

WATERS OF TOKYO

Organizing Questions

- How have the waters of Tokyo contributed to the city's economy and society?
- What human actions have shaped and changed Tokyo's waterways and bay?
- What are some environmental, economic, and social issues concerning Tokyo's waters?

Introduction

In this lesson students consider the importance of water in a general sense and then learn about the rivers and waterways of Tokyo. Students become familiar with the historical significance of Tokyo's waters and how they contributed to the economy and society beginning in the Edo Period. Students learn about how human actions have shaped and changed Tokyo's waters as well as how its waters have impacted and continue to effect the people and city of Tokyo.

Students first discuss issues related to bodies of water where they live and then learn about water-related issues in Tokyo. They learn water-related vocabulary terms, navigate a web-based interactive map of Tokyo's rivers, read an informational handout about the waters of Tokyo, and research a contemporary water-related concern and present their findings to the class.

Objectives

In this lesson, students will

- consider consequences of physical processes on Earth;
- examine physical characteristics of the waters of Tokyo;
- learn the historical significance of Tokyo's rivers;
- explore contemporary environmental, economic, and social issues surrounding Tokyo's waters;
- compare and contrast issues pertaining to Tokyo's waters with those pertaining to the waters where students live; and
- learn water-related vocabulary terms.

Connections to Curriculum Standards

This lesson has been designed to meet certain national history, social studies, geography, and common core standards as defined by the National Center for History in the Schools, the National Council for the Social Studies, the National Council for Geographic Education, and the Common Core State Standards Initiative. The standards for the lesson are listed here.

National History Standards (from the National Center for History in the Schools)

World History

Era 6, Standard 6A: The student understands major global trends from 1450 to 1770.

- Grades 5–12: Assess how the acceleration of scientific and technological innovations in this era affected social, economic, and cultural life in various parts of the world. [Analyze cause-and-effect relationships]
- Grades 5–12: Describe major shifts in world population and urbanization in this era and analyze how such factors as industrialization, migration, changing diets, and scientific and medical advances affected worldwide demographic trends. [Interrogate historical data]

Era 9, Standard 2A: The student understands how population explosion and environmental change have altered conditions of life around the world.

- Grades 7–12: Analyze causes of the world’s accelerating population growth rate and connections between population growth and economic and social development in many countries. [Analyze multiple causation]
- Grades 5–12: Analyze how population growth, urbanization, industrialization, warfare, and the global market economy have contributed to environmental alterations. [Analyze cause-and-effect relationships]
- Grades 5–12: Assess the effectiveness of efforts by governments and citizens’ movements to protect the global natural environment. [Obtain historical data]

World History Across the Eras, Standard 1: Long-term changes and recurring patterns in world history

- Grades 5–12: Analyze ways in which human action has contributed to long-term changes in the natural environment in particular regions or worldwide.

National Social Studies Standards (from the National Council for the Social Studies)

- Culture; Thematic Strand I: Social studies programs should include experiences that provide for the study of culture and cultural diversity.
- Time, Continuity, and Change; Thematic Strand II: Social studies programs should include experiences that provide for the study of the past and its legacy.

- People, Places, and Environments; Thematic Strand III: Social studies programs should include experiences that provide for the study of people, places, and environments.
- Individuals, Groups, and Institutions; Thematic Strand V: Social studies programs should include experiences that provide for the study of interactions among individuals, groups, and institutions.
- Production, Distribution, and Consumption; Thematic Strand VII: Social studies programs should include experiences that provide for the study of how people organize for the production, distribution, and consumption of goods and services.
- Science, Technology, and Society; Thematic Strand VIII: Social studies programs should include experiences that provide for the study of relationships among science, technology, and society.
- Global Connections; Thematic Strand IX: Social studies programs should include experiences that provide for the study of global connections and interdependence.
- Ideals, Principles, and Practices; Thematic Strand X: Social studies programs should include experiences that provide for the study of the ideals, principles, and practices of citizenship in a democratic republic.

National Geography Standards (from the National Council for Geographic Education)

The geographically informed person knows and understands:

- Standard 1: How to use maps and other geographic representations, geospatial technologies, and spatial thinking to understand and communicate information [Essential Element I: The World in Spatial Terms]
- Standard 3: How to analyze the spatial organization of people, places, and environments on Earth's surface [Essential Element I: The World in Spatial Terms]
- Standard 4: The physical and human characteristics of places [Essential Element II: Places and Regions]
- Standard 7: The physical processes that shape the patterns of Earth's surface [Essential Element III: Physical Systems]
- Standard 9: The characteristics, distribution, and migration of human populations on Earth's surface [Essential Element IV: Human Systems]
- Standard 10: The characteristics, distribution, and complexity of Earth's cultural mosaics [Essential Element IV: Human Systems]
- Standard 11: The patterns and networks of economic interdependence on Earth's surface [Essential Element IV: Human Systems]
- Standard 14: How human actions modify the physical environment [Essential Element V: Environment and Society]
- Standard 15: How physical systems affect human systems [Essential Element V: Environment and Society]

- Standard 17: How to apply geography to interpret the past [Essential Element VI: The Uses of Geography]
- Standard 18: How to apply geography to interpret the present and plan for the future [Essential Element VI: The Uses of Geography]

Reading Standards for Literacy in History/Social Studies (from the Common Core State Standards Initiative)

- Standard 3, Grades 9–10: Analyze in detail a series of events described in a text; determine whether earlier events caused later ones or simply preceded them.
- Standard 4, Grades 9–10: Determine the meaning of words and phrases as they are used in a text, including vocabulary describing political, social, or economic aspects of history / social science.
- Standard 7, Grades 11–12: Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., visually, quantitatively, as well as in words) in order to address a question or solve a problem.

