Lesson Plan: Should We Remove the Oil Rigs?

Bringing complex environmental problem solving into a high school classroom through a case study approach

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Overview

Goals

As sustainability challenges and climate change continue to pose major issues on a global scale, it is important that high school students not only understand science concepts but also can apply these concepts to creatively address the difficult problems their generation will face. As environmental problems are most often interdisciplinary problems, they will likely have interdisciplinary solutions. Because students in middle school and high school take subject specific classes, introducing truly interdisciplinary concepts in class may be difficult for teachers to fit into curriculum. This creates a space for outside assistance in creating lessons centered on environmental problem solving that seamlessly integrate state standards.

The goal of this project was to create an environmental education curriculum highlighting problem solving and critical thinking as they relate to real world environmental problems, and bring it to an AP Biology class in Santa Barbara as a three-class-period lesson in May 2017. We wanted to give the students exposure to a specific local environmental problem, and create space for students to creatively problem solve as a group. The ultimate objective was to have students understand the interdisciplinary nature of problem solving (social, economic, environmental).

Learning Objectives

Knowledge

1. Understand the basic ecological significance of the oil rigs in the Santa Barbara channel.
2. Understand that many environmental problems are complex and multifaceted, and solutions to these problems require consideration of all the different stakeholders and perspectives.

Skills

3. Analyze real data and draw conclusions from that data about the relative productivity of the artificial habitat provided by the rig structures versus the habitat provided by natural reefs.
4. Come to a conclusion given limited information provided, present / defend it to peers, and field questions about how the conclusion was decided upon.
5. Read news, scientific, or quasi-scientific article and pick out the main ideas and pertinent details to use in support of an argument.
6. Acknowledge and relate to multiple different perspectives for one issue / problem.

Reference Standards

In response to recent changes in California education policy with the adoption of the Next Generation Science Standards (NGSS) and the California Common Core State Standards (CCSS), interdisciplinary learning and problem solving have been given much greater weight. We did not build our curriculum around NGSS because we taught in an AP class, which is not beholden to the standards. That being said, in order to make our curriculum more widely adoptable, and potentially usable by other teachers in the future to fulfill NGSS, we have identified three particular standards that are applicable to our curriculum:

HS-ESS3–6. Use a computational representation to illustrate the relationships among Earth systems and how those relationships are being modified due to human activity.

HS-ETS1-1. Analyze a major global challenge to specify qualitative and quantitative criteria and constraints for solutions that account for societal needs and wants.

HS-ETS1-3. Evaluate a solution to a complex real-world problem based on prioritized criteria and trade-offs that account for a range of constraints, including cost, safety, reliability, and aesthetics, as well as possible social, cultural, and environmental impacts.

Content

Based on conversations with the classroom teacher and advisement from an external curriculum consultant, we chose to build our curriculum around a case study focusing on a local environment issue: the decommissioning of offshore oil platforms in the Santa Barbara Channel. This was a timely topic, because in April 2017 it was announced that Platform Holly, the oil platform closest to UC Santa Barbara, is to be decommissioned. Platform Holly has been extracting oil since 1966. Venoco, the company that owns the platform, has a legal and economic responsibility to completely remove the platform. However, scientists have found that the underwater rig supporting the platform has become an accidental reef, providing habitat for many fish and invertebrate species.

Because of this, there are many competing views about what should be done with the oil platforms (see Appendix V). Some marine biologists argue that the oil rigs should be kept in place to continue providing habitat. Many in the environmental community fear that this sets a dangerous precedent of allowing industry to litter and pollute our oceans with unnatural materials. The curriculum is built to provide students with an understanding of the scientific, social, and economic complexities of this issue, from the perspectives of different stakeholders. The students' ultimate goal is to try and come up with a comprehensive solution to the question: what should be done with these oil rigs and why?

Evaluation

In order to assess how well the curriculum met our learning objectives, we gave all students a free write at the beginning of Day 1 and the end of Day 3. The students were asked to answer the question, "What do you think should be done with the platform now that it will no longer be in operation, and why? What factors need to be taken into account?" (see Appendix I for full sheet). By comparing students' responses to this same question between the beginning and end of the curriculum, we were able to evaluate the impact of the curriculum on the students' thought processes and approach to the problem.

We received 33 free write pairs (Day 1 and Day 3) at the end of the week. Of those, 19 students had changed their opinion from the first to last day. The direction of change in students' responses was varied, though we mostly saw students change from one extreme "keep rig in" or "completely remove rig" to a compromise recommendation of keeping the bottom half and removing the top. In the Day 1 free writes the students' focus was predominantly on the biological impacts of removal on marine populations. By Day 3, multiple students emphasized the need the need to appease / take into account different stakeholder groups in addition to ecological considerations. We also got some really creative solutions by the end, with ideas ranging from cutting off the top portion of the rig and placing it somewhere else in the ocean that needed 'reef' habitat, to replacing the top with solar panels, to relocating all the fish before complete removal. Importantly, we saw a change in the depth of understanding and analysis around the issue from Day 1 to Day 3, which is what we were hoping for.

