Course: Environmental Science **Unit #4: Energy Resources and Sustainability**	**Year of Implementation:** 2023-2024

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Stage One - Desired Results

Link(s) to New Jersey Student Learning Standards for this course:
https://www.state.nj.us/education/cccs/2020/

- **Unit Standards:**
  - ***Content Standards***
    - HS-LS1-5 Use a model to illustrate how photosynthesis transforms light energy into stored chemical energy.
    - HS-LS2-2 Use mathematical representations to support and revise explanations based on evidence about factors affecting biodiversity in ecosystems.
    - HS-LS2-7 Design, evaluate, and refine a solution for reducing the impacts of human activities on the environment and biodiversity.
    - HS-LS4-6 Create or revise a simulation to test a solution to mitigate adverse impacts of human activity on biodiversity.
    - HS-ESS2-2 Analyze geoscience data to make the claim that one change to Earth's surface can create feedbacks that cause changes to other Earth systems.
    - HS-ESS2-4 Use a model to describe how variations in the flow of energy into and out of Earth's systems result in changes in climate.
    - HS-ESS2-6 Develop a quantitative model to describe the cycling of carbon among the hydrosphere, atmosphere, geosphere, and biosphere.
    - HS-ESS3-1 Construct an explanation based on evidence for how the availability of natural resources, occurrence of natural hazards, and climate change have influenced human activity.
    - HS-ESS3-2 Evaluate competing design solutions for developing, managing, and utilizing energy and mineral resources based on cost-benefit ratios.
    - HS-ESS3-3 Create a computational simulation to illustrate the relationships among management of natural resources, the sustainability of human populations, and biodiversity.
    - HS-ESS3-4 Evaluate or refine a technological solution that reduces impacts of human activities on climate

change and other natural systems.

- HS-ESS3-5 Analyze geoscience data and the results from global climate models to make an evidence-based forecast of the current rate of global or regional climate change and associated future impacts to Earth systems.
- 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-PS3-3 Design, build, and refine a device that works within given constraints to convert one form of energy into another form of energy.
- 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.

- ***21st Century Life & Career Standards***
  - 9.1.12.CFR.3: Research companies with corporate governance policies supporting the common good and human rights.
  - 9.1.12.CFR.4: Demonstrate an understanding of the interrelationships among attitudes, assumptions, and patterns of behavior regarding money, saving, investing, and work across cultures.
  - 9.1.12.CDM.1: Identify the purposes, advantages, and disadvantages of debt.
  - 9.1.12.CDM.3: Determine ways to leverage debt beneficially
  - 9.1.12.CDM.8: Compare and compute interest and compound interest and develop an amortization table using business tools
  - 9.1.12.EG.1: Review the tax rates on different sources of income and on different types of products and services purchased.
  - 9.1.12.FP.1: Create a clear long-term financial plan to ensure its alignment with your values.
  - 9.1.12.PB.2: Prioritize financial decisions by considering alternatives and possible consequences.
  - 9.4.12.CT.1: Identify problem-solving strategies used in the development of an innovative product or practice (e.g., 1.1.12acc.C1b, 2.2.12.PF.3).
  - 9.4.12.CT.4: Participate in online strategy and planning sessions for course-based, school-based, or other project and determine the strategies that contribute to effective outcomes.
  - 9.4.12.GCA.1: Collaborate with individuals to analyze a variety of potential solutions to climate change effects and determine why some solutions (e.g., political. economic, cultural) may work better than others (e.g., SL.11-12.1., HS-ETS1-1, HS-ETS1-2, HS-ETS1-4, 6.3.12.GeoGI.1, 7.1.IH.IPERS.6, 7.1.IL.IPERS.7,

