and wealth, so there is a higher demand for water.

Agriculture also has a large need for water for **irrigation**. These changes have had a number of social, economic, environmental and political consequences (Figures 4 and 5).

Energy South Africa still uses coal as its major source of energy (approximately 77% of total energy sources). Coal requires a huge amount of water in the processes of cooling, extracting and washing.

Poor infrastructure and management of water Storage of water has not

2001–04	A period of lower than expected rainfall
2009	Berg River Dam completed, adding 17% more storage for water
2013–14	Period of heavy rainfall
2015	Start of drought in the Western Cape
November 2016	Level 3 restrictions on water introduced
October 2017	Plans for Day Zero scenario released
January 2018	Level 6 restrictions on water introduced
February 2018	Rains begin to recharge the reservoir systems; Day Zero avoided

Figure 4 Key dates in Cape Town’s water crisis

kept up with the demand (Figure 6). The Berg River Dam was completed in 2009 but the increase in storage it created did not meet the increasing demands of water. Poor-quality

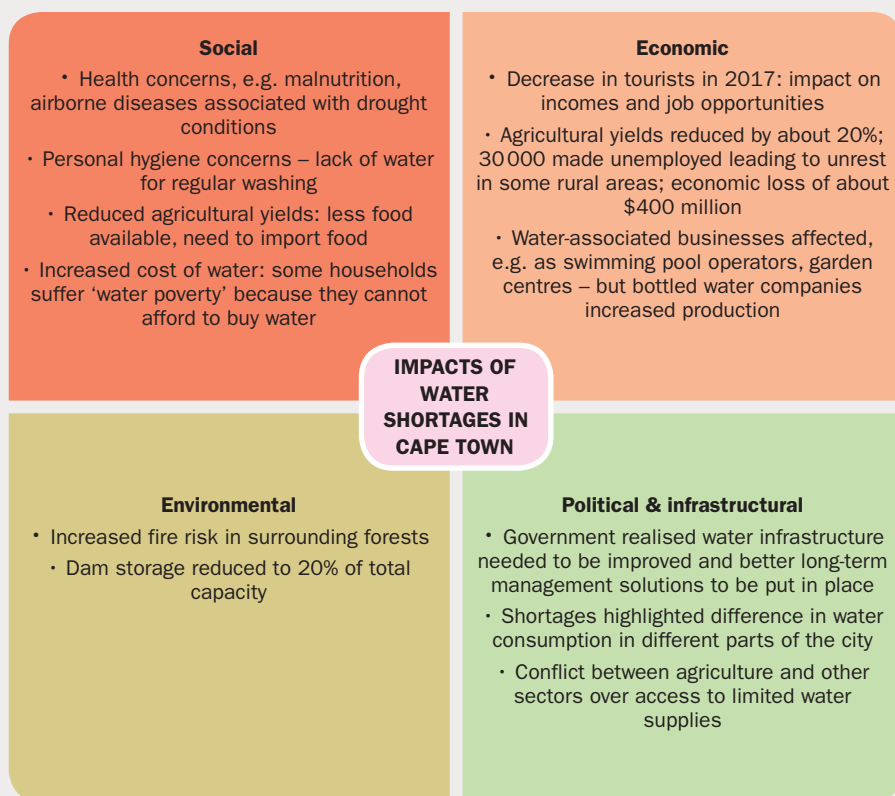


Figure 5 Impacts of the water shortages in Cape Town

infrastructure, such as leaking pipes, mean there is a regular loss of water from the system.

Government policy Before the shortages, water was freely available, with all households receiving over 6000 litres a month free of charge. This meant that many people wasted water.

Virtual water Cape Town’s agriculture uses a lot of water for the production of grapes, apples and other fruits. This is water that is consumed during the growing of crops and is held ‘invisibly’ within the crop.

Solutions to the water shortages

A number of short-term and long-term measures were put in place to try to manage water demand (Figure 7). For example:

“The thought that a Day Zero would actually happen forced people to take action and reduce their consumption.”

- **Strict restrictions** were put in place, such as fines up to £700 for those people who consumed high volumes of water. These were based on a scale of restrictions from Level 1 (least concern over water) to Level 6B (most concern) which changed according to the seriousness of the crisis.
- **Additional charges** were introduced and increased. There was now a charge for

	Capacity (million litres)	Storage (%)					
		2014	2015	2016	2017	2018	2019
Berg River	130 010	90.5	53.7	27.2	31.7	39.1	69.1
Steenbras Lower	33 517	39.6	46.7	36.2	25.5	33.7	38.5
Steenbras Upper	31 767	79.1	58.4	55.7	55.7	56.2	73.8
Theewaterskloof	480 188	74.5	50.7	30.8	14.6	12.1	35.9
Voelvlei	164 095	59.5	41.6	21.3	16.4	14.4	54.6
Wemmershoek	58 644	58.8	49.8	47.3	36.1	47.5	42.0
Total stored (megalitres)	898 221	646 137	445 054	275 581	185 755	189 375	412 815
% stored		71.9	49.5	30.7	20.7	21.1	46.0

Figure 6 Storage capacity of dams in the Western Cape

Source: <http://resource.capetown.gov.za/documentcentre/Documents/City%20research%20reports%20and%20review/damlevels.pdf>

- water, except for the very poorest communities.
- **Water management devices and smart meters were installed.** The devices could set limits on water consumption: when the daily limit was exceeded, no more water was available from the tap. The smart meters monitored water consumption.
- **Pressure reductions** on the water pipes were introduced, so overall consumption was reduced city-wide.
- **Education** about water consumption and use was increased. Websites, radio broadcasts and social media played an important role. Some people received letters from the Mayor of Cape Town and local



Figure 7 Road sign in Cape Town, 2018

Source: Shutterstock / Lisa Lildemann

residents were encouraged to monitor each other's usage. A Cape Town Water Map was introduced, which indicated households that met consumption targets and those that did not.