Writing Standards for Literacy in History/Social Studies, Science, and Technical Subjects (from the Common Core State Standards Initiative)

- Standard 4, Grades 6–12: Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.
- Standard 6, Grades 9–10: Use technology, including the Internet, to produce, publish, and update individual or shared writing products, taking advantage of technology’s capacity to link to other information and to display information flexibly and dynamically.
- Standard 9, Grades 6–12: Draw evidence from informational texts to support analysis, reflection, and research.

Materials

- Handout 1, *Vocabulary Terms*, 15 copies
- Handout 2, *Tokyo’s Rivers*, 15 copies
- Handout 3, *The Waters of Tokyo*, 30 copies
- Handout 4A, *Research Project: Local Water Issues*, 5 copies
- Handout 4B, *Research Project: Typhoons*, 5 copies
- Handout 4C, *Research Project: Japan’s Flood Prevention Systems*, 5 copies
- Handout 4D, *Research Project: Tokyo’s Flood Risk Increase*, 5 copies
- Handout 4E, *Research Project: Tokyo’s Reclaimed Land*, 5 copies
- Handout 4F, *Research Project: Arakawa River “Super Levees,”* 5 copies
- Handout 5, *Presentation Notes*, 30 copies
- Quiz, *Vocabulary Terms*, 30 copies
- Answer Key 1, *Quiz: Vocabulary Terms*

Answer Key 2, *Tokyo's Rivers*

Answer Key 3, *The Waters of Tokyo*

Teacher Information, *Research Project Rubric*

Equipment	15 computers with Internet access, for student use
Teacher Preparation	<p>Instructions and materials are based on a class size of 30 students. Adjust accordingly for different class sizes.</p> <ol style="list-style-type: none"> 1. Make the appropriate number of copies of handouts. 2. Become familiar with the content of handouts, quiz, answer keys, and teacher information. 3. Set up and test student computers and Internet connection. 4. Gather and become familiar with several current news articles about water-related issues in Tokyo and where you live. Bring the articles to class to share with the students on Day One.
Time	Three 50-minute class periods
Procedures Day One	<ol style="list-style-type: none"> 1. Begin this lesson by telling the students about a famous Japanese legend from the Sumida River. <p>One of the most famous temples in Tokyo and a popular tourist destination is Sensoji Temple, which lies along the Sumida River. The temple was built to house a statue of the Buddhist goddess of mercy, Kannon. As legend goes, this statue that stands in the temple was fished out of the Sumida River by two brothers in the year 628. The fishermen gave the gilded statue to the chief of their village. The chief later built the original temple to enshrine the statue so that the villagers could worship Kannon. The temple is the oldest in Tokyo and has been rebuilt and expanded many times over the last seven centuries but still houses the famous Buddhist relic.</p> 2. Mention to students that water often has a mystical appeal to people and many river or water-related legends exist in various cultures. Ask students to share their thoughts on why this is the case. 3. Discuss the benefits of water (source of food and necessary for drinking, cooking, washing, serving industrial needs, irrigation; means of transportation, commerce, recreation, etc.). Then discuss potential concerns related to water (drought, flooding, pollution, spreading of disease, drowning, etc.). 4. Ask students to think about the waters where they live—ocean, lakes, rivers, reservoirs, dams, creeks, etc. In what ways are these waters important to your community? What issues are a concern for the waters where we live? Briefly share the local news stories you gathered earlier with the students.

5. Explain that the class will learn about the waters of Tokyo. Ask student volunteers to share any information they may know about Tokyo's waters—its rivers, canals, bay, etc.
6. Share the Tokyo water-related news stories you gathered earlier. With the students, compare and contrast the local issues with those of Tokyo.
7. Divide the class into pairs. Distribute one copy of Handout 1, *Vocabulary Terms*, to each pair. Instruct students to read and study the terms with their partner and then quiz each other on the definitions. Collect Handout 1.
8. Distribute one copy of Quiz, *Vocabulary Terms*, and instruct students to quietly complete the quiz on their own. When all students have completed the quiz, ask them to switch papers with their partner. Review the answers with the class, using Answer Key 1, *Quiz: Vocabulary Terms*, and ask students to evaluate their partner's quiz, make and circle any necessary corrections, and return the quiz to their partners. Allow a couple minutes for students to look over their own quiz and note any corrections that were made.
9. Make computers available for student use. Distribute one copy of Handout 2, *Tokyo's Rivers*, to each pair and instruct students to complete the handout while they navigate the interactive map of Tokyo's rivers at http://web.stanford.edu/group/spice/road_to_tokyo/. (Select "Rivers" in the Maps menu.) Explain that they will need to click on each river on the map and read the information provided. When pairs are finished, review the answers as a class, using Answer Key 2, *Tokyo's Rivers*. Collect Handout 2.
10. Distribute one copy of Handout 3, *The Waters of Tokyo*, to each student. Instruct students to spend the remainder of the class period reading the handout and answering the questions on a separate sheet of paper. Instruct students to complete the assignment for homework and bring their answers to the next class period.