8.2.12.ETW.3).
    - 9.4.12.IML.3: Analyze data using tools and models to make valid and reliable claims, or to determine optimal design solutions (e.g., S-ID.B.6a., 8.1.12.DA.5, 7.1.IH.IPRET.8)
    - 9.4.12.IML.5: Evaluate, synthesize, and apply information on climate change from various sources appropriately (e.g., 2.1.12.CHSS.6, S.IC.B.4, S.IC.B.6, 8.1.12.DA.1, 6.1.12.GeoHE.14.a, 7.1.AL.PRSNT.2).
    - 9.4.12.IML.6: Use various types of media to produce and store information on climate change for different purposes and audiences with sensitivity to cultural, gender, and age diversity (e.g., NJSLSA.SL5).
    - 9.4.12.TL.2: Generate data using formula-based calculations in a spreadsheet and draw conclusions about the data.
    - 9.4.12.TL.3: Analyze the effectiveness of the process and quality of collaborative environments.
    - 9.4.12.TL.4: Collaborate in online learning communities or social networks or virtual worlds to analyze and propose a resolution to a real-world problem (e.g., 7.1.AL.IPERS.6).

- ***English Companion Standards***
    - RL.11-12.1. Cite strong and thorough textual evidence and make relevant connections to support analysis of what the text says explicitly as well as inferences drawn from the text, including determining where the text leaves matters uncertain.
    - RI.11-12.1. Accurately cite strong and thorough textual evidence, (e.g., via discussion, written response, etc.), to support analysis of what the text says explicitly as well as inferentially, including determining where the text leaves matters uncertain
    - RI.11-12.3. Analyze a complex set of ideas or sequence of events and explain how specific individuals, ideas, or events interact and develop over the course of the text.
    - RI.11-12.7. Integrate and evaluate multiple sources of information presented in different media or formats (e.g., visually, quantitatively) as well as in words in order to address a question or solve a problem.
    - NJSLSA.SL2. Integrate and evaluate information presented in diverse media and formats, including visually, quantitatively, and orally.
    - NJSLSA.SL4. Present information, findings, and supporting evidence such that listeners can follow the line of reasoning and the organization, development, and style are appropriate to task, purpose, and audience.
    - SL.11-12.4 Present information, findings and supporting evidence clearly, concisely, and logically. The content, organization, development, and style are appropriate to task, purpose, and audience.

- ***Interdisciplinary Content Standards***

- RST.11-12.1 Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account.
- WHST.9-12.7 Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation.
- WHST.11-12.8 Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the strengths and limitations of each source in terms of the specific task, purpose, and audience; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and overreliance on any one source and following a standard format for citation.
- WHST.9-12.9 Draw evidence from informational texts to support analysis, reflection, and research.
- SL.11-12.5 Make strategic use of digital media (e.g., textual, graphical, audio, visual, and interactive elements) in presentations to enhance understanding of findings, reasoning, and evidence and to add interest.
- MP.2 Reason abstractly and quantitatively.
- MP.4 Model with mathematics.
- HSN.Q.A.1 Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays.
- HSN.Q.A.2 Define appropriate quantities for the purpose of descriptive modeling.
- HSN.Q.A.3 Choose a level of accuracy appropriate to limitations on measurement when reporting quantities.

- ***NJ Statutes:*** NJ State law mandates the inclusion of the following topics in lesson design and instruction as aligned to elementary and secondary curriculum.

  Amistad Law: N.J.S.A. 18A 52:16A-88 Every board of education shall incorporate the information regarding the contributions of African-Americans to our country in an appropriate place in the curriculum of elementary and secondary school students.

  Holocaust Law: N.J.S.A. 18A:35-28 Every board of education shall include instruction on the Holocaust and genocides in an appropriate place in the curriculum of all elementary and secondary school pupils. The instruction

shall further emphasize the personal responsibility that each citizen bears to fight racism and hatred whenever and wherever it happens.

LGBT and Disabilities Law: N.J.S.A. 18A:35-4.35 A board of education shall include instruction on the political, economic, and social contributions of persons with disabilities and lesbian, gay, bisexual, and transgender people, in an appropriate place in the curriculum of middle school and high school students as part of the district's implementation of the New Jersey Student Learning Standards (N.J.S.A.18A:35-4.36) A board of education shall have policies and procedures in place pertaining to the selection of instructional materials to implement the requirements of N.J.S.A. 18A:35-4.35.