Curriculum Plan

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Day 1

Overview

The main idea of Day 1 is to provide an interesting and compelling introduction to this complicated issue with the use of a video. Next, we want to instill that basing decisions in science is an important first step to environmental problem solving. We use compiled data tables (Appendix III) from raw data supplied by Dr. Milton Love of UCSB, a leading scientist in platform ecology. You can visit this website for more information about his research as well as access to videos and pictures.

Standard Addressed: **HS-ESS3–6.** Use a computational representation to illustrate the relationships among Earth systems and how those relationships are being modified due to human activity.

Materials Needed

- Manila envelopes
- 6 highlighters
- 6 large whiteboards OR a roll of butcher paper
- Multiple colored markers for 6 groups of students
- Copies of free write worksheet for all students (Appendix I)
- 1 copy of each ecology exercise worksheet (Appendix II)
- 6 data tables printed out (Appendix III)
- Internet connection to classroom TV to show video

Preparation

Print out free write worksheets for each student. Print one copy of each of the six ecology exercise sheets (fo 6 total) and one copy of each data set. Combine each ecology exercise worksheet (Appendix II) with their corresponding data (Appendix III) and a highlighter pen into manila envelopes, one per group. There should be six groups in total. Place one manila envelope at each lab table along, with a whiteboard (or butcher paper) and multiple color markers for each group. Queue up the introduction video *Remnants* (available on the Blue Horizons Vimeo page).

Agenda (60 minutes)

Intro - **5 minutes** (show picture of oil platform)

Oil platforms are offshore structures that allow oil companies to drill into the sea floor to extract oil. They have been in California waters since the 1950s. The law stated that once oil companies were done using these platforms, they would have to pay to remove them completely to return the coast to its natural state. However over the many years since they were put in, a whole ecosystem has been created with millions of organisms

living in or around them. We call these man-made structures that create habitat in the ocean artificial reefs. It has just recently been announced that Platform Holly (off the coast of Santa Barbara, CA) will be decommissioned in the near future and so the debate about what to do with it is on center stage. Do we keep them in to protect the animals living there? Do we take them out to return the area to its natural state as the law originally intended? Or is there another solution?

Free Write Worksheet - **5 minutes**

- See Appendix I

Remnants Video - **15 minutes**

This video was made by UCSB students to introduce the issue of decommissioning oil rigs and how a decision about the fate of these rigs will affect different interests. Students should take notes about potential solutions laid out in the video and how different interests feel about these potential solutions.

- https://vimeo.com/channels/147339

Intro to data collection activity - **5 minutes** (show picture of Dr. Love's submersible)

Now that we see how complicated this problem is, how do we go about finding solutions? First and foremost, we want to base our decisions in a scientific understanding of the problem. To take a closer look at the ecology of the platforms, we will analyze real data from Dr. Milton Love of UCSB. He and his team use submersibles and dive below the ocean's surface to counts fish on the platforms and natural reefs in the Santa Barbara Channel. Dr. Love designates transects (straight lines along which observations are made) of a specific length and counts the number, size, and species of the fish seen along the transect so that fish counts can be compared at different sites. Keep in mind Dr. Love is not measuring ALL the fish at a site just the ones along the transects he sets up. We can use these smaller data sets to help us estimate what the whole ecosystem looks like. We will only focus on a few ecological questions because if we were to work with all of Dr. Love's data, it would be far too overwhelming.

Ecology data activity - **20-30 minutes**

- Split class into six groups and send to different lab tables
- Directions:
  - Have students read the questions on their worksheet and use the data to graphically represent their answer either on whiteboards or butcher paper.
  - Then students can answer the questions on their worksheet.
  - Reminder to students: label axes and include appropriate units.
  - We have left some of the questions a bit ambiguous on purpose, we want students to have to look through the data and see how they want to use it.

- Students DO NOT need to use all data points given to them; it is up to them to see which data points are the most important to answer their question. For example, if students are looking at change over time, they should not use every year, maybe every two or five years.
- Students can use highlighters to help them work through data.
- Once students are done at the end of the period, collect the butcher paper or whiteboards for the start of the second day. Have students return their data and worksheet to the manila envelope for safe keeping by teacher until Day 2 lesson.
- Walk around and help students through this process

Reflections

Remind students to answer BOTH questions of the free write. Students struggle when first looking at the data, especially groups 1 and 2 (as their data is bigger) but encouraging them to read the question first helped because no question is asking them to plot too many points. This is also a good lesson that finding a story in these massive data sets is really difficult. Also, it is a good lesson that depending on which points you choose to plot the data, it might tell a different story which is why we must always look at reported data analysis with a critical eye. Walk around and check in on students to help them if they get stuck while trying to decipher the data.

Day 2

Overview

Day 2 finishes up the ecology data activity and then focuses on stakeholder analysis. This will help students look at these issues through different lenses as well as challenge them to build an argument.

Standard Addressed: **HS-ETS1-1.** Analyze a major global challenge to specify qualitative and quantitative criteria and constraints for solutions that account for societal needs and wants.

