



Lesson Plan 050105

Oceans of Trouble (Target: Grades 6-8)

Objectives:

1. Create awareness of human activities that contribute to nuclear waste dumping.
2. Create awareness of illegal and legal nuclear waste dumping activities by various nations, including the United States.
3. Create awareness of effects of nuclear waste dumping in the oceans and in coastal areas that share ecosystems with ocean life.
4. Challenge students to communicate with decision-makers and ask for reconsideration of recent discussions about increasing number of nuclear facilities in the U.S.

Materials/Sources:

1. Lesson Information (following 3 pages)
2. Letters to Elected Officials Page
3. Worksheet: "Nuclear Waste in Our Oceans."
4. Powerpoint found at: <http://www.rustletheleaf.com/nuclearocean.zip>
5. Classroom Comic

Methods:

1. Divide class into five or six Nuclear Waste Disposal 'detective teams'. In addition to the .url information given on the following pages (per each team's topic), give each team web 'Google' search criteria as follows:
 - nuclear waste ocean Japan dumping
 - nuclear waste ocean Russia dumping
 - nuclear waste ocean England dumping
 - nuclear waste ocean France dumping
 - nuclear waste ocean United States dumping
 - nuclear waste ocean dumping United Nations
2. Give each team 15 minutes to find one or two articles and to have them ready to read as you go around the class. Give each team 5 minutes to read highlights of their articles out loud to the rest of the class.
3. Worksheet: Hand out copies of "Nuclear Waste in Our Oceans" as homework.
4. Discussion: During the next class period, show the first section of the powerpoint presentation by Professor Jean-Paul Rodrigue "Nuclear Waste Disposal." Next, review the worksheet and then discuss the pros and cons of nuclear energy as an alternative to petroleum or other energy sources. Hand out copies of the "Letter to Elected Officials" page and ask students to complete a letter to a chosen elected official. (Provide names, addresses for local, state and federal officials who represent your students, including the President).



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“...the size of the world’s human population and the extent of our technological creativity create enormously damaging impacts on all of the oceans. We are now capable of altering the ocean’s chemistry, stripping it of fish and the many other organisms which comprise its amazingly rich biodiversity, exploding and bleaching away its coral nurseries, and even reprogramming the ocean’s delicate background noise.”

– David Rockefeller, Jr., Vice Chair, National Park Foundation

In many ways, the story of humanity is a story of struggle to occupy and own land, and to have control over territory. Conversely, human civilization has viewed the oceans as uninhabitable, belonging to no one and being no one’s responsibility. This disparity in valuation—terra firma as incredibly valuable, oceans as barriers between yet more tracts of land—led to the widespread abuse of the oceans. Regardless of race, creed or nationality, virtually every recent human civilization is guilty of using the ocean as a vast repository for waste. In the past three decades, however, the role the ocean plays in the health of the planet—and therefore in a healthy human population—has become more obvious. As a food source, a mineral source, even an oxygen source, the ocean stands without peer on Planet Earth. It is especially frightening, then, to consider the ways in which humans have assaulted its habitats and chemistry as part of a normal course of governmental policy and day-to-day life. Although there are many ways in which oceanic pollution has occurred, this lesson focuses one of the most destructive: the dumping of nuclear waste.

For a world with a growing, energy-hungry human population, nuclear power seems like a ‘miracle’ resource. From a controlled reaction, millions of megawatts of power can be sent into ‘the grid’ with no carbon gasses fouling the air and no risk of massive oil spills on the high seas. Unfortunately, as with all ‘miracle’ solutions, there is an incredible downside to nuclear power: the nuclear waste it creates. After the ‘near miss’ at Three Mile Island in the 1970s and the devastation of the Chernobyl meltdown in the 1980s, the United States turned away from nuclear energy as a viable energy source. Several major, private nuclear power projects, which were unable to open due to design and production difficulties and cost U.S. consumers billions, led to the rejection of the industry as a whole. Unfortunately, other developed nations were not so cautious, and refused to suspend their long-term plans for increasing nuclear power facilities. For example, since the U.S. backed away from nuclear power projects in the mid 1980s, the nation of France has added over 40 new facilities. Along with drastically-reduced dependence on foreign oil, France has also enjoyed the public perception of occupying the ‘moral high ground’ where carbon gas emissions are concerned. However, while the U.S. is being (justly) criticized for its unabated demand for fossil fuels, France and other nuclear-power-embracing nations are churning out thousands of pounds of highly radioactive metals and waste water, and are turning these toxic materials over to third-party contractors for disposal. Where are these third-party contractors disposing of the nuclear waste?