Diversity and Inclusion (N.J.S.A. 18A:35-4.36a) A board of education shall incorporate instruction on diversity and inclusion in an appropriate place in the curriculum of students in grades kindergarten through 12 as part of the district's implementation of the New Jersey Student Learning Standards.

Asian American and Pacific Islanders (AAPI) P.L.2021, c.410 Ensures that the contributions, history, and heritage of Asian Americans and Pacific Islanders (AAPI) are included in the New Jersey Student Learning Standards (NJSLS) for Social Studies in kindergarten through Grade 12 (P.L.2021, c.416)

For additional information, see

NJ Amistad Curriculum: ***http://www.njamistadcurriculum.net/***

Diversity and Inclusion: ***https://www.nj.gov/education/standards/dei/index.shtml***

- *(Sample Activities/ Lessons):* ***https://www.nj.gov/education/standards/dei/samples/index.shtml***

Asian American and Pacific Islanders:

- ***Asian American and Pacific Islander Heritage and History in the U.S.***
  A Teacher's Guide from EDSITEment offering a collection of lessons and resources for K-12 social studies, literature and arts classrooms that center around the experiences, achievements and perspectives of Asian Americans and Pacific Islanders across U.S. history.

Transfer Goal: Students will be able to independently use their learning to make informed and responsible decisions pertaining to energy and Earth's finite resources.

As aligned with LRHSD Long Term Learning Goal(s):

- design, critique, and carry out experiments in order to investigate scientific questions and/or propose solutions
- collect, interpret, and analyze data in order to solve a defined problem
- apply mathematics to express relationships efficiently and accurately
- draw evidence-based conclusions from data in order to make informed decisions;
- construct, interpret, and refine models (scientific and mathematical) to explain the physical and natural world
- effectively communicate scientific ideas and evidence-based arguments to an appropriate audience through written and oral means
- evaluate the validity of arguments that rely on scientific reasoning presented in the popular press and informational sources

Enduring Understandings	*Essential Questions*
Students will understand that. . . *EU 1* the use of nonrenewable resources is the cause of excess amounts of anthropogenic pollution and is not sustainable.	*EU 1* ● How do we obtain the energy necessary to power our daily lives? ● Why is the use of nonrenewable energy resources not sustainable? ● How does the combustion of fossil fuels impact our environment? ● Why should we be concerned about global climate change?

EU 2 it is vital to evaluate data to measure the effectiveness and quality of sustainable solutions. *EU 3* the adaptation and implementation of renewable resources is key to living and creating a more sustainable future. *EU 4* sustainable energy strategies must include energy efficiency and conservation. *EU 5* multiple strategies must be employed to manage waste properly.	● How can we minimize the impacts of nonrenewable resources usage? *EU 2* ● What constitutes meaningful scientific evidence that scientists have collected to support global climate change? ● What data is necessary to collect and compare in order to test the effectiveness of sustainable solutions? ● How will population growth impact energy use and the demand for different forms of energy? ● How has human activity accelerated the rate of climate change? *EU 3* ● Could solar, wind, hydropower and other renewables eliminate the need for fossil fuels? ● What are the obstacles necessary to overcome when implementing renewable energy strategies? ● Do the advantages of using biofuels outweigh the disadvantages? ● How is our economy impacted from a transition towards the use of renewable energy sources? *EU 4* ● Why is energy efficiency & conservation an important part in moving towards a more energy sustainable future? ● How do we decide what the best form of energy is to use and depend upon? *EU 5* ● Why is waste produced?

