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91243R

Mana Tohu Mātauranga o Aotearoa
New Zealand Qualifications Authority

Level 2 Geography 2023

91243 Apply geography concepts and skills to demonstrate understanding of a given environment

Credits: Four

RESOURCE BOOKLET

Refer to this booklet to answer the questions for Geography 91243.

Check that this booklet has pages 2–11 in the correct order and that none of these pages is blank.

YOU MAY KEEP THIS BOOKLET AT THE END OF THE EXAMINATION.

Geographic concepts you may choose to use in your answers include:

Environments
May be natural and / or cultural. They have particular characteristics and features, which can be the result of natural and / or cultural processes.

Perspectives
Ways of seeing the world that help explain differences in decisions about, responses to, and interactions with environments. Perspectives are bodies of thought, theories, or worldviews that shape people's values and have built up over time.

Processes
A sequence of natural and / or cultural actions that shapes and changes environments, places, and societies. Processes can have temporal or spatial variations. Some examples of geographic processes include erosion, migration, desertification, and globalisation.

Patterns
May be spatial (the arrangement of features on the Earth's surface) or temporal (how characteristics differ over time in recognisable ways).

Change
Involves any alteration to the natural or cultural environment. Change can be spatial and / or temporal. Change is a normal process in both natural and cultural environments. It occurs at varying rates, at different times, and in different places.

Interaction
Involves elements of an environment affecting each other and being linked together. Interaction incorporates movement, flows, connections, links, and interrelationships, which work together and may be one- or two-way interactions. Landscapes are the visible outcome of interactions. Interaction can bring about environmental change.

Sustainability
Involves adopting ways of thinking and behaving that allow individuals, groups, and societies to meet their needs and aspirations without preventing future generations from meeting theirs. Sustainable interaction with the environment may be achieved by preventing, limiting, minimising, or correcting environmental damage to water, air, and soil, as well as considering ecosystems and problems related to waste, noise, and visual pollution.

INTRODUCTION: The Colorado River and Lake Mead

The Colorado River system has been eroding rock and carving through the American southwest for the past six million years. Spanning seven US states and two countries, this network of rivers is vitally important to both people and the natural environment in which it is found.

Fifteen dams have been built on the main stem of the Colorado River. Collectively, dams in the Colorado River basin can hold four to five times the river's annual flow, generating hydroelectricity and supplying irrigation and municipal water for over 35 million people.

Figure 1 (above): The drainage basin (the area that supplies the river with water, coloured yellow) of the Colorado River.

Figure 2 (left): Location of the Hoover Dam within the Colorado River drainage basin in the United States of America.

Figure 3: Lake Mead and the surrounding environment (2018).

RESOURCE A: People and the environment

It is likely the first human inhabitants of the Colorado River basin were Paleo-Indians of the Clovis and Folsom cultures, who arrived on the Colorado Plateau about 12,000 years ago. Prehistoric inhabitants led a nomadic lifestyle, gathering plants and hunting small animals.

The Colorado and Virgin Rivers had been home to Native Americans for over a thousand years when Euro-American farmers settled in the area in 1869. Some mining took place in the 19th and early 20th centuries.

In 1928, the US Government authorised the Boulder Canyon Project, which included the key feature of the Hoover Dam, 48 km southeast of the newly established city of Las Vegas in Nevada. Over 20,000 people worked on the dam during its build – an average of 3,500 per day – providing much needed employment to the region.

The Hoover Dam was completed by 1936, and is 221 metres high and 201 metres thick at ground level. The aims of its construction were to:

- control water flow
- improve irrigation possibilities
- generate electricity.

Figure 4: The Colorado River before (left) and after (right) construction of the Hoover Dam, with Lake Mead behind it.

Figure 5: Aerial view of the Hoover Dam and Lake Mead.

Lake Mead is a reservoir formed by the Hoover Dam and is the largest reservoir in the United States in terms of water capacity. It is the largest artificial lake in the US and vital to almost 20 million people.

Las Vegas has undergone an increase in population since the construction of the Hoover Dam in 1936. The Hoover Dam and Lake Mead provide hydroelectricity generation to power the growing city.

