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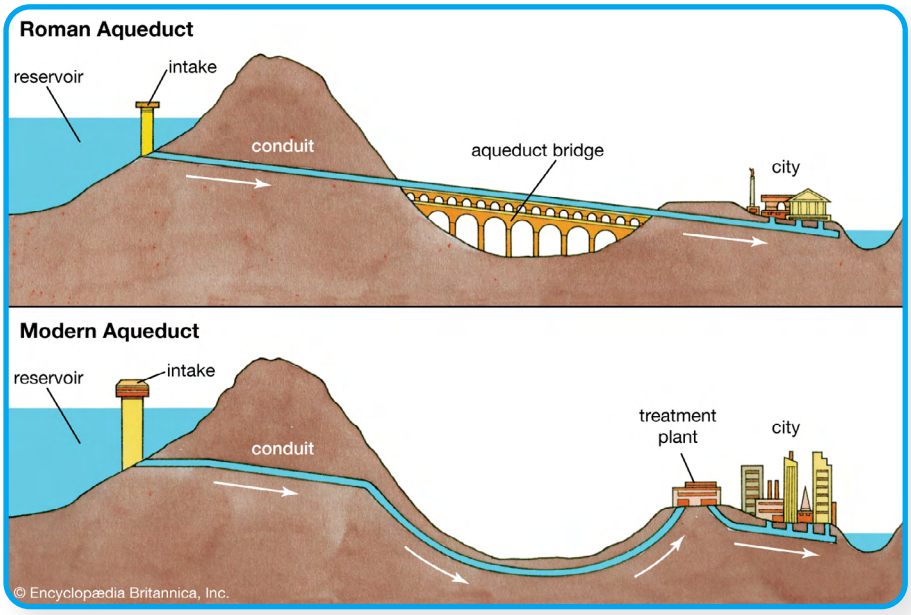
Name: **Date:**

Water Systems in the Middle Ages

Instructions: Read the article to answer the questions below.

Aqueducts

Most towns and cities arise on sites where water is plentiful, whether from lakes, rivers, or wells. As cities grow, the source of water is sometimes insufficient or even becomes too polluted for domestic use. Such cities must build artificial waterways, called aqueducts, to bring water from other sources.



Early aqueducts, such as those made by the Romans (top), had to rely on the force of gravity to move water over long distances. For this reason, the water could only move from a high point to a lower point. Modern aqueducts use electric pumps to move the water along.

Aqueducts may be canals, open troughs, overland pipelines, or tunnels. The earliest aqueducts were dug through clay or cut out of solid rock. Ancient engineers used wood, stone, and primitive concrete. A few early aqueducts used siphons to carry water across valleys and over hills. For the most part, however, aqueducts had to follow gentle, downhill courses, sometimes taking paths around mountains, through hills, and atop long, bridgelike arcades.

One of the most famous aqueduct builders of ancient times was the Romans. Roman aqueducts continued to be used even after the fall of the empire. Repairs were often inadequate, however, and most of the aqueducts gradually fell into disuse. A few were kept in operation through the Middle Ages.

Churchmen were often involved in aqueduct building in the Middle Ages. Aldric, the bishop of Le Mans from 832 to 856 CE, constructed an aqueduct to bring water to two fountains. A monastery in Canterbury, England, built an aqueduct in about 1153 CE to supply its water. Other waterworks were built by Cistercian abbeys in England, France, Germany, and Italy. In 1285 CE, the convent of Chester, in England, laid a lead pipe 3 miles (5 kilometers) long to provide water.

A number of medieval aqueducts were built in African and Asian countries. One such aqueduct, an arched conduit, was constructed in the 9th century CE to carry water to Cairo, Egypt. In India, an aqueduct 15 miles (24 kilometers) long was built in 1406 CE, most of it cut through solid rock, connecting with the Tungbhadra Dam.

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The Grand Canal in China

The natural and artificial channels that connect natural bodies of water are called canals. A canal may be dug to drain low areas, to float away sewage, to bring water to dry farmlands, or to carry water from storage places, such as reservoirs, to city water-supply systems. Some canals provide "detours" in rivers. These canals enable boats to avoid waterfalls, rapids, and dams.

Cargo barges travel on the Grand Canal in Hangzhou, China.