According to a March, 2005 report by the United Nations Environment Program, the waste has been dumped along the coastline of Africa, specifically in the coastal waters off Somalia. Since the late 1980s, Somalia has been one of the least politically stable countries in Africa. As the U.S. learned in 1991, when it unsuccessfully sent troops to Somalia in an attempt to alleviate starvation and human rights violations perpetrated by well-armed warlords, Somalia is a hornet’s nest of tribal factions and ethnic animosity. Somali warlords, looking for capital to continue to consolidate their power and wage war against rivals, have been selling “dumping rights” to third-party companies looking for places to dispose of nuclear waste from Western Europe. The folly of this practice came to light in early 2005 when, in the aftermath of the tsunami that occurred on December 26, 2004, Somalis started to complain of illnesses and symptoms that sounded very much like radiation poisoning. As United Nations agencies began to investigate, it was discovered that containers of nuclear and chemical waste, which had been dumped along the Somali coastline, were leaking into the coastal waters and even farther out along the continental shelf.

<http://www.reliefweb.int/rw/rwb.nsf/0/7662fcfd033a7cef85256fba006064da?OpenDocument>

Lesson Information - pg 2

Although the coastline of Somalia may seem like an extreme example of nuclear waste dumping in the oceans, it is a fraction of the overall nuclear waste problem. The government of Singapore has been linked to a plot to dispose of nuclear waste by labeling it as “high tech fertilizer” and sending it to a company in Indonesia.

<http://info.channelnewsasia.com/bb/viewtopic.php?t=9857&>

Along the Arctic Circle, the nation of Russia has been illegally dumping nuclear waste, continuing a practice in which its predecessor, the Soviet Union, engaged for over 30 years. The result has been rising tension between Russia and its Scandinavian neighbors, who have depended on the coastal waters as a primary food source for thousands of years. According to various studies and investigations, for a 45-year period, the Soviet Union/Russia is guilty of dumping twice the amount of nuclear waste as was reported by all other nations combined. At one Russian nuclear submarine facility, thousands of dead starfish and many whales and other marine mammals have been washing ashore. Within that same area, the incidence of cancer among residents is six times the rate of other areas in Russia and along the Arctic Circle. There is growing concern that, because the Arctic Regions are extremely cold and have extremely slow regenerative capabilities, the areas now contaminated by Soviet/Russian nuclear waste could make the areas fishing waters unsafe for over 700 years. In 1999, a retired Russian scientist revealed that the former Soviet Union had dumped four nuclear reactors into the Sea of Japan in the 1970s—not two as had been previously reported by the Soviet government. The reactors, which were taken from decommissioned nuclear submarines, had 230 times the radioactivity that had been declared in a Soviet white paper in 1973.

<http://www.american.edu/TED/arctic.htm>

<http://www.ce-review.org/99/21/szyszo21.html>

<http://www.hartford-hwp.com/archives/55/072.html>

Since 1978, Greenpeace has been actively protesting and participating in the tracking of ocean-going vessels that dumped nuclear waste into the North Sea area. Most of the waste being dumped came from France and Great Britain, and was disposed of with the full knowledge of both governments. The government of Norway strongly protested the actions by these neighboring governments, and it was not until the late 1990s that there was some agreement to stop the dumping.

<http://archive.greenpeace.org/nuclear/ospar2000/html/content/ospar00/docs/briefings/OSPARhistorybft.pdf>

Although recent years have brought a new understanding of the dangers of dumping nuclear waste in the oceans, there is a frightening legacy of nuclear waste left by previous generations. Just off the coast of San Francisco, an area called the Gulf of the Farallones was used as a nuclear dumping site from 1946 until 1970. According to government officials, more than 55,000 barrels of nuclear waste were dumped there, and little is known about the condition of the barrels or the impact on marine life in the area. A U.S. Geological Survey study was commissioned to assess the situation, but there is little disagreement that the waste material represents an ongoing threat to the area for many years to come.