Day Two

1. Collect student responses to Handout 3, *The Waters of Tokyo*, completed for homework. Then review the answers with the class, using Answer Key 3, *The Waters of Tokyo*.
2. Divide the class into six groups, A–F. Explain that each group will research a different topic and present their findings during the next class period.
3. Distribute copies of Handout 4A–F, *Research Project*, to students according to their groups. For example, all students in Group A will receive one copy of Handout 4A, all students in Group B will receive one copy of Handout 4B, and so on.
4. Make computers available for student use. Allow the remainder of class time for groups to divide responsibilities, begin research using class computers, and plan their presentations. Instruct students to complete their projects for homework and be prepared to present

their findings and share their visuals to the class during the next class period.

- Day Three**
1. Allow groups five minutes to reconvene and discuss their presentation plan one more time. Distribute one copy of Handout 5, *Presentation Notes*, to each student. Explain that students should take notes and record their opinions about each topic on the handout while watching the other groups' presentations.
 2. Facilitate group presentations, ensuring that groups stay within the five-minute time limit.
 3. Collect group presentation materials and Handout 5 for assessment.
 4. Conclude the lesson with a debriefing discussion based on the following questions.
 - What are the most important issues pertaining to Tokyo's waters currently? How are governments, institutions, and individuals addressing these issues?
 - What are some key concepts you learned about Tokyo's waters in this lesson?
 - Do you feel you have gained a general understanding of Tokyo's waters?
 - What did you find most interesting about this lesson? Why?
 - What questions do you still have?
 - What topics or issues would you like to learn more about?

- Assessment**
- The following are suggestions for assessing student work in this lesson:
1. Informally assess student responses to prompts on Handout 2, *Tokyo's Rivers*, based on Answer Key 2, *Tokyo's Rivers*.
 2. Assess student responses to prompts on Handout 3, *The Waters of Tokyo*, based on Answer Key 3, *The Waters of Tokyo*.
 3. Evaluate group research projects and presentations, based on Teacher Information, *Research Project Rubric*.
 4. Informally assess student level of attention during the presentations, demonstrated by quality of notes taken and thoughtful opinions expressed on Handout 5, *Presentation Notes*.
 5. Assess student participation in group and class discussions, evaluating students' ability to
 - clearly state their opinions, questions, and/or answers;
 - provide thoughtful answers;
 - exhibit sensitivity toward different cultures and ideas;
 - respect and acknowledge other students' comments; and
 - ask relevant and insightful questions.

VOCABULARY TERMS

Study the terms and definitions below with your partner and quiz each other.

Terms	Definitions
aqueduct	an artificial channel for conveying water, typically in the form of a bridge supported by tall columns across a valley
dike	a long wall or embankment built to prevent flooding from the sea; a ditch or watercourse
divert	to cause something to change course or turn from one direction to another
embankment	a wall or bank of earth or stone built to prevent a river flooding an area
floodplain	an area of low-lying ground adjacent to a river, formed mainly of river sediments and subject to flooding
“kawa”	in Japanese, refers to a river; can appear as “gawa” when used as a suffix, e.g., Edogawa or Edo River
headwaters	a tributary stream of a river close to or forming part of its source
landfill	a place to dispose of refuse and other waste material by burying it and covering it over with soil, especially as a method of filling in or extending usable land
levee	an embankment built to prevent the overflow of a river
reclaimed land	land that was under the sea or in very poor condition but has been improved so that it can be used for farming or building on
reservoir	a large natural or artificial lake used as a source of water supply
tributary	a river or stream flowing into a larger river or lake
typhoon	a tropical storm in the region of the Indian or western Pacific oceans

TOKYO'S RIVERS

Go to http://web.stanford.edu/group/spice/road_to_tokyo/ and select "Rivers" under the Maps menu. With your partner, respond to the following prompts as you navigate through the interactive map of Tokyo's rivers.

Arakawa River

1. Why was the Arakawa split into two waterways in 1930?
2. Why did the Mayor of Tokyo give the city of Washington, D.C. scions from the famous cherry trees along the Arakawa River?
3. Is the Arakawa the longest or shortest river in Tokyo?

Edo River

4. The Edo River was born from a diversion of the Tone River. Why did the shogunate divert the river?
5. How is the Edo River used today?
6. What new technology in the 20th century led to the decreased use of the river for transportation?

Kanda River

7. A tributary of the Kanda fills the moat of this famous landmark in Tokyo: _____

8. How was this river born?
9. Why has the Kanda had a long history of flooding? What measures have been taken to prevent future flooding?

Sumida River

10. The Sumida River Fireworks Display is a famous festival in Tokyo. What year did the annual festival begin? What was the purpose of the original festival?
11. The Sumida is known for its Edo-era _____, which were all rebuilt after suffering damage or destruction during the _____ of 1923 and the firebombings of World War II. Today many tourists enjoy taking boat tours on the Sumida River to view its bridges and get a different perspective of Tokyo's sights from the water.