	• Can waste production be managed? • How is the health of people and the environment affected when waste is not managed properly? • How can the production of waste be reduced? • How do the pros and cons drive how we implement waste management strategies?
Knowledge *Students will know . . .* *EU 1* ● the ways in which we obtain the energy necessary to power our daily lives and which activities consume the most energy overall. ESS3.A ● nonrenewable resources are limited and that if not managed properly will run out. (ESS3.A, ESS3.C) ● the flow of additional carbon dioxide throughout the globe can have an adverse affect on our environment. (ESS2.D) ● there are many factors that contribute to and result from climate change. (ESS2.D, ESS3.C) ● that climate change is a real phenomenon that can have negative effects on both the biotic and abiotic components of the environment. (ESS3.C) ● there are several options for energy that don't rely on nonrenewable options. (ESS3.A, ESS3.C, ETS1.B)	*Skills* *Students will be able to. . .* *EU 1* ● compare and contrast the different types of energy sources used by humans. ESS3.A ● calculate the amount of time a nonrenewable resource will last based on current supply and consumption rates. (ESS3.A, ESS3.C, ETS1.B) ● formulate the negative effects when resources are no longer available (ESS3.A, ESS3.C, ETS1.B) ● identify the factors that contribute to climate change. (ESS2.D) ● investigate what would happen when additional carbon dioxide emissions are added to the environment. (ESS2.D) ● defend that climate change is real using research that has been accepted by the scientific community. (ESS2.D) ● identify a solution that can help to mitigate or slow down the rate of climate change. (ESS3.A, ESS3.C, ETS1.B) ● compare and contrast renewable options that relate to energy consumptions that are available to different

EU 2 ● the research that has been conducted relating to climate change. (ESS2.D, ESS3.D) ● the difference between sustainable and unsustainable options. (ETS1.B) ● that evidence and data collection is important when testing effectiveness. (ETS1.A, ETS1.B) ● as the population continues to grow it will need to find more efficient ways to make and consume energy. (ESS3.A) ● that humans are negatively affecting the environment and it is leading to an increased change in climate. (ESS2.D) *EU 3* ● renewable resources can eliminate the need for fossil fuels if there is a plan in place to make the shift efficiency. (ESS3.A) ● government and policies play a huge role in determining the switch to renewable energy strategies. (ESS3.A) ● biofuels have both advantages and disadvantages. (ESS3.A) ● the economy plays a role in determining whether renewable energy sources should be implemented in areas around the world. (ESS3.A, ETS1.A, ETS1.B)	populations across the world. (ESS3.A, ESS3.C, ETS1.B) *EU 2* ● analyze and interpret the research that has been done relating to climate change. (ESS2.D, ESS3.D) ● classify different resources as either sustainable or unsustainable and be able to defend their answer. (ESS3.A) ● collect evidence and distinguish whether the information supports your hypothesis. ((ETS1.A, ETS1.B) ● critique the different methods used to produce and consume energy. (ESS3.A) ● identify how humans are impacting the environment and discuss what we can do to change this. (ESS2.D) *EU 3* ● recognize that renewable resources can be difficult to implement. (ESS3.A) ● analyze the qualitative and quantitative criteria and constraints for solutions such as renewable energy resources that account for societal needs and wants. (ESS3.A, ETS1.A, ETS1.B) ● evaluate a solution to a complex real-world problem such as a switch to renewable energy resources 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. (ESS3.A, ETS1.A, ETS1.B) ● compare and contrast whether biofuels should be implemented in society. (ESS3.A, ETS1.A, ETS1.B)