Materials Needed

- Manila envelopes
- Copies of ecology notes worksheet (Appendix IV)
- Copies of different news articles (refer to Appendix V)
- Printed and cut stakeholder cards (Appendix VI)
- Copies of News Articles Reading Worksheet for each student (Appendix VII)

Preparation

Graphs and manila envelopes (with data and their corresponding ecology worksheet) should be distributed back to the same lab tables as Day 1. Print out enough ecology notes worksheets for all students. Put together separate manila envelopes for each stakeholder group (fishers, government, scientists, local residents, oil companies, and environmentalists). In each envelope should be stakeholder cards and a copy of the corresponding articles. You can find which articles correspond to each stakeholder and a link to each article in the stakeholder matrix (Appendix V).

Agenda (60 minutes)

Finish up ecology data analysis - **5 minutes**

- Have students get back into groups at lab tables and give them 5 minutes to finish answering ecology worksheet questions and decide what they want to say about their graph to the rest of the class

Ecology Mini-Presentations and Discussion - **20 minutes**

- Hand out ecology notes worksheets to each student to fill out during presentations
- Have a couple students from each group stand up and present their graph, specifically what they are comparing and what the main takeaway is
- Teacher and other students should ask questions to spark discussion of what these results may mean about the ecology of the platforms

Introduce stakeholder analysis - **5 minutes**

> *Now that we have a bit of insight into the ecology of these platforms, we now need to understand how different people will be affected by the decision we will be making. This will help us see where compromises can be made or where there can be no compromise.*

Break out into 6 stakeholder groups (we used same groups as ecology exercise) - **20-25 minutes**

- Each student picks a notecard with their specific role
  - Have students read articles (hand-picked articles for each group) and fill out worksheets individually
  - Finish class with giving students 5 minutes to share worksheet answers within group to make sure all stakeholders within each group are on the same page and understand the issues from that point of view

<u>Reflections</u>

Day 2 lesson worked well with the exception of the last five minutes of the class. Once students finished reading their articles and filling out their worksheets, student discussion within stakeholder groups became unstructured and largely unproductive. If there was a way to bring greater structure to this brief five minute discussion meant to get all stakeholders on the "same page" this would be helpful. Perhaps a final question could be added to the worksheet: "What do other characters in your stakeholder group believe? Do all of these characters have the same opinion about what should be done to these platforms?"

Day 3

Overview

Day 3 focuses on the critical thinking and problem solving where students have to begin working together to build proposals that take into account multiple stakeholder perspectives. A wrap-up conversation about how this case study shows us problem solving that can be applied to many other environmental or social problems helps students to contextualize this lesson.

Standard addressed: **HS-ETS1-3.** Evaluate a solution to a complex real-world problem based on prioritized criteria and trade-offs that account for a range of constraints, including cost, safety, reliability, and aesthetics, as well as possible social, cultural, and environmental impacts.

Materials Needed

- Manila envelopes
- 7 stacks of different color post-its
- Copies of proposal worksheet for each student (Appendix VIII)

Preparation

Have one stack of post-its for the first round of Sticky Note activity. Prepare one manila envelope for each decision group, six in total. In each envelope should be copies of the proposal worksheets as well as a different color of post-its.

Agenda (90 minutes)

Introduction - **2 minutes**

> *The goal of this last day is to come to a comprehensive plan as a class, BUT we don't know if we are all going to be able to come to an agreement. This is often how it is in real life, people can't always agree on large difficult problems such as these. Tap into your creative brain to come up with new and different solutions that can appease multiple stakeholders.*

Sticky Notes Round 1 - **20 minutes**

- Every student gets a sticky note to write their initial solution idea based on their role notecard
- Question for students: what should be done with platform Holly once it is decommissioned?
- Ask students to place finished sticky notes onto one of 3 whiteboards at the front of the room- Fully Remove, Fully Keep in Place, or Something Else

- Group discussion with whole class, discuss major categories of solutions, point out if any are missing
- All ideas likely to be physical (ex. Remove half of platform) -- this could be a place to prompt discussion about policy / research / economic approaches to add complexity to their solutions (ex. Remove half the platform and use money saved for conservation efforts and ecological research on platform before and after removal)

Break into decision groups (one rep from each stakeholder group) - **25 minutes**

- Have students break into decision groups based on the number on their stakeholder card. For example Fisher #1, Environmentalist #1, etc. will all be in decision group 1
- Introduce the period as decision groups working together to develop one proposal each
- Have students first get to know each other's stakeholder views
- All students must fill out their own proposal worksheet to keep all students engaged in discussion
- Walk around and help students develop proposal ideas paying close attention to making sure that students are well representing their stakeholder characters

- Sticky Notes Round 2 - **20 minutes**
  - Have students write main tenants of proposal on sticky notes (color coded by decision group) and place up on front whiteboard
  - Group discussion of specific proposals what do multiple groups agree on and disagree on, why? Is there anyway to bridge that gap?
  - Ask questions to spark discussion about the difficulties of stakeholders coming to a compromise
  - ***If time permits- come up with comprehensive solution proposal as a class***

Free Write Worksheet (same question as Day 1) - **10 minutes**

- See Appendix IX

Wrap-Up Discussion - **15 minutes**

Even though the solution you came up with are specific to this problem, the way that we approached this through data analysis, stakeholder analysis, and group problem solving can be used to address all kinds of environmental and/or social problems

- Main takeaways
  - Problem solving should start with facts/science, but never ends there
  - Have to consider policy, economics, social ramifications, emotions, etc.
  - Important to consider multiple stakeholders

        - Most issues have more than 2 sides, be weary of black and white thinking, try to find the grey area
    - Connect back to big themes about complex environmental problems and varied stakeholders like climate change and overfishing
    - Questions?