Tama River

12. The Tama River runs for _____ miles, beginning at Mount _____ and ending at _____.
13. How was the Tama instrumental during the Edo Period?
14. What were the reasons for delayed construction of Japan's largest reservoir?

General Questions

15. Which is the main river of Tokyo?
16. What are some similarities among the five rivers?
17. Over the last four centuries, human actions have shaped and changed the rivers of Tokyo. Cite two specific examples from the reading.

THE WATERS OF TOKYO

BY DR. RODERICK IKE WILSON

Odaiba—a large artificial island in Tokyo Bay, across the Rainbow Bridge from central Tokyo

Palette town—a massive complex including a shopping center and a Ferris wheel that can be seen all across Odaiba

anime—a style of Japanese film and television animation, typically aimed at adults as well as children; characterized by stark colorful graphics depicting vibrant characters often with fantastic or futuristic themes

Tokugawa Ieyasu—one of the most significant figures in Japanese history; warrior, statesman, and founder of the Tokugawa dynasty of shoguns. He worked hard to restore stability to Japan and encourage foreign trade.

shogun—a hereditary commander-in-chief in feudal Japan. Because of the military power concentrated in his hands and the consequent weakness of the nominal head of state (the emperor), the shogun was generally the real ruler of the country until feudalism was abolished in 1867.

reclaim—to bring (waste land or land formerly under water) under cultivation

The port of Tokyo is a bustling site of activity. Large container ships arrive from around the globe to deliver, in 2015, over 86 million tons of goods to one of the world's largest cities. For almost a century, the world's largest fish market has also occupied the bayside site at Tsukiji and will soon move to an even larger site on the nearby island of Harumi. Residents of Tokyo and visitors to the city also frequent the port area via ferries, subway lines, and aboard the monorail and cars over the famous Rainbow Bridge. Less interested in the massive ships and fish market, these local and foreign tourists flock to the island area of Odaiba to take in the sun and waves along its beach, visit one of its many museums, shop in the multistory Aquacity shopping mall, ride the coasters and the Ferris wheel in Palette Town, or attend one of the many *anime* or technology conventions that are held at the country's largest exhibition area—the Tokyo Big Sight. Few are aware, however, that the port and bay area was built atop landfill and is reflective of how for over four hundred years the residents of the city have intimately interacted with the area's rivers and bay to make Tokyo what it is today.

In 1590 and after more than a century of warfare, Tokugawa Ieyasu chose the small castle town of Edo (now Tokyo) to be his new military headquarters. Over the next two decades, Ieyasu defeated his remaining enemies, became the new shogun, and began transforming the castle and city into the country's urban center. Over the next half century, tens of thousands of laborers, artisans, and merchants moved to Edo to build the city and make a living of their own. Much of their work focused on digging the massive moats that encircle the castle grounds (now the site of the Imperial Palace) and rerouting streams and rivers away from Edo. With all that excavated dirt, they filled in a portion of the bay called the Hibiya inlet and built dense neighborhoods of one- and two-story wood buildings. Thereafter, the city continued to grow by slowly draining and expanding into nearby marshes and reclaiming portions of the bay. By the 1720s when the first census was conducted, Edo had grown to over a million residents making it as large as Beijing and nearly twice the population of London, at the time the largest city in Europe.

Having built much of the commoner districts atop reclaimed parts of the bay, the well water in that part of the city was often too salty for drinking. At the same time, many of the warriors (*bushi* or samurai) and domain lords (*daimyo*) who moved to the city lived in estates built atop the surrounding hills where well water was not always reliable. To quench this need for water, the shogun's advisors ordered the digging of several aqueducts, the longest of which was over 30 miles long, to supply a vast underground system of wood pipes and wells buried beneath the city. Not by accident, these waters first supplied the warrior estates, which were mostly built on the hills to the north and west of the city, before flowing on to the commoner districts. At the same time, the central Sumida River and a dense network of canals carried the boats that supplied the city

purveyor—a person who sells or deals in particular goods

battery—a fortified emplacement for heavy guns

gunboat diplomacy—foreign policy that is supported by the use or threat of military force

cholera—an infectious and often fatal bacterial disease of the small intestine, typically contracted from infected water supplies and causing severe vomiting and diarrhea

typhoid—an infectious bacterial fever with an eruption of red spots on the chest and abdomen and severe intestinal irritation

dysentery—an infection of the intestines resulting in severe diarrhea with the presence of blood and mucus in the feces

inundate—to overwhelm with a huge quantity

tidal flat—a shallow, often muddy, part of foreshore, which is covered and uncovered by the rise and fall of the tide

with most of its food and other necessities. These same waterways also carried out boatloads of finished products and empty barrels as well as “nightsoil,” human manure that the city’s residents *produced* and *sold* to purveyors who shipped it to the countryside where farmers used it as fertilizer. In 1853–54, the shogun’s government called on Edo’s fishers, boat pilots, and thousands of laborers to haul dirt and rock from the nearby shore to construct 11 stadium-sized battery islands in the bay in front of Edo as a means of defending the city from the U.S. Navy’s East Asia Squadron effort at “opening” Japan through so-called gunboat diplomacy. In the end, the shogun opted to negotiate a treaty with the United States and stopped the costly construction of the battery islands after completing only six, which became collectively known as Odaiba (the same island area mentioned above, although only two of these original islands remain).