EU 4 ● having better energy efficiency and conservation is important because it creates less waste. (ESS3.C) ● there are pros and cons to every form of energy creation. (ESS3.A) *EU 5* ● there are different methods to categorize and manage waste. (ESS3.C) ● when waste in not managed properly it can lead to negative impacts to the environment and the people that live there. ((ESS3.C) ● waste can be reduced by recycling and using biodegradable products ((ESS3.C) ● there are many factors that drive the implementation of waste management such as economy and policies. (ETS1.A, ETS1.B)	● discuss why the economy can stop the implementation of using renewable resources in an area. (ESS3.A, ETS1.A, ETS1.B) *EU 4* ● design a town that is energy efficient and be able to defend their design with both qualitative and quantitative evidence. (ESS3.A, ETS1.A, ETS1.B, ETS1.C) ● create a pros and cons list for the different types of energy creation techniques. (ESS3.A) *EU 5* ● report on the different methods that are available to manage waste. (ESS3.C) ● write about the effects poor waste management can have on a population. (ESS3.C) ● create a list of different ways we can reduce waste as a population. (ESS3.C) ● analyze the factors that drive the implementation of waste management. (ETS1.A, ETS1.B)
Stage Two - Assessment	

Stage Three - Instruction

Learning Plan: **Suggested Learning Activities to Include Differentiated Instruction and Interdisciplinary Connections: Each learning activity listed must be accompanied by a learning goal of A= Acquiring basic knowledge and skills, M= Making meaning and/or a T= Transfer.** *The following color codes are used to notate activities that correspond with interdisciplinary connections and 21st Century Life & Career Connections (which involves Technology Literacy): Red = Interdisciplinary Connection; Purple = 21st Century Life & Career Connection*

PHENOMENON*:* Glacier National Park is Melting Away (video &/or photo) EU 1-4
Glacier National Park used to have 150 glaciers and it now has 25. Photographic evidence in this video shows how drastically the glaciers have changed. To show the decrease in glacier size, scientists from the USGS Northern Rocky Mountain Science Center photographed the same areas where glaciers were photographed in the early 1900s. Dan Fagre, a USGS research ecologist, has been studying climate change in the park for more than 20 years. Fagre and his colleagues discuss what melting glaciers and climate change mean for the future of the park, which is expected to be nearly glacier free by 2030, based on present warming trends.
https://thewonderofscience.com/phenomenon/2018/5/13/glacier-national-park-is-melting-away
GOAL: Students will discover the impacts of global climate change and why it is vital to make changes in order to address this imminent danger to both the environment and our own survival and way of life.

1. Compare and contrast the before and after picture of Glacier National Park in 1913 to 2012 (EU 1&2)
    a. Do this in pairs for a few minutes, then have a class discussion. (A/M)
    b. Watch the video: Photo Evidence: Glacier National Park Is Melting Away | National Geographic (A/M) (youtube)
    c. Students will take notes on 1) what data is being collected 2) what is happening in addition to the melting of the glaciers as they watch (M)
    d. Discuss as a class and compile a list of concepts needed to be learned in order to understand and address this issue. (M,T)
2. Energy By State - Using Interactive Maps https://www.eia.gov/electricity/state/ (EU 1&2)
    a. Students will use the interactive maps to compare and contrast energy use and energy statistics for various states.(M)
    b. Result/Connection to Phenomena: Energy needs to be consumed to power everyday life. The amount of energy consumed varies. (T)
3. Comparing & contrasting Nonrenewable Energy Resources (EU 1&2)

a. Students will create a trifold pamphlet by researching and recording facts about each of the nonrenewable energy resources (Coal, Oil, Natural Gas, Nuclear Energy) including pros and cons of each type of resource. (A,M)
b. Result/Connection to Phenomena: Extra CO_2 released by the use of fossil fuels is contributing to global climate change and the melting of the polar ice caps. (T)

