

# Port Operations and Logistics – Sustainability and STEM Careers

## LESSON PLAN

**Subject:** Science Technology Engineering and Math (STEM)

**Unit:** 1

**Lesson Title:** Port Pollution

**Sessions Number:** 1

**Number of Sessions:**  
approximately 7 - 90 minute  
blocks

**Objective(s): After given instruction, the student will:**

### 1. Research

- a. Apply digital tools to gather, evaluate, and use information.
- b. Explore training and careers in port pollution reduction.
- c. Explore operations and management of port pollution control measures.

### 2. Design

- a. Plan and manage activities to develop a solution to a Port pollution reduction project.
- b. Develop and analyze a storyboard.
- c. Demonstrate creative thinking, construct knowledge, and develop innovative products and processes.
- a. Work as a member of a design team.
- b. Apply existing knowledge to generate new sustainability ideas, products, or processes.

### 3. Model Creation

- a. Model/design a Green related transportation, distribution, or warehousing process in a port facility.
- b. Create visualizations using basic design skills, graphing, image processing, 2D and 3D modeling, animation and simulation.

### 4. Presentation

- c. Demonstrate understanding of technological concepts, and systems in maritime port operations for commerce.
- d. Manipulate and manage data, including the use of spreadsheets and application of mathematical principles.
- e. Use computer data input and output devices that handle audio, video, static graphic, and alphanumeric-based information.

- f. Create and deliver multimedia presentations.
- g. Use appropriate marine terminal, modeling, and simulation terms in context.

**5. Develop 21<sup>st</sup> Century Skills - 21st Century Skills Culture at [High Tech High](#) (Show students this video and discuss their reaction prior to beginning instruction)**

- a. Use flexibility and adaptability throughout the project process.
- b. Develop self-directed skills to produce quality products.
- c. Work in diverse teams to complete projects on time.
- d. Develop leadership, responsibility, social skills, collaboration skills, and cultural awareness.

**6. Develop Career Awareness**

- a. Research qualifications for entry level employment.
- b. Identify schools and training which will lead to skill sets required to be employable,

**Materials/Technology Integration:**

**Text:**

- Word processing software
- Presentation software (e.g. 3ds Max, Sketch Up, Premiere Elements, Movie maker, Photo Story, Powerpoint)
- Computer with Internet access and a web browser that is Java –enabled
- Electronic Portfolio
- [Storyboard template](#)

- Multimedia Projector
- Mapping software e.g. Google Earth
- Graph paper
- Pencil and paper

**Anticipatory Set:** Marine ports in the United States are major hubs of economic activity and major sources of pollution. Enormous ships with engines running on the dirtiest fuel available, thousands of diesel truck visits per day, mile-long diesel locomotives hauling cargo and other polluting equipment, and activities at marine ports cause an array of environmental impacts that can seriously affect local communities and the environment.

Marine ports are now among the most poorly regulated sources of pollution in the United States. The result is that most U.S. ports

are heavy polluters, releasing largely unchecked quantities of health-endangering air and water pollution, causing noise and light pollution that disrupts nearby communities, and harming marine habitats.

*Ask students: What are some ways to combat pollution at and around marine ports? Allow students the opportunity to discuss their understanding of pollution impacts on their community.*

**Estimated Time:** 15 Minutes

**Correlation with Virginia Standards of Learning:**

**English:** 10.4

**Mathematics:** A.1, A.2, A.4, G.2, G.3, G.10, G.12 and All-T.2

**Science:** PH.1, PH.2

**History and Social Science:** WHII.1, WHII.6, WHII.8

The overall goal of these activities is to empower students to use 21st century tools in a learning process that requires critical and creative thinking, collaboration, and problem solving. The immediate goal is to engage students in hands-on, less abstract learning. The ultimate goal is preparing students for work and life in a changing economy that demands participants who are creative and innovative thinkers in addition to being skilled digital-age workers. *The following activities are designed to be used in order or randomly as the teacher sees fit based on student needs. The activities were developed with differentiation in mind for both product and process.*

**Evaluation:** Assigned Activities

1. Students successfully answer 75% of the post test questions.
2. Review storyboard for correctness.
3. Students complete an animated model or 2d drawing of a system for sustainment within the Port.
4. Students present and explain their portion of the project to their team and the other members of the class.
5. Present completed model/drawing to the class for peer