While in need of constant maintenance, Edo’s system of canals and wooden pipes continued to serve the city’s needs until well after the 1868 Meiji Restoration when the Tokugawa shoguns were replaced with a new modernizing government and Edo was renamed Tokyo. As the city began to industrialize and continued growing, the demands placed on its waters also increased along with the number of boats plying its waters. (According to a 1921 survey, there were more than 20,000 boats in the city.) Moreover, as cheaper chemical fertilizers came on the market and farms were pushed further from the city center, the old system of collecting and selling nightsoil collapsed, leaving the city’s residents with little other choice than to dump their buckets of human waste into nearby gutters and canals. The result was a public health crisis with occasional cholera epidemics and regular problems with typhoid and dysentery.

Both to tackle these problems and modernize the city, from the 1880s onward the city and national governments carried out a number of large engineering projects that aimed to transform the city from the country’s largest castle town into a modern political and economic capital. Among these projects, three stand out for their size and influence on the city’s waters. The first were the Tokyo Municipal Improvement Projects, which for 30 years from the 1880s slowly replaced arching wood bridges with flat ones made of steel and concrete, straightened and widened streets, strengthened canal embankments, replaced the old system of wood pipes with ones made of cast iron, and for the first time installed sewer lines and water filtration plants. Just as these projects were slowing down, however, in the summer of 1910 a massive flood inundated parts of Tokyo with as much as 10 feet of water. In response, the national government spent two decades building the massive Arakawa River Drainage Canal around the north and east of the city, making it by far the city’s largest waterway. The third and largest project transformed the broad tidal flats that stretched out in front of Tokyo for a couple miles into a world-class deep-water port. Because of its cost and technical difficulties, however, most construction was repeatedly delayed until the 1923 Kanto earthquake, which destroyed much of the city center and killed as many as 100,000 people, convinced the government that a deep-water port

could better supply the city during an emergency as well as work as an economic engine for rebuilding the city. The Port of Tokyo, however, did not officially open until 1941 in the middle of Japan's war in China and just months before the attack on the United States at Pearl Harbor. Another casualty of Japan's 1937 invasion of China was the cancellation of the 1940 Tokyo Olympics and the International Exposition of Japan, the site for which was to be built atop reclaimed land in the bay.

Following the destruction of Tokyo during the bombing raids of 1945 and Japan's surrender later that year, the city looked to its polluted waterways and bay as an easy place to dispose of all that wartime rubble. Over the next several years, many canals were buried and boatloads of rubble were dumped along the bay to make new landfill on which to build more factories and warehouses for the ever-growing city. Along with rebuilding the city, planners and politicians also embraced the business community's desire to rapidly grow the economy of Tokyo and the whole of Japan. Widely known as the "Japanese Economic Miracle" for achieving more than 10 percent annual GDP growth, people celebrated when Tokyo was selected to host the 1964 Olympics. Despite the phoenix-like rise of Tokyo from the ashes of war, the city's waters suffered from widespread pollution and frequent die-offs of fish and shellfish. While not as severe as the infamous water pollution in Minamata, Japan, the industrial growth and pollution in Tokyo was bad enough that in the late 1950s the remaining fishing communities gave up their centuries-old rights to fish the bay in exchange for a compensation package. Within the city as well, the city literally turned its back on its watery past as new buildings typically had their facades facing the streets and their unadorned, windowless backs facing its remaining waterways, over many of which the government built the city's new system of expressways.

Since the 1970s and the passage of strict laws regulating pollution, a combination of academics and citizen's groups have worked to rediscover and protect Tokyo's waters and their rich history. Often motivated by a desire to improve their local neighborhoods, these groups have been successful in encouraging the metropolitan government to buy narrow strips of land along these waterways in order to build walkways and small parks. As the quality of the water in the Sumida River and bay has improved, developers have also replaced factories and warehouses with towering apartment buildings and restaurants. While visitors to Odaiba or the nearby Disney Sea resort may not pause to think about the history of the water before taking a stroll or a plunge, the location of these sites and the waters that make them so popular are the result of centuries of interaction by people living in their environment. And, at each stage of its more than 400-year history, political and business leaders along with local residents have made choices that have literally shaped the city's waterways and the quality of the water flowing therein.

gross domestic product (GDP)—the total market value of the goods and services produced in a country in a given year

facade—the face of a building, especially the principal front that looks onto a street or open space

Assignment

Respond to the following prompts on a separate sheet of paper.

1. In what ways have Tokyo's bay, rivers, and canals been a central component of Tokyo's civilization since the Edo Period?
2. Explain why Tokyo was plagued with occasional cholera outbreaks as well as problems with typhoid and dysentery in the 20th century.
3. The waters of Tokyo were instrumental in the modernization of the capital city. List and briefly describe the three large modernization projects (mentioned in the handout) that transformed Tokyo from the 1880s onward.
4. After World War II, what did the city do with all rubble from the destruction?
5. While Tokyo's economy grew rapidly after World War II, what happened to the city's waters?
6. Do you think this is a unique problem for Tokyo, or has this occurred in other rapidly developing areas of the world? Explain.
7. List several efforts that have been made since the 1970s to protect Tokyo's waters.