The Grand Canal has often been paired with the Great Wall as the two great engineering feats of ancient China. Few construction projects of the classical world can rival the political and economic significance of this series of waterways, which linked the early military and political centers of northern China to the granaries of the south. Today the Grand Canal continues to be used for shipping and irrigation. Located in eastern China, it connects Beijing to Hangzhou, in Zhejiang Province. It is the only major north–south waterway in China. With a length of about 1,085 miles (1,747 kilometers), it is the world's longest artificial waterway, though parts of it follow the natural course of rivers. The other parts consist of human-made canals. The name of the Grand Canal in Chinese is Da Yunhe.

The Grand Canal permitted the movement of troops from the dynastic capitals in northern China to the south. This relatively fast route by water was most instrumental for the early southward territorial expansions from the Han Dynasty (206 BCE–220 CE) onward. Throughout the many dynasties that followed, the canal system provided a safe and reliable means of grain and freight transport.

The oldest segment of the Grand Canal was traditionally known as the Shanyang Canal. This portion runs south from the city of Huai'an (formerly called Qingjiang), in northern Jiangsu Province, to the Yangtze (Chang) River. This segment was constructed as early as the 4th century BCE. It was rebuilt in 607 ce and has been used ever since.

Over the centuries that followed the initial construction, several additional segments were added, and the entire canal system was widened repeatedly. The Sui Dynasty (581–618 CE) built a major canal system known as the New Bian Canal, which remained the main waterway in the Tang (618–907 CE) and Northern Song (960–1127 CE) dynasties. The modern configuration of the Grand Canal came into being during the Yuan Dynasty (1279–1368 CE), when the capital was first established in Beijing.

The Grand Canal now crosses five major river systems: those of the Hai, Huang, Huai, Yangtze (Chang), and Qiantang rivers. The connection of so many east-west rivers to the Grand Canal greatly expanded the territory accessible via the canals. The challenge of crossing large rivers while ensuring that seasonal overflow from the rivers did not flood croplands along the canals required that the gradient of the canals be carefully managed, with frequent dredging. Along some low-lying areas, levees had to be constructed as well.

In the 19th century, a series of terrible floods on the Huang He broke many of the levees and caused serious problems on part of the Grand Canal. After the Taiping Rebellion and other major disturbances in the mid-19th century, the canal system was abandoned as the main supply route for Beijing. The northern sections of the system gradually fell into disrepair and disuse. Major restoration work on the Grand Canal was completed in the 20th century.

Byzantine Cisterns

Major water systems were designed during the growth of Constantinople, the capital city of the early Byzantine period (330–726 CE). One distinctive system was the underground cisterns, of which more than 30 are known to exist today. A cistern is a large container used to collect water. Byzantine cisterns in Constantinople all took on the same character, with strong outer walls and roofs of small domes supported by tall columns. Some are of great size, some comparatively small. In some, like the great Basilica Cistern near Hagia Sophia called by the Turks the Yerebatan (Underground) Palace, old material was reused; in others, like the even more impressive Binbirdirek (Thousand and One Columns) Cistern, new columns of unusually tall and slender proportions and new capitals of cubic form were designed specially. These cisterns assured an adequate supply of water even when the aqueducts that fed the city were cut by an attacking enemy. Many of them were still in use at the end of the 19th century.

The Basilica Cistern, the largest of the ancient cisterns beneath Istanbul.

1. How did different societies solve their water supply problems in the Middle Ages?

2. Why might control over major water systems have impacted society?

3. What are the long-term impacts of these water systems?

Water Systems in the Middle Ages Answer Key

1. How did different societies solve their water supply problems in the Middle Ages?
   People in different places built special systems to bring or store water. In Europe, church leaders and monasteries built aqueducts to carry water from far away. In Africa and India, people built long aqueducts through rock to bring water to cities. In China, people built the Grand Canal to move water and goods across the country and for irrigation. The Byzantines in Constantinople built large underground cisterns to store water in case enemies cut off access to their aqueducts.

2. Why might control over major water systems have impacted society?
   Controlling water helped leaders gain power because it supported farming, trade, and growing cities. Water systems also made it easier to move goods. Whoever controlled the water had control over important resources that people depended on.

3. What are the long-term impacts of these water systems?
   Many of these water systems lasted for hundreds of years and influenced how people built cities later on. Some, like the Grand Canal, are still used today. They also inspired modern engineers to build better water systems. These projects showed how important water was for trade, agriculture, and daily life.