**Closure:**

<p>critique.</p> <p>6. Review Notes: It is suggested that each student have a project notebook to organize their work throughout the projects. If possible, this notebook can be an online project notebook. Online notebooks may be created with many different free online tools. Two possibilities are: Google Docs (<a href="http://docs.google.com">http://docs.google.com</a>) and Wikispaces (<a href="http://www.wikispaces.com/">http://www.wikispaces.com/</a>). Teams working together may organize their work in a shared online project notebook.</p> <p><b>Estimated Time:</b> As Noted</p>	
<p><b>Homework:</b> None</p>	<p><b>Reflections:</b></p>
<p><b>Procedure: Guided Practice (Instructional Strategies)</b>  <b>Teachers Note:</b> View “<a href="#">21st Century Skills: How do we get there?</a>” (<a href="#">video</a>)</p> <p><b>Project #1:</b> Administer the Port Pollution <a href="#">Pre Test</a> section to students. Explain that The results on this test will help identify their understanding and learning needs.</p> <p><b>Estimated Time:</b> 3 Minutes</p> <p><b>Project #2:</b> Present <a href="#">Port Operations</a> and Logistics PowerPoint presentation section on <b>Port Pollution</b> to students.  <b>Estimated Time:</b> 25 Minutes</p>	<p><b>Procedure: Independent Practice:</b></p> <p><b>Project #1:</b> Answer to the best of your ability the Port Pollution <a href="#">Pre Test</a> section questions. The results on this test will help identify your understanding and learning needs.</p> <p><b>Estimated Time:</b> 15 Minutes</p> <p><b>Project #2:</b> Listen and analyze <a href="#">Port Operations</a> and Logistics PowerPoint presentation section on <b>Port Pollution</b>. Take notes to ensure understanding. Ask questions and be an active learner.  <b>Estimated Time:</b> 25 Minutes</p>

**Project #3:** Assign students the activity of defining the terms on [Terminology worksheet](#) and use them in context. This can be a team assignment where one member defines and the other team member using the word in context

**Estimated Time:** 5 Minutes

**Project #4:** Invite guest speaker to discuss Port pollution control measures with students. ( also consider a Science teacher or city environmentalist as a guest speaker to discuss pollution) [Crane Island Expansion Academic Outreach Contact Form](#):

**Estimated Time:** 15 Minutes

**Project #5:** Assign students the task of determining the amount of CO2 emission generated from a typical marine shipment using the [Shipping Calculator](#). Have them compare the CO2 emissions from other modes of movement.

[http://www.carbonfund.org/site/pages/carbon\\_calculators/category/Assumptions](http://www.carbonfund.org/site/pages/carbon_calculators/category/Assumptions)

**Estimated Time:** 5 Minutes

**Project #6:** Assign students to read about, and write a 3-paragraph paper on one of the benefits of the Truck Stop Electrification Project

[http://www.carbonfund.org/site/projects/profile/truck\\_stop\\_electrification\\_project/](http://www.carbonfund.org/site/projects/profile/truck_stop_electrification_project/)

**Estimated Time:** 5 Minutes

**Project #7:** Task students to determine when the freight ship *Maersk Alabama* received its **International Oil Pollution Prevention Certificate** using the following Coast Guard vessel search website: <http://cgmix.uscg.mil/PSIX/Default.aspx>

**Project #3:** Define the terms on [Terminology worksheet](#) and use them in context as directed by your teacher.

**Estimated Time:** 25 Minutes

**Project #4:** Listen to a Port professional and ask questions about the day to day pollution control measures taken. Complete the [guest speaker worksheet](#) and discuss at the conclusion of the presentation.

<http://craneisland.info/educationservices.html>

**Estimated Time:** 35 Minutes

**Project #5:** determine the amount of CO2 emission generated from a typical marine shipment using the [Shipping Calculator](#). [http://www.carbonfund.org/site/pages/carbon\\_calculators/category/Assumptions](http://www.carbonfund.org/site/pages/carbon_calculators/category/Assumptions) Compare the results also to other modes of movement.

**Estimated Time:** 25 Minutes

**Project #6:** You and your team mate are to read and the discuss the benefits of the Truck Stop Electrification Project

[http://www.carbonfund.org/site/projects/profile/truck\\_stop\\_electrification\\_project/](http://www.carbonfund.org/site/projects/profile/truck_stop_electrification_project/)

Write a 3-paragraph paper explaining one of the benefits below:

**Environmental Benefits**

- Mitigate climate change
- Reduce localized air and noise pollution
- Reduce fuel usage and the environmental harm caused by fossil fuel extraction

**Community Benefits**

**Estimated Time:** 5 Minutes

**Project #8:** Task students to read and discuss the **Water Pollution Prevention: Keeping Our Earth's Water Clean** article at

<http://reducepollutiontip.com/prevention/permalink.php?article=Water+pollution+prevention.txt>

**Estimated Time:** 5 Minutes

**Project #9:** Task students to read and discuss the **Clean Air Act Timeline** at [http://www.edf.org/documents/2695\\_cleanairact.htm](http://www.edf.org/documents/2695_cleanairact.htm)

**Estimated Time:** 5 Minutes

**Project #10:** Task students to read about and construct a model of the hydrologic cycle. See lesson plan at:

<http://www.epa.gov/ogwdw000/kids/usb/pdfs/The%20Water%20Sourcebooks%20-%20Grade%20Level%209-12.pdf>

**Estimated Time:** 5 Minutes

**Project #11:** Require students to listen to the Chesapeake Bay TMDL Podcast at:

[http://www.epa.gov/region03/multimedia/playercontents/audio/Bay\\_TMDL2.html](http://www.epa.gov/region03/multimedia/playercontents/audio/Bay_TMDL2.html) (5-min) Lead a discussion on how they can limit their impact on the Chesapeake Bay watershed.