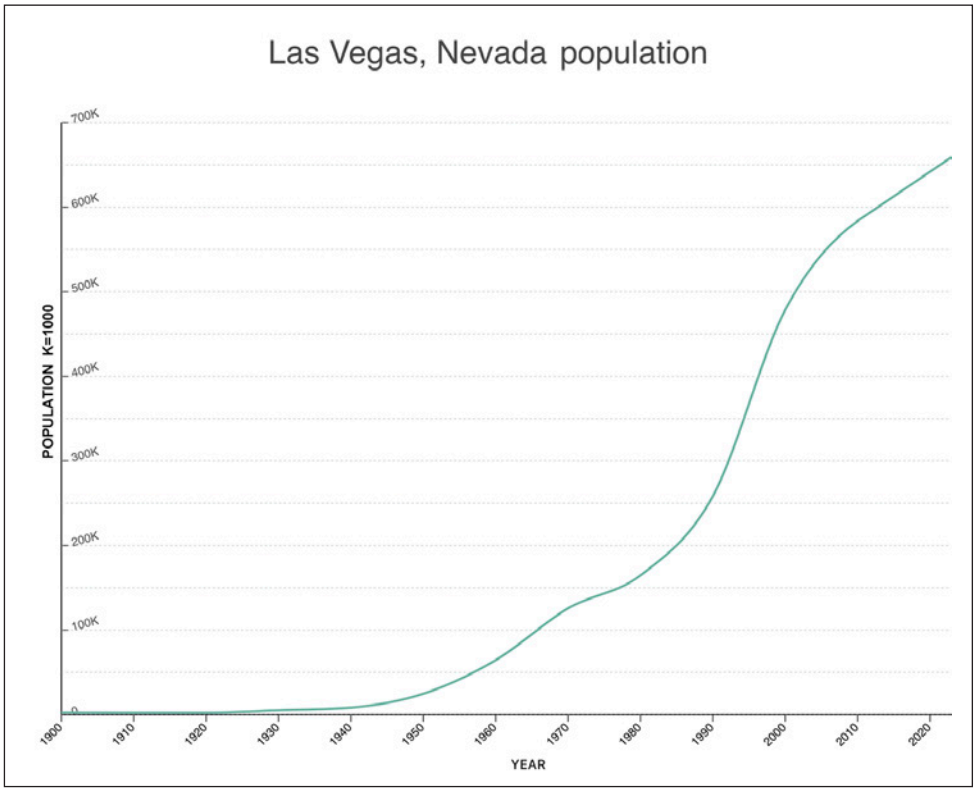

Figure 6: Line graph showing the growth in population of Las Vegas.

Figure 7: Aerial view of Las Vegas looking up the main Strip, with casinos and hotels on either side.

Many people are attracted here for a holiday to experience the excitement of the area.

Figure 8: Satellite views of Lake Mead, the Las Vegas urban area, and the surrounding environment in 1972 (left) and 2018 (right).

RESOURCE B: Hydroelectricity generation, farming, and fishing

The primary purpose of the Hoover Dam is to control the waters of the Colorado River during flood periods, lowering the threat of flood damage to the fertile regions below the dam.

Secondarily, the dam and Lake Mead provide storage for the annual runoff of the Colorado River, thereby creating a stable water supply for irrigating hundreds of thousands of hectares of land in southern California and southwest and central Arizona.

In addition, hydroelectric power is generated. Presently, the Hoover Dam can produce over 2,000 megawatts of capacity and a yearly average generation of 3.8 billion kilowatt hours to serve the annual electrical needs of nearly 8 million people in Arizona, Las Vegas, and southern California.

Colorado River dams, lake sizes, and electricity generation			
	Reservoir volume (million m^3)	**Installed capacity (MW)**	**Annual generation (MWh)**
Glen Canyon Dam / Lake Powell	32,336	1,296	3,454,847
Hoover Dam / Lake Mead	35,703	2,079	3,806,935
Davis Dam / Lake Mojave	2,243	255	1,147,673
Parker Dam / Lake Havasu	797	140	456,944
Total / average	**71,079**	**3,770**	**8,866,399**

Figure 9: Colorado River dams, lake sizes, and electricity generation.

Figure 10: Irrigation of crops is an important use of river water.

Agriculture uses approximately 30% of the upper Colorado River's water to irrigate (water) 15% of the USA's farmland and produce 90% of the winter vegetables. Examples of irrigated crops include wheat, corn, berries, and fresh produce, as well as crops such as alfalfa and hay that are used by farmers to feed cattle.

A recent study found that the largest consumer of river water in the western US is irrigation for cattle-feed crops.

With damming and increased use of the Colorado River, big changes have occurred in the area. Many large fertile farm areas, cultural remains, areas of natural beauty, wildlife habitats, and valuable environmental treasures are now covered by lakes that fill for hundreds of kilometres behind the dams.

Water and land habitats are altered to the extent that many native plant and water animal species have become endangered or even extinct due to either submergence under water or changes in habitat characteristics due to water shortage.