Reflections

This day went well but discussion to wrap up engaged some students and not others. Finding a way to engage more of the class in this discussion would be very helpful. We saw 14 students keep their same opinions of what should be done with the oil platforms in their free write responses while 19 students changed their mind. We also noticed many students' answers include more consideration in their second free write after the lesson plan but specific code word analysis of responses was not performed.

Appendices

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Appendix I: Oil Platform Free Write Day 1

Name_____

Date_____

Platform Holly has been extracting oil offshore in the Santa Barbara Channel since 1966. Venoco, the company that owns the platform, has gone bankrupt and must decommission the platform. Venoco has a legal and economic responsibility to completely remove the platform. However, scientists have found that the underwater rig supporting the platform has become an accidental reef, providing habitat for many fish species. **What do you think should be done with the platform now that it will no longer be in operation, and why? What factors need to be taken into account?**

Appendix II: Ecology Exercise Worksheets

Group 1 - Fish Abundance

From video and pictures it seems like a lot of fish are living underneath these platforms, but are fish more abundant here than at a natural reef? This section of Dr. Love's data shows the average abundance of rockfish species on natural reefs and oil platforms, across multiple years. Use the data provided to graphically represent how the **average abundance of all rockfish** compares between platforms and natural reefs over the years sampled. You DO NOT have to use every year but plot multiple years (4-6) to see if there are any patterns or trends. Find a clear way to draw this BIG on your whiteboard.

Questions:

- Is it fair to compare platform habitats and natural reef habitats? Why do you think yes or no?

- What about these structures would attract fish?

- Are their certain fish that seem to be more abundant at the platforms?

Group 2 - Abundance of heavily fished species

Fishermen are not allowed to fish near the oil rigs. Because of this, the rigs have acted as refuges for marine life. Some people think that this could help boost the populations of fish species that are heavily fished within the channel. Have you ever ordered rockfish off the menu in Santa Barbara? Well, it is hard to know exactly what type of rockfish you are getting because there are so many different species. Most notably, **Boccacio** rockfish and **Widow** rockfish are heavily fished and are currently being specially managed to try to increase population numbers. This data set includes all the fished species of rockfish in the channel. Do platforms have a higher abundance of these two fish species under pressure? Pick 4-6 years to draw data from. Graphically represent your answer however you wish and draw it BIG on the whiteboard provided.

Questions:

- Why do you think these 2 species are more heavily fished than other fished rockfish shown in the data table? If the menu just says rockfish, why are these specific species hit harder?

- Are all rockfish species more abundant on the oil rig platforms? Does it depend on the year?

Group 3 - Average Biomass

Dr. Love observed the frequency of fish, as well as the length of their bodies, from his submarine dives. From a fish's length, Dr. Love and his team estimated its weight. We multiplied the frequency and the weight of fish to get to the *biomass* of fish. Fish biomass is an important indicator of the trophic structure of an area. More top predators will increase the total biomass. Use Dr. Love's data to compare the average biomass in multiple years at oil rig platforms and natural reefs. Is there a difference? Graphically represent your data however you choose and draw it BIG on your whiteboard. You DO NOT have to use every year in your graph (but pick at least 10 years to pull data from).

Questions:

- Why would biomass be different between rigs and natural reefs?

- Why are we are looking at average biomass instead of total biomass when comparing different sites?

- Do you think biomass at the rigs contribute a significant amount to the channel ecosystem?

Group 4 - Species Richness

Will an artificial reef have more or less species present than a natural reef? Should we expect all platforms to have the same ecology because they are structurally similar? Look at the species richness (number of different species present) of selected platforms and how they compare to the species richness of natural reefs out at the Channel Islands and along the Santa Barbara coast. Graphically represent this however you choose and draw it BIG on your whiteboard. Refer to the "Fish_code" packet to find what species you are looking at!

Questions:

- Is the composition of species that same at all the platforms? Why do you think it is, or isn't?

- Is the composition of species the same at the natural reefs and at the platforms? Why do you think it is, or isn't?

Group 5 - Holly Depth Comparisons

Some of the platforms in the channel descend hundreds of feet below the surface. Platform Holly sits in ~66 meters (211 feet) of water. When deciding if the platform should stay or go, or if only a piece should remain, it is important to understand the ecology at different depths. Is the ecology uniform throughout all water depths, or is it different? Look at Dr. Love's data and use the measures of fish abundance, biomass, and size class to visually compare depths. It is completely up to your group how you will visually graph this but draw it BIG on your whiteboard. You DO NOT have to use every depth (but use at least 10).

Questions:

- If the structure is the same throughout, why would the ecology change with depth?

- Do you think a natural reef would show the same changes in ecology with depth or do you think it is different at the platforms?

Group 6 - Platform Comparison

Whatever is decided at Platform Holly could potentially set a precedent for the other oil platforms decommissioned off the coast of California. Do all platforms create similar habitats and therefore have similar ecology? Should we assume that all platforms have the same ecological importance to the region? Graphically show how the **abundance** and **biomass** of fish change between platforms in any given year. You can do this however you like drawn BIG on your whiteboard. You DO NOT have to use every year or every platform, but use years in which Platform Holly was sampled! You may want to have two separate graphs for abundance and biomass.