4. Eco Footprint - Metal Consumption (Data Analysis & Calculations) EU 1
   a. Students will use data provided to determine how many years various nonrenewable metal resources will last based on current consumption rates. (A/M)
   b. Result/Connection to Phenomena: In addition to contributing to climate change, nonrenewable resources are finite and can run out. (T)
5. Gasland Documentary & Debate (EU 1,2,5)
   a. Students will watch documentary. (A)
   b. Students will determine the position the creators of this documentary are taking and what evidence they are using to back up this position. (M)
   c. Students will decide whether they agree or disagree with this position. (M)
   d. The class will then have a debate: Is the use of natural gas a sustainable solution? (M/T)
   e. Result/Connection to Phenomenon: The production of energy to meet growing population demands and economic profits has many negative consequences on the environment that are difficult to address and solve. (T)
6. Half Life & Radioactive Decay (EU 1-4)
   a. Students will complete first guided and then individual half life calculations to simulate the amount of time necessary to wait until radioactive waste produced by nuclear power plants will become safe. (A/M)
   b. Result/Connections to Phenomenon: Nuclear power was once thought to be the solution to issues associated with fossil fuels but came with its own set of advantages and disadvantages. (T)
7. Pick a Side: Which nonrenewable energy resource is the best to use & why? (EU 1,4)
   a. Each corner of the room will represent a different nonrenewable energy resource.
   b. Students will choose a corner. (M)
   c. In groups students defend their position, as well as, identify arguments against other groups. (M)
   d. Result/Connection to Phenomenon: The production of energy to meet growing population demands and economic profits has many negative consequences on the environment that are difficult to address and solve. (T)
8. Global Climate Change Activity - Graph It: Atmospheric Carbon Dioxide & Temperature Change (EU 2)
   a. Online Textbook Resource that analyzes the trends in atmospheric carbon dioxide and average global temperature over time (A,M)
   b. Result/Connection to Phenomenon: Both average CO_2 and global temperature levels have increased over time.
9. Greenhouse Effect Simulation Lab (EU 2)

a. Students will complete an online simulation of the greenhouse effect to investigate how it works and how humans have impacted it. Students can also use this interface to make predictions. (A,M,T)
b. Example: https://phet.colorado.edu/en/simulations/greenhouse-effect/about
c. Result/Connection to Phenomenon: The addition of extra CO_2 emissions enhances the natural greenhouse effects ability to trap heat. (T)

10. Phenomena Reflection

a. Have students reflect on the photos of National Glacier Park from the beginning of the unit. (A,M)
b. Students will attempt to draw a model that links what they have learned to the changes observed in the photos. (M)
c. Identify any gaps or inconsistencies in models. (T)

11. "How I Harnessed the Wind" TED Talk with William Kamkwamba (EU 3 & 4)

a. Students will watch ted talk: https://www.youtube.com/watch?v=6QkNxt7MpWM
b. Students will take notes as they watch. (A)
c. The class will discuss the large takeaways students noted about the use of wind power. (M)
d. Result/Connection to Phenomenon: A switch to renewable energy resources is one possible solution to human energy needs.

12. Activity: Light Today, Light Tomorrow - CFL vs. LED (EU 3 & 4)

a. Test and compare the temperature, light intensity, cost and efficiency of each bulb to determine which light bulb is the best and most efficient (A/M/T)
https://docs.google.com/document/d/1RjtRuL8RvBKBXC-VFIlgVMItCdBfRHsCFMx9PlDb55o/edit
b. Result/Connection to Phenomenon: Increased energy efficiency is one necessary part to sustainably address the globe climate crisis.

13. Energy Sources Gallery Walk (EU 1-4 A/M/T)

a. Renewable vs. Nonrenewable Energy
    i. Solar, Wind, Geothermal, Tidal/Current, Freshwater Solar Ponds, Thermal Ocean/Freshwater, Hydroelectricity, Hydrogen Fuel Cells, Biofuels & Biomass
    ii. Nuclear Energy, Natural Gas, Oil, Coal
    https://docs.google.com/document/d/1JUr7BHy6WF0YfdWe9sRrzcJTRQ90qojef-8erTbVRFY/edit
    iii. Rubric: https://docs.google.com/document/d/1joBJPuXGdQYe1E9Etx-dIrBGgg_rAoAQtnprBj1z9Ak/edit

14. Build a Sustainable City Project (A/M/T EU 1-5)

a. Students will design and present a plan to develop a sustainable city.
https://docs.google.com/document/d/1cocPcw-dHK7GzbyLBrrwLVd20vacDTW4-eWsNKt5SBM/edit

b. Rubric: https://docs.google.com/document/d/15BECYS3sgFrLma3MniuWClq38FJkgg17nDRJmIr4KAg/edit
c. Result/Connection to phenomena: Although difficult for many reasons, changes can be made and implemented to address the global climate crisis.