**Estimated Time:** 45 Minutes

**Project #12:** Administer the Port Pollution [Post Test](#) section to students. Explain that The results on this test will help identify

- Development of new technologies and additional jobs created
- Better resting conditions for drivers
- Provide alternative to idling in parking lots or road shoulders

**Estimated Time:** 25 Minutes

**Project #7:** Determine when the freight ship *Maersk Alabama* received its **International Oil Pollution Prevention Certificate** using the following Coast Guard vessel search website:

<http://cgmix.uscg.mil/PSIX/Default.aspx>

1. When will the certification expire?
2. What is the Gross tonnage of this ship?
3. How long is this ship?
4. What national incident was the Maersk Alabama involved in?

**Estimated Time:** 25 Minutes

**Project #8:** Read and discuss the **Water Pollution Prevention: Keeping Our Earth's Water Clean** article at

<http://reducepollutiontip.com/prevention/permalink.php?article=Water+pollution+prevention.txt>

1. Identify two types of potential water pollution in your neighborhood
2. What did the Clean Water Act of 1970 say about wastewater?
3. What did the [Clean Water Act of 1972](#) say about water pollution?

**Estimated Time:** 25 Minutes

their understanding of the instruction presented.

**Estimated Time:** 3 Minutes

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**Additional Resources:**

- Maersk line Reducing Greenhouse gases - [http://www.maerskline.com/link/?page=brochure&path=/about\\_us/environment/reducing\\_gas\\_emissions](http://www.maerskline.com/link/?page=brochure&path=/about_us/environment/reducing_gas_emissions)
- Chesapeake Bay TMDL - <http://www.epa.gov/reg3wapd/tmdl/ChesapeakeBay/index.html>
- Water Sources Fact Sheet <http://www.epa.gov/ogwdw000/kids/wsb/pdfs/The%20Water%20Sourcebooks%20-%20Fact%20Sheets.pdf>
- Transportation education and training solutions - <http://onlinepubs.trb.org/Onlinepubs/trnews/trnews257.pdf>
- Carbonfund.org - [http://www.carbonfund.org/site/pages/carbon\\_calculators/category/Assumptions](http://www.carbonfund.org/site/pages/carbon_calculators/category/Assumptions)
- SEVAPORT News on M&S High school programs collaboration with Junior Achievement - <http://seavaport.org/news/news.html#news3>

**Project #9:** Task students to read and discuss the 1970 Clean Air Act Timeline at

[http://www.edf.org/documents/2695\\_cleanairact.htm](http://www.edf.org/documents/2695_cleanairact.htm)

1. List the six criteria pollutants identified in the National Ambient Air Quality Standards (NAAQS).
2. What year did Earth Day begin? Who founded Earth Day?
3. What did the New Source Review of 2002, do to pollution control provisions?

**Estimated Time:** 45 Minutes

**Project #10:** Students read about and construct a model of the hydrologic cycle. See lesson plan at:

<http://www.epa.gov/ogwdw000/kids/wsb/pdfs/The%20Water%20Sourcebooks%20-%20Grade%20Level%209-12.pdf>

**Estimated Time:** 45 Minutes

**Project #11:** Students listen to the Chesapeake Bay TMDL Podcast at:

[http://www.epa.gov/region03/multimedia/playercontents/audio/Bay\\_TMDL2.html](http://www.epa.gov/region03/multimedia/playercontents/audio/Bay_TMDL2.html) (5-min) Discuss how you can limit your impact on the Chesapeake Bay watershed.

**Estimated Time:** 45 Minutes

**Project #12:** Answer to the best of your ability the Port Pollution [Post Test](#) section questions. The results on this test will help identify how well you learned the objectives of the instruction.

**Estimated Time:** 15 Minutes

- The Port of Virginia - <http://www.portofvirginia.com/>
- Teaching Port operations Outreach programs - <http://www.aapa-ports.org/files/PDFs/sec5.pdf>
- **HPTI** Hamburg Port Training Institute GmbH - [http://www.hpti.de/port\\_operations\\_courses.html](http://www.hpti.de/port_operations_courses.html)
- Emissions from Maritime Shipping - <http://www.internationaltransportforum.org/jtrc/environment/GHG/07Corbett.pdf>
- APM Terminals - <http://www.apmterminals.com/americas/virginia/>
- U.S. Container Ports and Air Pollution: A Perfect Storm - [http://s3.amazonaws.com/energy-futures.com/port\\_study\\_ef.pdf](http://s3.amazonaws.com/energy-futures.com/port_study_ef.pdf)
- *Emissions-Free, 30-ton Container Hauler Will Cut Noise and Air Pollution at the Port* - [www.portoflosangeles.org/.../news\\_051608\\_et.asp](http://www.portoflosangeles.org/.../news_051608_et.asp)
- Harboring Pollution - Strategies to Clean Up U.S. Ports - <http://www.nrdc.org/air/pollution/ports/execsum.asp>