Questions:

- If one platform showed relatively low abundance but a relatively high biomass, what could this mean about the fish that were surveyed there?

- Do you think that it matters how North or South a platform is in determining its ecological make-up? Why or why not? (see attached map)

Appendix III: Ecology Exercise Data

*Excel spreadsheet with all data sets for ecology exercise can be downloaded **here**.*

Appendix IV: Ecology Discussion Worksheet

Name_____ Date_____

Group 1

What are they comparing?

Main findings

Group 2

What are they comparing?

Main findings

Group 3

What are they comparing?

Main findings

Group 4

What are they comparing?

Main findings

Group 5

What are they comparing?

Main findings

Group 6

What are they comparing?

Main findings

Appendix V: Stakeholder Matrix

Stakeholder Group (6 groups)	Stakeholder Role (3 of each role per group, for total of 6 people)	Perspective	Readings
Environmentalist	EDC lawyer	You are worried about letting oil companies off the hook, and the precedent that would set for the future.	Abandoned Offshore Rigs to be Left in the Ocean - Not Without a Fight 2 Marine Life Thrives in Unlikely Place: Offshore Oil Rigs 1
	Get Oil Out activist	You don't care if all the fish die in the process of removing the oil rig, you strongly believe that we can't let oil companies get away with this, and the Santa Barbara Channel must be returned to its natural state.	What to Do After an Oil Rig Dies: California's Quandary 2 Offshore oil rigs can provide prime fish habitat 1
Scientist	Rig habitat researcher	You believe that the rigs are super important habitat for economically valuable fish species, should not be removed.	The Good News About Offshore Oil Rigs 2 Offshore oil rigs can provide prime fish habitat 1
	Ecology professor	You are skeptical about how big the ecological impact of the rigs really is compared to all the marine life in the Santa Barbara Channel, and you're not sure if letting the oil companies keep them in is worth it. But you are supportive of habitat protection as a concept, even if it's not totally "natural."	What to Do After an Oil Rig Dies: California's Quandary 2 Abandoned Offshore Rigs to be Left in the Ocean - Not Without a Fight 1
Oil Company	Owner of Platform Holly (Venoco)	You want to keep the rig in for costs savings because you're bankrupt, but you also don't want any liability in the future, and don't have much money to hire lawyers to get your way.	Venoco Ditches Platform Holly 2 Marine Life Thrives in Unlikely Place: Offshore Oil Rigs 1

	Executive from other oil company	You see that removal of Platform Holly is going to set a precedent. You are willing to put in lots of money to fight for keeping this rig in now in order to get cost savings from not having to remove your platforms in the future.	First California offshore oil platform in 20 years to be removed 2 What to Do After an Oil Rig Dies: California's Quandary 1
Fisher	Commercial trawler	You want full removal of the rigs because the remnants tear up your nets so you can't fish in that area.	Happy Fish Are Fueling a Battle to Preserve Offshore Rigs as Artificial Reefs 2 First California offshore oil platform in 20 years to be removed 1
	Recreational fisher	You want partial or no removal, because the rig is a great fishing spot. But if the site is going to become a no-fish-zone, then you would withdraw your support for keeping the rig in because you wouldn't be able to fish there anyway.	Offshore oil rigs can provide prime fish habitat 2 Marine Life Thrives in Unlikely Place: Offshore Oil Rigs 1
Local Resident	Homeowner with an ocean view	You don't really care whether the rig is partially or fully removed, as long as at least the top is taken off so you can't see it out in the ocean anymore.	First California offshore oil platform in 20 years to be removed 1 Happy Fish Are Fueling a Battle to Preserve Offshore Rigs as Artificial Reefs 2
	Engaged local resident	Been attending all public hearings, waiting to see who is most persuasive	The Good News About Offshore Oil Rigs 2 Marine Life Thrives in Unlikely Place: Offshore Oil Rigs 1
State Government	Governor	You have the tough job of trying to please all the stakeholders involved, including the oil companies because they're good for the state's	Oil Platform Off Santa Barbara Coast to Be Decommissioned 2

		economy.	Happy Fish Are Fueling a Battle to Preserve Offshore Rigs as Artificial Reefs 1
	Local representative	You have to make your voters (local residents) and people who might try to sue you (environmentalists) happy.	Abandoned Offshore Rigs to be Left in the Ocean - Not Without a Fight 2 What to Do After an Oil Rig Dies: California's Quandary 1

Appendix VI: Stakeholder Role Cards (36)

Environmentalist 1
Linda Krop

You are a lawyer with the Environmental Defense Center, a nonprofit organization located in Santa Barbara. You want to see the Santa Barbara Channel returned to its natural state, free of oil rigs. You are also worried about letting oil companies off the hook for paying for the removal, and the precedent that would set for the future. You don't want it to become okay for companies to just leave things in the ocean and be released of responsibility for them.