RESEARCH PROJECT: LOCAL WATER ISSUES

Group A: Local Water Issues

Research a river or body of water near where you live. Are there environmental, health, or safety concerns? Is flooding, drought, or pollution an issue? If so, how is your community addressing these concerns?

Instructions

With your group, research your assigned topic, compile your findings, and create a presentation, including visuals, to share with the class.

- Write one or two paragraphs describing your topic. You will share this information during your presentation and turn it in to your teacher for assessment.
- Find or create at least two visuals to use to inform the class about your topic.
- Prepare a presentation and present it to the class.

Questions to Address in Your Research

- What are the important facts about this topic?
- Why is this topic important to know about?
- How is it relevant to us/the world?

Presentation Guidelines & Evaluation Criteria

- All members of your group must present information and actively participate during the presentation.
- Your presentation must be between three and five minutes in length.
- Your presentation and visuals will be evaluated on content as well as appearance and use of correct mechanics. Make sure your visual information is well organized, aesthetically pleasing, free from errors, and easy to read and understand. Use appropriate body language, voice, and eye contact, and present information in a logical, organized way.

RESEARCH PROJECT: TYPHOONS

Group B: Typhoons

Research the history of typhoons in Japan, specifically in the Tokyo area. Be sure to include information about the Great Kanto Earthquake of 1923, which was accompanied by a typhoon. Why are typhoons a hazard? When do they occur in Japan? How can people be prepared for a typhoon?

Instructions

With your group, research your assigned topic, compile your findings, and create a presentation, including visuals, to share with the class.

- Write one or two paragraphs describing your topic. You will share this information during your presentation and turn it in to your teacher for assessment.
- Find or create at least two visuals to use to inform the class about your topic.
- Prepare a presentation and present it to the class.

Questions to Address in Your Research

- What are the important facts about this topic?
- Why is this topic important to know about?
- How is it relevant to us/the world?

Presentation Guidelines & Evaluation Criteria

- All members of your group must present information and actively participate during the presentation.
- Your presentation must be between three and five minutes in length.
- Your presentation and visuals will be evaluated on content as well as appearance and use of correct mechanics. Make sure your visual information is well organized, aesthetically pleasing, free from errors, and easy to read and understand. Use appropriate body language, voice, and eye contact, and present information in a logical, organized way.

RESEARCH PROJECT: JAPAN'S FLOOD PREVENTION SYSTEMS

Group C: Japan's Flood Prevention Systems

Research Japan's flood preparation systems: (a) river improvement projects, (b) water lock gates, and (c) underground run-off routes. Summarize the projects and how they have helped manage Tokyo's waterways in preparation for floods.

Instructions

With your group, research your assigned topic, compile your findings, and create a presentation, including visuals, to share with the class.

- Write one or two paragraphs describing your topic. You will share this information during your presentation and turn it in to your teacher for assessment.
- Find or create at least two visuals to use to inform the class about your topic.
- Prepare a presentation and present it to the class.

Questions to Address in Your Research

- What are the important facts about this topic?
- Why is this topic important to know about?
- How is it relevant to us/the world?

Presentation Guidelines & Evaluation Criteria

- All members of your group must present information and actively participate during the presentation.
- Your presentation must be between three and five minutes in length.
- Your presentation and visuals will be evaluated on content as well as appearance and use of correct mechanics. Make sure your visual information is well organized, aesthetically pleasing, free from errors, and easy to read and understand. Use appropriate body language, voice, and eye contact, and present information in a logical, organized way.

RESEARCH PROJECT: TOKYO'S FLOOD RISK INCREASE**Group D: Tokyo's Flood Risk Increase**

Research why Tokyo's flood risk is increasing. Find relevant statistics, and research the role of global warming and the "heat-island" phenomenon.

Instructions

With your group, research your assigned topic, compile your findings, and create a presentation, including visuals, to share with the class.

- Write one or two paragraphs describing your topic. You will share this information during your presentation and turn it in to your teacher for assessment.
- Find or create at least two visuals to use to inform the class about your topic.
- Prepare a presentation and present it to the class.

Questions to Address in Your Research

- What are the important facts about this topic?
- Why is this topic important to know about?
- How is it relevant to us/the world?

Presentation Guidelines & Evaluation Criteria

- All members of your group must present information and actively participate during the presentation.
- Your presentation must be between three and five minutes in length.
- Your presentation and visuals will be evaluated on content as well as appearance and use of correct mechanics. Make sure your visual information is well organized, aesthetically pleasing, free from errors, and easy to read and understand. Use appropriate body language, voice, and eye contact, and present information in a logical, organized way.

RESEARCH PROJECT: TOKYO'S RECLAIMED LAND

Group E: Tokyo's Reclaimed Land

Tokyo's downtown and harbor areas were built on top of reclaimed land from Tokyo Bay over the past 400 years. Research the advantages and disadvantages of using reclaimed land, Tokyo's issues related to building on reclaimed land, and Tokyo's future plans for using reclaimed land.

Instructions

With your group, research your assigned topic, compile your findings, and create a presentation, including visuals, to share with the class.