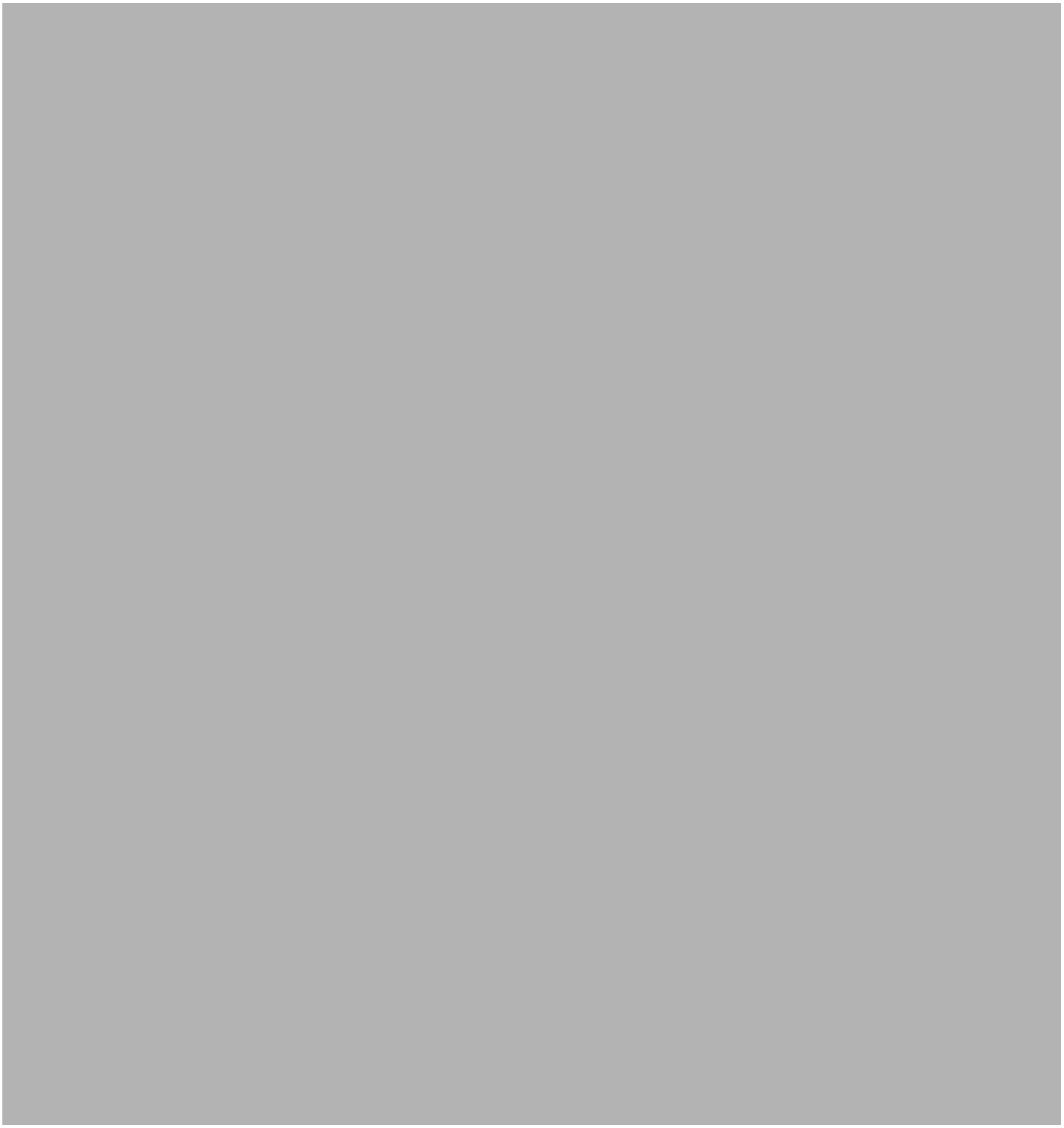

Figure 11: Endangered fish species of the Colorado River.

Lake Mead's story is one that shows the importance of discovery and of conservation. People have affected the lake and now the lake is affecting people's lives too. The lake was seen as something to use freely, but now people see they need to protect it.

Lake Mead is one of the largest constructed lakes on Earth. It is important because it is used as a drinking water and irrigation source for tens of millions of people in the surrounding regions. As the lake changes, this water source may need to be replaced.

Water reduction

Figure 12: Gila monsters are highly venomous, although they release only a relatively small amount of venom when they bite.