Environmentalist 2
Kristen Hislop

You are a lawyer with the Environmental Defense Center, a nonprofit organization located in Santa Barbara. You want to see the Santa Barbara Channel returned to its natural state, free of oil rigs. You are also worried about letting oil companies off the hook for paying for the removal, and the precedent that would set for the future. You don't want it to become okay for companies to just leave things in the ocean and be released of responsibility for them.

Environmentalist 3
Owen Bailey

You are a lawyer with the Environmental Defense Center, a nonprofit organization located in Santa Barbara. You want to see the Santa Barbara Channel returned to its natural state, free of oil rigs. You are also worried about letting oil companies off the hook for paying for the removal, and the precedent that would set for the future. You don't want it to become okay for companies to just leave things in the ocean and be released of responsibility for them.

Environmentalist 4
Carla Frisk

You are a board member of Get Oil Out! Inc., an advocacy group formed after the big oil spill of 1979 that opposes any oil production happening in the Santa Barbara Channel. You feel very strongly that the oil rigs in the Channel must be completely removed. You don't care if all the fish using that rig as habitat die; the oil companies simply cannot get away with leaving the rigs in the Channel. You want this area returned to its natural state, at any cost.

Environmentalist 5
Michael Lyons

You are a board member of Get Oil Out! Inc., an advocacy group formed after the big oil spill of 1979 that opposes any oil production happening in the Santa Barbara Channel. You feel very strongly that the oil rigs in the Channel must be completely removed. You don't care if all the fish using that rig as habitat die; the oil companies simply cannot get away with leaving the rigs in the Channel. You want this area returned to its natural state, at any cost.

Environmentalist 6
Brad Lundgren

You are a board member of Get Oil Out! Inc., an advocacy group formed after the big oil spill of 1979 that opposes any oil production happening in the Santa Barbara Channel. You feel very strongly that the oil rigs in the Channel must be completely removed. You don't care if all the fish using that rig as habitat die; the oil companies simply cannot get away with leaving the rigs in the Channel. You want this area returned to its natural state, at any cost.

Scientist 1
Milton Love

You are an academic researcher in marine biology, and you study the Santa Barbara Channel. The research you have done seems to show that the oil rigs are very important habitat for marine life, particularly economically valuable fish species like boccaccio. Because of these ecological benefits, you believe the oil rigs should not be removed, at least not the bottom part that is providing habitat.

Scientist 2
Jeremy Claise

You are an academic researcher in marine biology, and you study the Santa Barbara Channel. The research you have done seems to show that the oil rigs are very important habitat for marine life, particularly economically valuable fish species like boccaccio. Because of these ecological benefits, you believe the oil rigs should not be removed, at least not the bottom part that is providing habitat.

Scientist 3
Chelsea Williams

You are an academic researcher in marine biology, and you study the Santa Barbara Channel. The research you have done seems to show that the oil rigs are very important habitat for marine life, particularly economically valuable fish species like boccaccio. Because of these ecological benefits, you believe the oil rigs should not be removed, at least not the bottom part that is providing habitat.

Scientist 4
Hunter Lenihan

You are a professor of marine biology at a University. You are skeptical about how big the ecological impact of the rigs really is compared to all the marine life in the Santa Barbara Channel, and you're not sure if letting the oil companies keep them in is worth it. But you are supportive of habitat protection as a concept, even if it's not totally "natural." You believe we need to carefully weigh the benefit to marine life against the costs and risks of letting the oil companies leave the rigs in place.

Scientist 5
James Cowan

You are a professor of marine biology at a University. You are skeptical about how big the ecological impact of the rigs really is compared to all the marine life in the Santa Barbara Channel, and you're not sure if letting the oil companies keep them in is worth it. But you are supportive of habitat protection as a concept, even if it's not totally "natural." You believe we need to carefully weigh the benefit to marine life against the costs and risks of letting the oil companies leave the rigs in place.

Scientist 6
Laurel Zahn

You are a professor of marine biology at a University. You are skeptical about how big the ecological impact of the rigs really is compared to all the marine life in the Santa Barbara Channel, and you're not sure if letting the oil companies keep them in is worth it. But you are supportive of habitat protection as a concept, even if it's not totally "natural." You believe we need to carefully weigh the benefit to marine life against the costs and risks of letting the oil companies leave the rigs in place.

Oil Company 1
Michael Wracher

You work for Venoco, the company that owns Platform Holly. Your company has gone bankrupt, and therefore you must decommission this oil platform. Your company is out of money and would like to complete this process as cheaply as possible. The best option for you is to keep the rigs in place. It is the least expensive and easiest option for you and your company. However, the company has little funding to pay for lawyers to argue for keeping the rigs in place, so your bargaining power is small.

Oil Company 2
Timothy Marquez

You work for Venoco, the company that owns Platform Holly. Your company has gone bankrupt, and therefore you must decommission this oil platform. Your company is out of money and would like to complete this process as cheaply as possible. The best option for you is to keep the rigs in place. It is the least expensive and easiest option for you and your company. However, the company has little funding to pay for lawyers to argue for keeping the rigs in place, so your bargaining power is small.