<http://walrus.wr.usgs.gov/farallon>

Lobsters in the Irish Sea near a plutonium processing plant in England are contaminated with radiation. According to Greenpeace, the nuclear plant at Sellafield is discharging over 2 million gallons of radioactive effluent into the ocean each day. In a new conference in December 2002, UK Environment Minister Michael Meacher said that Britain might have to dump radioactive pollution stockpiled at its Sellafield nuclear reprocessing plant into the Irish Sea after 2006, because tanks storing the waste are aging and becoming unsafe. He said the government was researching ways to store the waste on land, but if they were not successful, then the radioactive liquid kept in offshore tanks may be dumped in the sea. "If the tanks can't

Lesson Information - pg 3

take it beyond 2006, then we might have to look at an alternative solution... to discharge (their contents) into the Irish Sea quickly," Meacher told a news conference.

<http://www.planetark.com/avantgo/dailynewsstory.cfm?newsid=19019>

In late April, 2005 (less than 10 days preceding this writing), President Bush outlined a new energy policy initiative in which nuclear power plays a central role. According to news reports, the President's initiative stems from low approval ratings that are linked to the skyrocketing price of gasoline. However, the proliferation of nuclear power facilities will create yet more nuclear materials, which are vulnerable to theft by terrorist organizations and rogue states, and will contribute to the already staggering tonnage of existing nuclear waste.

"For over 40 years nuclear technology has spread into many areas of modern society, enabling advances in energy production, defense and medicine. But along with the use of nuclear technology comes an added burden—nuclear waste. Nuclear waste results from the use and production of nuclear materials. As nuclear materials are produced and used up, one by-product of the process is a large amount of dangerous chemical elements. Plutonium is the most dangerous of these. Plutonium is highly radioactive and has a half-life of 25,000 years. This means that plutonium takes approximately 25,000 years to decay to half of its original potency. The immediate and long-term threats of radioactivity include causing cancer or genetic damage in humans and animals; large amounts lead directly to radiation sickness and death. Also, any form of plutonium may be fashioned into a very potent nuclear weapon; this poses a threat to the safety of humanity (if this nuclear waste were to fall into the wrong hands). The stockpile of nuclear-grade plutonium continues to grow as the use of nuclear energy in its various forms is proliferated. What is being done to stave off the possible negative effects of this valuable metal—either the material for energy in the future or the stuff of nuclear weapons and potential environmental danger?"

—Todd Bell, *East Tennessee State University, 1999*

"In the half century of the nuclear age, the U.S. has accumulated some 30,000 metric tons of spent fuel rods from power reactors and another 380,000 cubic meters of high-level radioactive waste, a by-product of producing plutonium for nuclear weapons. None of these materials have found anything more than interim accommodation, despite decades of study and expenditures in the billions of dollars on research, development and storage."

—Chris Chris Chris G. Whipple

"*Can Nuclear Waste Be Stored at Yucca Mountain?*"

Scientific American, June, 1996.

While it is understandable for our government to explore means of petroleum reduction, the proliferation of nuclear power facilities is merely trading one form of destruction for another. The real solution—which has been staring us in the face since the first Arab Oil Embargo in the early 1970s—is a policy of reducing energy consumption through more efficient automobiles and other fossil-fuel-burning technologies. Under lobbying pressure from the oil and automotive industries, our government, as represented by both Republican and Democratic presidential administrations and legislative majorities, has been unwilling to mandate such change over the past 30 years. It is time for us to take an active role in demanding that our elected officials put meaningful emissions standards in place for automobiles manufactured domestically, and imported into the United States. Although it seems like a strange and distant connection, a mandatory reduction in the use of fossil fuels will alleviate politically expedient, knee-jerk reactions to reconsider nuclear power alternatives and preserve our vital oceanic ecosystems.