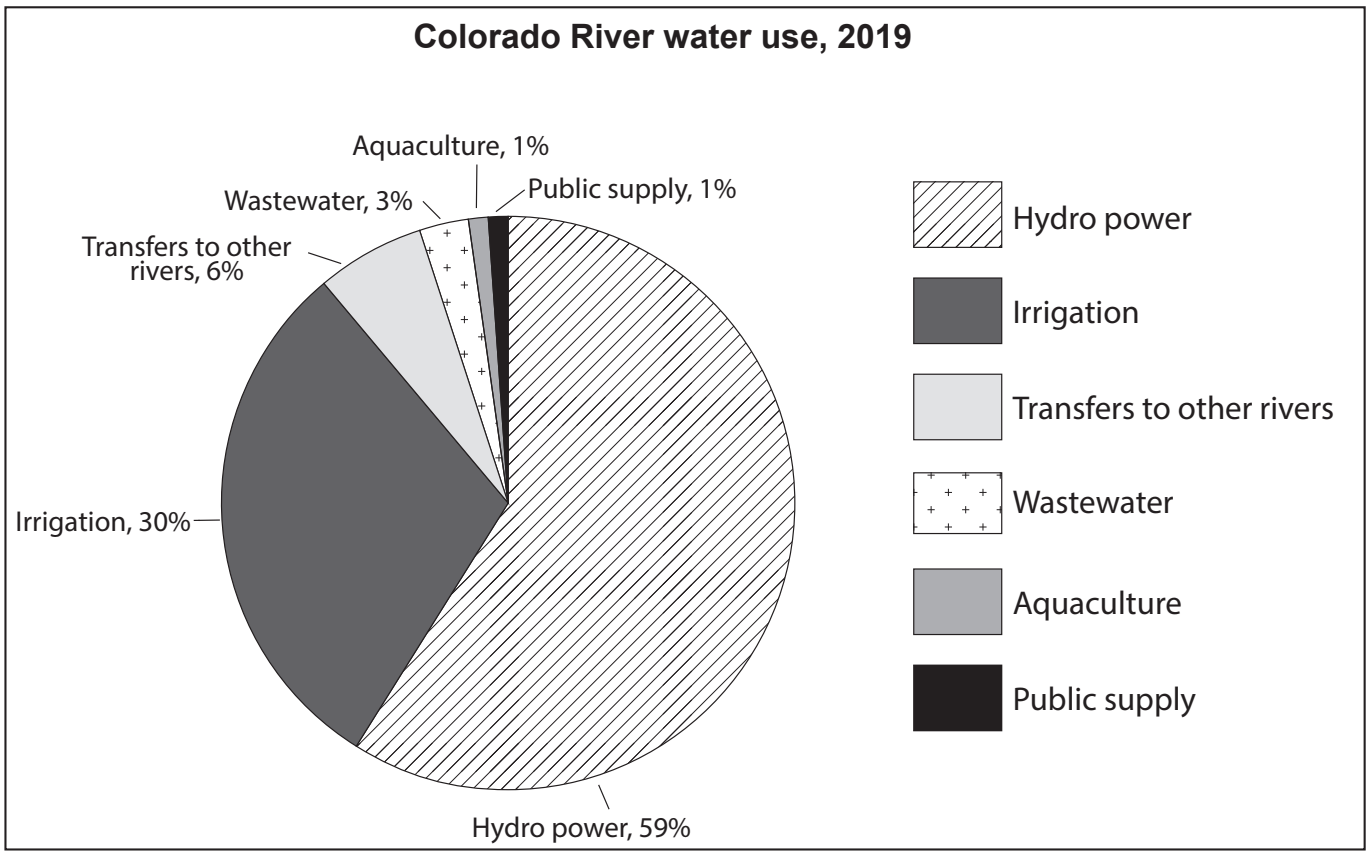

Figure 13: Uses of water flowing through the Colorado River environment.

Figure 14: The upper reaches of the Colorado River showing vegetation growing near the river edges.

RESOURCE C: Perspectives

The construction of the Hoover Dam has had huge benefits for me. I have a job doing what I love, and help to grow and feed a large population as part of an agricultural industry worth $5 billion. Without the dam, farming wouldn't happen here in this dry environment.

Of course, we're concerned about the local environment. Before the dam was here there was a diverse wetland, but 95% of the freshwater wetland was wiped out in less than 70 years. If the Hoover Dam was removed, four native fish species that are native to the Colorado River may survive – the bonytail chub, Colorado pikeminnow, humpback chub, and the razorback sucker.

In 1930, the population of Las Vegas was just 5,165. The Hoover Dam construction provided jobs for over 20,000 people and it continues to provide jobs now. Without the Hoover Dam, cities like Las Vegas never would have succeeded. The Hoover Dam provides electricity to cities like Las Vegas and Los Angeles. Las Vegas now has a population of over 650,000 and relies on the bright lights to bring tourists in.

Acknowledgements
Material from the following sources has been adapted for use in this assessment:

Introduction
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Resource A
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