- Write one or two paragraphs describing your topic. You will share this information during your presentation and turn it in to your teacher for assessment.
- Find or create at least two visuals to use to inform the class about your topic.
- Prepare a presentation and present it to the class.

Questions to Address in Your Research

- What are the important facts about this topic?
- Why is this topic important to know about?
- How is it relevant to us/the world?

Presentation Guidelines & Evaluation Criteria

- All members of your group must present information and actively participate during the presentation.
- Your presentation must be between three and five minutes in length.
- Your presentation and visuals will be evaluated on content as well as appearance and use of correct mechanics. Make sure your visual information is well organized, aesthetically pleasing, free from errors, and easy to read and understand. Use appropriate body language, voice, and eye contact, and present information in a logical, organized way.

RESEARCH PROJECT: ARAKAWA RIVER “SUPER LEVEES”

Group F: Arakawa River “Super Levees”

Research the issue of building “super levees” along the Arakawa River. Prepare to explain the issue, including the advantages and challenges involved. Are there alternative solutions? Explain.

Instructions

With your group, research your assigned topic, compile your findings, and create a presentation, including visuals, to share with the class.

- Write one or two paragraphs describing your topic. You will share this information during your presentation and turn it in to your teacher for assessment.
- Find or create at least two visuals to use to inform the class about your topic.
- Prepare a presentation and present it to the class.

Questions to Address in Your Research

- What are the important facts about this topic?
- Why is this topic important to know about?
- How is it relevant to us/the world?

Presentation Guidelines & Evaluation Criteria

- All members of your group must present information and actively participate during the presentation.
- Your presentation must be between three and five minutes in length.
- Your presentation and visuals will be evaluated on content as well as appearance and use of correct mechanics. Make sure your visual information is well organized, aesthetically pleasing, free from errors, and easy to read and understand. Use appropriate body language, voice, and eye contact, and present information in a logical, organized way.

PRESENTATION NOTES

Topic	Notes	Personal Opinion

VOCABULARY TERMS

Write the correct term that corresponds with the definition on the blanks below.

1. _____ a tributary stream of a river close to or forming part of its source
2. _____ a large natural or artificial lake used as a source of water supply
3. _____ an area of low-lying ground adjacent to a river, formed mainly of river sediments and subject to flooding
4. _____ an artificial channel for conveying water, typically in the form of a bridge supported by tall columns across a valley
5. _____ a wall or bank of earth or stone built to prevent a river flooding an area
6. _____ a tropical storm in the region of the Indian or western Pacific oceans
7. _____ a long wall or embankment built to prevent flooding from the sea; a ditch or watercourse
8. _____ an embankment built to prevent the overflow of a river
9. _____ land that was under the sea or in very poor condition but has been improved so that it can be used for farming or building on
10. _____ in Japanese, refers to a river
11. _____ a river or stream flowing into a larger river or lake
12. _____ a place to dispose of refuse and other waste material by burying it and covering it over with soil, especially as a method of filling in or extending usable land
13. _____ to cause something to change course or turn from one direction to another

Terms				
tributary	levee	divert	floodplain	dike
headwaters	typhoon	aqueduct	reclaimed land	“kawa”
landfill	embankment	reservoir		

QUIZ: VOCABULARY TERMS

1. headwaters—a tributary stream of a river close to or forming part of its source
2. reservoir—a large natural or artificial lake used as a source of water supply
3. floodplain—an area of low-lying ground adjacent to a river, formed mainly of river sediments and subject to flooding
4. aqueduct—an artificial channel for conveying water, typically in the form of a bridge supported by tall columns across a valley
5. embankment—a wall or bank of earth or stone built to prevent a river flooding an area
6. typhoon—a tropical storm in the region of the Indian or western Pacific oceans
7. dike—a long wall or embankment built to prevent flooding from the sea; a ditch or watercourse
8. levee—an embankment built to prevent the overflow of a river
9. reclaimed land—land that was under the sea or in very poor condition but has been improved so that it can be used for farming or building on
10. “kawa”—in Japanese, refers to a river
11. tributary—a river or stream flowing into a larger river or lake
12. landfill—a place to dispose of refuse and other waste material by burying it and covering it over with soil, especially as a method of filling in or extending usable land
13. divert—to cause something to change course or turn from one direction to another

TOKYO'S RIVERS

Arakawa River

1. Why was the Arakawa split into two waterways in 1930?
The Arakawa was split to help prevent future flooding due to typhoons and torrential rains.
2. Why did the Mayor of Tokyo give the city of Washington, D.C. scions from the famous cherry trees along the Arakawa River?
He gave them as a gift to celebrate and strengthen the friendship between Japan and the United States.
3. Is the Arakawa the longest or shortest river in Tokyo?
The Arakawa is the longest river in Tokyo.

Edo River

4. The Edo River was born from a diversion of the Tone River. Why did the shogunate divert the river?
The river was diverted to connect the northern and eastern parts of Kanto to Edo and for transporting cargo to and from Edo.
5. How is the Edo River used today?
Today the Edo River is used for drainage and as a water source for industrial production.
6. What new technology in the 20th century led to the decreased use of the river for transportation?
Japan's extensive rail network led to the decreased use of the river for transportation.