Lesson Worksheet

Nuclear Waste in Our Oceans

1. List two recent historical events (within the past 35 years) that caused the United States to back away from nuclear power plants as an alternative fuel source. (Hint: only one of them happened in the U.S.)
2. What nation is implicated in the dumping of nuclear waste materials and other chemical waste off the coast of an African nation?
3. What African nation has warlords that sold 'dumping rights' to private companies, allowing them to dump nuclear waste along its coastline?
4. What recent event revealed the extent of the nuclear dumping problem?
5. List two types of aquatic life were killed and observed washing onto shore near a Russian nuclear submarine base?
6. What nation operates a plutonium processing facility that is dumping 2 million gallons of radioactive effluent into the Irish Sea every day?
7. What type of marine life near the facility was discovered to be radioactive?
8. What nation is implicated in the exporting of nuclear waste under the label "high-tech fertilizer?"
9. What region of the world has been the largest dumping ground for Soviet Union/Russian nuclear waste?
10. Into what body of water did a retired Russian scientist say his country dumped four dismantled nuclear sub reactors?
11. Where is the Gulf of the Farallones located?
12. Approximately how much nuclear waste was dumped there?
13. By what nation was it dumped?
14. For what reasons did President Bush recently suggest a return to the building of nuclear power plants in the U.S.?
15. List three reasons why nuclear power is a questionable energy alternative for any nation.

ONLINE RESOURCES

<http://www.planetark.com/avantgo/dailynewsstory.cfm?newsid=19019>

<http://walrus.wr.usgs.gov/farallon>

<http://archive.greenpeace.org/nuclear/ospar2000/html/content/ospar00/docs/briefings/OSPARhistorybft.pdf>

<http://www.american.edu/TED/arctic.htm>

<http://www.ce-review.org/99/21/szyszl021.html>

<http://www.hartford-hwp.com/archives/55/072.html>

<http://info.channelnewsasia.com/bb/viewtopic.php?t=9857&>

<http://www.reliefweb.int/rw/rwb.nsf/0/7662fcfd033a7cef85256fba006064da?OpenDocument>



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Letter to a Legislator Template

Date

The Honorable (Legislator's Name, Title)
(Legislative Body Name)
Address
City, State, Zip

Dear (Legislator's Name):

My name is _____ and I am a (grade level) at (school name) in (city, state). Over the past two days, we have been learning about nuclear power and the problems caused by nuclear waste. As I'm sure you know, even though nuclear power gives us a 'break' from using petroleum products, it also results in the creation of dangerous waste materials that will take thousands of years to become stable. Further, it provides a means for terrorists and rogue governments to create weapons of mass destruction.

I am writing to ask that you strongly oppose any proposal that offers more nuclear power plants as an energy "alternative." Even though we are at the mercy of foreign oil for now, I believe we are safer without more plutonium pellets sitting around in ponds, buried underground, or dumped into the oceans.

Finally, I ask that you become an advocate for my generation, and do what elected officials for the past 30 years have been unwilling to do: I ask that you propose and/or support legislation that will require our automakers to build vehicles with MAXIMUM fuel efficiency, and stop the proliferation and marketing of needless, wasteful "gas-guzzler" passenger vehicles. You are making decisions that will affect my future long after your generation has passed. I ask you to think of us and of our children, and do what is necessary and right where energy policy is concerned.

Sincerely,

Your Name
Home Address
City, State, Zip



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Letter to the President Template

Date

The Honorable George W. Bush
President of the United States
1600 Pennsylvania Avenue
Washington, D.C.

Dear President Bush:

My name is _____ and I am a (grade level) at (school name) in (city, state). Over the past two days, we have been learning about nuclear power and the problems caused by nuclear waste. As I'm sure you know, even though nuclear power gives us a 'break' from using petroleum products, it also results in the creation of dangerous waste materials that will take thousands of years to become stable. Further, it provides a means for terrorists and rogue governments to create weapons of mass destruction.

I am writing to ask that you reconsider your proposal to build more nuclear power plants as an energy "alternative." Even though we are at the mercy of foreign oil for now, I believe we are safer without more plutonium pellets sitting around in ponds, buried underground, or dumped into the oceans.

Mr. President, I know this is a complicated issue, but it becomes very simple when you consider what is at stake for the long term. You are making decisions that will affect my future long after your generation has passed. I ask that you become an advocate for my generation, and do what elected officials for the past 30 years have been unwilling to do: I ask that you introduce and/or support legislation that will require our automakers to build vehicles with MAXIMUM fuel efficiency, and stop the proliferation and marketing of needless, wasteful "gas-guzzler" passenger vehicles. I ask you to think of my generation and of our children, and do what is necessary and right where energy policy is concerned. If terrorism is, indeed, a global priority for the United States, let's not give them more opportunities to build nuclear weapons or use radioactive materials as contaminants against us.

Sincerely,

Your Name
Home Address
City, State, Zip

RUSTLE THE LEAF™

BY PONCÉ & WRIGHT

CLASSROOM COMIC