Oil Company 3
Heather Hatfield

You work for Venoco, the company that owns Platform Holly. Your company has gone bankrupt, and therefore you must decommission this oil platform. Your company is out of money and would like to complete this process as cheaply as possible. The best option for you is to keep the rigs in place. It is the least expensive and easiest option for you and your company. However, the company has little funding to pay for lawyers to argue for keeping the rigs in place, so your bargaining power is small.

Oil Company 4
Darrell Woods

You are on the board of directors for ExxonMobil, an oil and gas company that owns oil rigs in the Santa Barbara Channel. You see that removal of Platform Holly is going to set a precedent for how oil rig decommissioning will be handled in the future. You are willing to pay lots of money for lawyers to fight for allowing this oil rig to stay in place. You see that investing money now to support keeping this rig in will help you get cost savings from not having to remove your platforms in the future.

Oil Company 5
Mark Albers

You are on the board of directors for ExxonMobil, an oil and gas company that owns oil rigs in the Santa Barbara Channel. You see that removal of Platform Holly is going to set a precedent for how oil rig decommissioning will be handled in the future. You are willing to pay lots of money for lawyers to fight for allowing this oil rig to stay in place. You see that investing money now to support keeping this rig in will help you get cost savings from not having to remove your platforms in the future.

Oil Company 6
Michael Dolan

You are on the board of directors for ExxonMobil, an oil and gas company that owns oil rigs in the Santa Barbara Channel. You see that removal of Platform Holly is going to set a precedent for how oil rig decommissioning will be handled in the future. You are willing to pay lots of money for lawyers to fight for allowing this oil rig to stay in place. You see that investing money now to support keeping this rig in will help you get cost savings from not having to remove your platforms in the future.

Fisher 1
Tom Raftican

You are a local recreational fisher, using the traditional hook and line method of fishing. You have noticed that the rigs are great fishing spots; there is always a ton of fish to catch around them. For this reason, you would like the rigs, or at least the bottom half, to stay in place. But there is one caveat: if the site is going to be designated as a no-fish-zone, then you would withdraw your support for keeping the rig in place because you would not be able to fish there anyway.

Fisher 2
Jen Watson

You are a local recreational fisher, using the traditional hook and line method of fishing. You have noticed that the rigs are great fishing spots; there is always a ton of fish to catch around them. For this reason, you would like the rigs, or at least the bottom half, to stay in place. But there is one caveat: if the site is going to be designated as a no-fish-zone, then you would withdraw your support for keeping the rig in place because you would not be able to fish there anyway.

Fisher 3
Trish Robinson

You are a local recreational fisher, using the traditional hook and line method of fishing. You have noticed that the rigs are great fishing spots; there is always a ton of fish to catch around them. For this reason, you would like the rigs, or at least the bottom half, to stay in place. But there is one caveat: if the site is going to be designated as a no-fish-zone, then you would withdraw your support for keeping the rig in place because you would not be able to fish there anyway.

Fisher 4
Chris Voss

You are a local commercial fisher, and you are on the Board of Directors for the Commercial Fishermen of Santa Barbara. You use bottom-trawling to catch fish, which means you drag a big net along the bottom of the ocean and scoop up anything that gets caught in it. The oil rigs present a problem for you, because you can't fish near them without your net getting caught in them. Because of this, you support full removal of the oil rigs.

Fisher 5
Kim Selkoe

You are a local commercial fisher, and you are on the Board of Directors for the Commercial Fishermen of Santa Barbara. You use bottom-trawling to catch fish, which means you drag a big net along the bottom of the ocean and scoop up anything that gets caught in it. The oil rigs present a problem for you, because you can't fish near them without your net getting caught in them. Because of this, you support full removal of the oil rigs.

Fisher 6
Mike McCorkle

You are a local commercial fisher, and you are on the Board of Directors for the Commercial Fishermen of Santa Barbara. You use bottom-trawling to catch fish, which means you drag a big net along the bottom of the ocean and scoop up anything that gets caught in it. The oil rigs present a problem for you, because you can't fish near them without your net getting caught in them. Because of this, you support full removal of the oil rigs.

Local Resident 1
Karen Smith

You own a house in the Santa Barbara hills, and you have a beautiful ocean view from your living room window. But there is one thing ruining that view -- those big, ugly oil rigs. They stand out like sore thumbs in the Santa Barbara Channel, and they even light up at night! You've always hated them, and now that there is a chance that they might be removed, you are putting all your support towards that. You wouldn't mind if they kept the bottom half of the rigs in; you just don't want to be able to see them anymore.

Local Resident 2
Julia Rosenberg

You own a house in the Santa Barbara hills, and you have a beautiful ocean view from your living room window. But there is one thing ruining that view -- those big, ugly oil rigs. They stand out like sore thumbs in the Santa Barbara Channel, and they even light up at night! You've always hated them, and now that there is a chance that they might be removed, you are putting all your support towards that. You wouldn't mind if they kept the bottom half of the rigs in; you just don't want to be able to see them anymore.

Local Resident 3
Derek Young

You own a house in the Santa Barbara hills, and you have a beautiful ocean view from your living room window. But there is one thing ruining that view -- those big, ugly oil rigs. They stand out like sore thumbs in the Santa Barbara Channel, and they even light up at night! You've always hated them, and now that there is a chance that they might be removed, you are putting all your support towards that. You wouldn't mind if they kept the bottom half of the rigs in; you just don't want to be able to see them anymore.