As a result of these measures, water consumption halved by February 2018. The thought that a Day Zero would actually happen forced people to take action and reduce their consumption.

Day Zero

Day Zero was the planned day when the city would literally run dry. An initial date of 12 April 2018 was set for Day Zero. This was the day when standpipes would be shut off and the population would be limited to 50 litres per person per day. However, rains arrived in early 2018, so Day Zero was never put into action, and over the following months the water restrictions were reduced.

Challenges for the future

Higher temperatures and reduction in rainfall are going to make water supply a challenge for Cape Town and for other cities around the world too. Day Zero was avoided due to strict control

and the arrival of heavy rains in early 2018. Water restrictions were eased once the dam storage reached over 70%. However, with Cape Town's growing population and increasing wealth, concerns about water will continue. Several long-term plans have already been considered.

Desalination – the conversion of salt water to fresh water. The project was started but has been stopped by fears of dirty water, the high cost, and disputes with the contractors.

Using groundwater – groundwater is available from rocks under the Earth's surface. Access to it requires drilling down into the rock, with possible consequences of overuse, subsidence of the ground and other environmental impacts.

Springwater collection – natural springs appear in many locations in Cape Town and could provide a partial solution to the water shortages.

“Early warning systems are important, as is cooperation among the authorities on how best to plan, prepare, manage and solve water shortages.”

Education – better education methods are already being used in workplaces, homes and schools. There is a widespread view that people have to be more careful in the future, and rules adhered to.

Better planning and preparation – the water restrictions took many people by surprise but new systems have been put in place, including better climate monitoring and rainfall predictions, and accurate monitoring of the dam storage levels.

Conclusion

Residents of Cape Town showed that they could adapt their lives in the short term to cope with major water shortages. The possibility of Day Zero challenged many views on water consumption. Early warning systems are important, as is cooperation among the authorities on how best to plan, prepare, manage and solve water shortages in the city. With climate change creating different rainfall and temperature patterns, cities like Cape Town are going to have to face water challenges in the future.

Activities

- 1 Define the term *water insecurity*. Explain why it is a better term to use than 'water security'.
- 2 a Copy and complete the following paragraph, using the terms below.
 Nearly all the world is facing moderate or severe water insecurity except for regions in Canada, Brazil and _____. The highest areas of water insecurity are found in northern Africa and the _____ regions where the levels are reaching extremely high risk. All of Africa is experiencing medium or above water insecurity. _____ has the most variation of water insecurity from low (Brazil) to extremely high (west coast).
Middle East South America Russia
- b Suggest a reason why some places in the world have high water insecurity/risk.
- 3 Describe the location of Cape Town, filling the gaps with suitable phrases. Use Figure 2 or an atlas to check your answers.
 Cape Town is located on the _____ coast of South Africa, near the southern tip of Africa. There is a natural _____ to the south of the city and overlooking the city are the Cape _____. This area stores the _____ for people to consume.
- 4 a Using the data in Figure 3, draw a climate graph for Cape Town.
 b Calculate the following: average temperature, range of temperature, total rainfall, average rainfall.
 c Decide whether the following statements are true or false.
 - i Cape Town experiences a Mediterranean climate.
 - ii Cape Town has mild and dry winters.
 - iii Cape Town experiences a wide annual range in temperature, over 10°C.
 - iv June is the wettest month.
- 5 a Using the information in Figure 6, draw a pie chart to show the distribution of storage capacity for the Western Cape dams.
 b What is the change in total stored capacity and percentage stored between 2014 and 2019?
- c Which dam experienced the greatest fluctuation in storage between 2014 and 2019?
- d Draw a line graph to show the percentage storage for Berg River and the Steenbras Upper Dam between 2014 and 2019, and total percentage stored during the same period.
- e Describe the changes shown in your graph for the Berg River and Steenbras Upper Dams.
- 6 Do you think the water shortage crisis was created by people or by natural causes? Explain your answer.
- 7 Explain what is meant by the term *water poverty*.
- 8 To try and solve the problems of Cape Town's water shortages, several strategies have been suggested: desalination, groundwater abstraction, springwater collection, education, better planning and preparation.
 Which method do you think should be used in the future?

Learning checkpoint

- Water insecurity is an issue facing people all over the world but those in the developing world have the greatest social and economic challenges.
- Water insecurity has major impacts on the livelihoods and health of people.
- Water insecurity can be reduced through education schemes and by introducing major infrastructural change, such as desalination plants and groundwater abstraction.

Glossary task

Write glossary definitions for these terms:

irrigation	virtual water
Sustainable Development Goals	water insecurity
	water management

Remember this unit

To help you remember this unit, make notes using the following headings:

Why are there water shortages in Cape Town?

What were some of the impacts of these water shortages in 2018?

How did Cape Town respond to the water shortages?

What are possible solutions that Cape Town could use in the future?

Try to fit your notes on a single sheet of A4.