Kanda River

7. A tributary of the Kanda fills the moat of this famous landmark in Tokyo: _____
Imperial Palace
8. How was this river born?
The Kanda River began as a canal which was part of the first aqueduct system in Japan.
9. Why has the Kanda had a long history of flooding? What measures have been taken to prevent future flooding?
The Kanda has had a long history of flooding due to typhoons and downpours. A huge underground basin and reservoir system was recently built to protect the city from future flooding.

Sumida River

10. The Sumida River Fireworks Display is a famous festival in Tokyo. What year did the annual festival begin? What was the purpose of the original festival?

The annual festival began in 1733. The purpose of the festival was to (a) pay respects to those who had perished during Japan's great famine and cholera outbreak, (b) drive away disease, and (c) entertain the masses.

11. The Sumida is known for its Edo-era _____, which were all rebuilt after suffering damage or destruction during the _____ of 1923 and the firebombings of World War II. Today many tourists enjoy taking boat tours on the Sumida River to view its bridges and get a different perspective of Tokyo's sights from the water.
- bridges/Great Kanto Earthquake*

Tama River

12. The Tama River runs for _____ miles, beginning at Mount _____ and ending at _____.

86/Kasadori/Tokyo Bay

13. How was the Tama instrumental during the Edo Period?

During the Edo Period, the Tama was an important source of fresh water, food (fish), irrigation, and transportation.

14. What were the reasons for delayed construction of Japan's largest reservoir?

Construction was delayed due to (a) cost, (b) protests by residents and farmers who would be displaced, and (c) World War II.

General Questions

15. Which is the main river of Tokyo?

The Sumida is Tokyo's main river.

16. What are some similarities among the five rivers?

Student responses will vary but may include some of the following:

- *They have had extensive flooding throughout their history.*
- *They benefit society in many ways.*
- *They have all been shaped by human action.*
- *They have all undergone construction projects to prevent future flooding.*
- *They all have green space or parks nearby.*

17. Over the last four centuries, human actions have shaped and changed the rivers of Tokyo. Cite two specific examples from the reading.

Student responses will vary.

THE WATERS OF TOKYO

1. In what ways have Tokyo's bay, rivers, and canals been a central component of Tokyo's civilization since the Edo Period?

The waters of Tokyo have been instrumental to the city for more than 400 years as a source of water for drinking, irrigation, industry, etc.; food; transportation; commerce; and recreation.

2. Explain why Tokyo was plagued with occasional cholera outbreaks as well as problems with typhoid and dysentery in the 20th century.

Nightsoil was replaced by cheaper chemical fertilizers on farms, and because there was no sewage system, people dumped their waste into gutters and canals in the city.

3. The waters of Tokyo were instrumental in the modernization of the capital city. List and briefly describe the three large modernization projects (mentioned in the handout) that transformed Tokyo from the 1880s onward.

- *Tokyo Municipal Improvement Projects*—These projects included the replacement of arching wooden bridges with flat steel and concrete ones, street improvements, strengthened embankments, the replacement of old wood pipes with new cast iron pipes, installation of a sewage system, and construction of water filtration systems.
- *Arakawa River Drainage Canal*—The city's largest waterway was constructed to protect the city from future flooding.
- *The Port of Tokyo*—In 1941 the world-class deep-water port was opened as a means to supply the city in emergencies and a tool for economic growth.

4. After World War II, what did the city do with all rubble from the destruction?

The rubble was disposed of in the bay and waterways.

5. While Tokyo's economy grew rapidly after World War II, what happened to the city's waters?

The waters of Tokyo suffered widespread pollution and some of the fish and shellfish populations died off, more factories and warehouses were built near them, and expressways were constructed over them.

6. Do you think this is a unique problem for Tokyo, or has this occurred in other rapidly developing areas of the world? Explain.

Student responses will vary. Students will probably be familiar with the fact that environmental degradation commonly occurs during industrialization and modernization.

7. List several efforts that have been made since the 1970s to protect Tokyo's waters.

Efforts include laws regulating pollution, construction of walkways and green space nearby, and replacing factories and warehouses with housing and restaurants.

RESEARCH PROJECT RUBRIC

Criteria	1	2	3	Score
Content	Demonstrates little knowledge of topic, or content is incomplete and/or inaccurate	Demonstrates some knowledge of topic; some content is incomplete and/or inaccurate	Demonstrates knowledge of topic; content is complete and accurate	
Organization of Information	Information is presented in an illogical, uninteresting, and/or disorganized format that confuses the audience	Information is presented in a somewhat logical, interesting, and organized format that audience can mostly understand	Information is presented in a logical, interesting, and organized format that audience can understand	
Visual Appeal	Does not include images, or images detract from the content or are inappropriate	Includes appropriate images that somewhat enhance and do not detract from the content	Includes appropriate images that enhance the content	
Mechanics	Contains three or more spelling and/or grammatical errors	Contains one or two spelling and/or grammatical errors	Free from spelling and/or grammatical errors	
Presentation	Uses distracting body language; and/or does not speak loudly or clearly; and does not make eye contact with audience	Uses distracting body language; and/or does not speak loudly or clearly; and makes occasional eye contact with audience	Uses appropriate body language; speaks loudly and clearly; and maintains eye contact with audience	

Comments	Total Score

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