Local Resident 4
Sally Leland

You are an engaged local citizen of Santa Barbara. You have been following the oil rig decommissioning issue, but haven't made up your mind yet. You have heard that the rigs provide fish habitat, which sounds like a good thing. But you also don't like the idea of letting oil companies get away with skirting their responsibilities. You have been attending all the public hearings and meetings, and you are waiting to see who presents the most compelling argument before making your decision.

Local Resident 5
Greg Collier

You are an engaged local citizen of Santa Barbara. You have been following the oil rig decommissioning issue, but haven't made up your mind yet. You have heard that the rigs provide fish habitat, which sounds like a good thing. But you also don't like the idea of letting oil companies get away with skirting their responsibilities. You have been attending all the public hearings and meetings, and you are waiting to see who presents the most compelling argument before making your decision.

Local Resident 6
Samantha Yu

You are an engaged local citizen of Santa Barbara. You have been following the oil rig decommissioning issue, but haven't made up your mind yet. You have heard that the rigs provide fish habitat, which sounds like a good thing. But you also don't like the idea of letting oil companies get away with skirting their responsibilities. You have been attending all the public hearings and meetings, and you are waiting to see who presents the most compelling argument before making your decision.

Government 1
Monique Limon

You are a California State Assemblymember. You represent Santa Barbara, as well as some other local areas in your district. You have the power to vote for or against any legislation regarding decommissioning of oil rigs in the Santa Barbara Channel. You personally feel that the Santa Barbara Channel should be restored to its natural state, but you have to take into consideration all the different perspectives, including your local voters and the oil companies.

Government 2
Jordan Cunningham

You are a California State Assemblymember. You represent Santa Barbara, as well as some other local areas in your district. You have the power to vote for or against any legislation regarding decommissioning of oil rigs in the Santa Barbara Channel. You personally feel that the Santa Barbara Channel should be restored to its natural state, but you have to take into consideration all the different perspectives, including your local voters and the oil companies.

Government 3
Hannah-Beth Jackson

You are a California State Senator. You represent Santa Barbara, as well as some other local areas in your district. You have the power to vote for or against any legislation regarding decommissioning of oil rigs in the Santa Barbara Channel. You personally feel that the Santa Barbara Channel should be restored to its natural state, but you have to take into consideration all the different perspectives, including your local voters and the oil companies.

Government 4
Cathy Murillo

You are a Santa Barbara City Councilmember. It is your responsibility to listen to, and make decisions based on, the perspectives of your local constituents. In this case, that means local residents and local environmentalists. You personally feel that fully removing the rigs would be a huge hassle and cause a lot of short-term destruction in the Channel, but ultimately your decision will be made based on which of your local constituent groups are most persuasive.

Government 5
Helene Schneider

You are the Mayor of the City of Santa Barbara. It is your responsibility to listen to, and make decisions based on, the perspectives of your local constituents. In this case, that means local residents and local environmentalists. You personally feel that fully removing the rigs would be a huge hassle and cause a lot of short-term destruction in the Channel, but ultimately your decision will be made based on which of your local constituent groups are most persuasive.

Government 6
Randy Rowse

You are a Santa Barbara City Councilmember. It is your responsibility to listen to, and make decisions based on, the perspectives of your local constituents. In this case, that means local residents and local environmentalists. You personally feel that fully removing the rigs would be a huge hassle and cause a lot of short-term destruction in the Channel, but ultimately your decision will be made based on which of your local constituent groups are most persuasive.

Appendix VII: News Article Reading Worksheet

Student Name: _____

Stakeholder Group: _____

Stakeholder Name: _____

Article Title:

_____
_

Article Source: _____

1. What is the main idea of this article?

2. What are some of the key facts given in the article?

3. What different views were portrayed in this article?

4. How was the view of your stakeholder group portrayed in this article?

5. How reliable do you think this source is? Why?

Other Notes (optional)

Appendix VIII: Decision Group Proposal Worksheet

Student Name: _____

Stakeholder Group: _____

Decision Group #: _____

What are possible scenarios for Platform Holly decommissioning?

Scenario 1:

Pros:

Cons:

Scenario 2:

Pros:

Cons:

Scenario 3:

Pros:

Cons:

<u>Group Proposal Questions</u>

1) Explain your group's proposal for decommissioning (What is being done to the physical structures?)

2) What are the impacts of your plan?

- Economic:

- Social/Political:

- Ecological:

3) Will your plan save $$ or cost $$? Who will pay for this or who will benefit from money saved?

4) Any additional ideas you want to put in place? (Further research? New laws? Be specific!)

5) Why did you choose this plan?

6) What was the hardest part about choosing this option (Where did your group struggle?)

Appendix IX: Oil Platform Freewrite Day 3

Name_____

Date_____

Platform Holly has been extracting oil offshore in the Santa Barbara Channel since 1966. Venoco, the company that owns the platform, has gone bankrupt and must decommission the platform. Venoco has a legal and economic responsibility to completely remove the platform. However, scientists have found that the underwater rig supporting the platform has become an accidental reef, providing habitat for many fish species. **What do you think should be done with the platform now that it will no longer be in operation, and why? What factors need to be taken into account?**