15. Phenomena Reflection

a. Students will reflect on their original models attempting to fill in or fix any gaps or inconsistencies noticed previously with new knowledge acquired.
b. Students will use models to predict what a picture of Glacier National Park might look like 10, 20, 50, 100 years from now both 1) if no actions are taken to combat climate change and 2) if actions are taken to combat climate change and what those actions might look like. (M,T)

PHENOMENON*:* The Great Pacific Garbage Patch (video) EU 5

16. Have students watch the following video clip: https://www.youtube.com/watch?v=MnCbTTTi7ic
    a. Students will record any questions that come to mind as they watch this video clip. (A)
    b. Students will choose one or two of these questions to place on a post it note. (M)
    c. Post It notes will then be placed on the board.
    d. The class will try to organize Post It note questions into different categories. (M)
    e. These questions and categories will guide future lessons. (T)
17. Ten Shocking Facts About Plastics in Our Oceans (EU 5)
    a. Have students go to the website: https://passportocean.com/2018/02/24/facts-plastics-oceans/ (A)
    b. Students will pick which fact they think is the most shocking and why. (M)
    c. Class discussion of results reflecting back on questions and categories. (T)
18. The Story of Stuff (EU 5)
    a. Students will watch: The Story of Stuff https://www.youtube.com/watch?v=9GorqroigqM (A)
    b. As students watch the video they will reflect on the following questions: (M)
        i. What did you think about the video?
        ii. Where does your stuff go when you are done using it?
        iii. How much do you think you throw away every year? Month? Day?
    c. Class Discussion of answers to reflection questions. (M)

19. Phenomena Reflection

a. Students will decide what questions from phenomena the class has sufficiently answered, what questions are still unanswered, and add any new questions that students have with information that has been gained. (T)

20. Make an Eco Brick! (EU 5)

a. https://ecobricks.org/en/what.php
b. Students will research and create their own Eco Brick. (A,M)
c. In groups, students will design a project that could use eco bricks to make something or solve a problem. (T)

21. Activity: Recycling Competition (EU 5)
    a. Time students to see how fast they can correctly sort a collection of waste into recyclable and nonrecyclable bins.
    b. Use the game to start a discussion about recyclables. (A,M)
        i. Why can some things be recycled but not others?
        ii. Which materials are recyclable in our area?
        iii. What has to be done to recycle properly (take off caps, rinse)?
    c. Students will design a plan to analyze how well your school is recycling, who is recycling best (underclassmen or upperclassmen), and implement strategies to increase your school's recycling success. (A,M)
    d. Students will use data from above to guide implementation of strategies to increase accuracy of recycling. (T)
22. *Phenomena Reflection:* How does recycling and other solutions like Eco bricks or composting relate to our phenomena about the Great Pacific Garbage Patch? (T)

Additional Suggested Ideas:

- Field trips – can include but not limited to: water treatment plant, Tuckerton, Palmyra Cove, Rutgers Ecocomplex in Bordentown, landfill, Island Beach state park, Sandy Hook, Wetlands Institute (M)
- Guest Speakers (M)
- Current Events (A,M,T)
- Case Studies - Ex: Love Canal (A,M,T)
- Enviroscape & Watershed Ambassador Program (A,M,T)
- Energy Efficient Home Project (M,T)
- Water Testing and Sampling Activity (M)
- Shattered Sky Documentary (A,M)
- Eyes of Nye Nuclear Energy Video (A,M)
- Kits: Build a Solar Car or Wind Turbine (A,M)
- Lesson 5 (see link attached below): Wash up! - Activity about Microplastics (A,M,T)
    - https://digitalcommons.hamline.edu/cgi/viewcontent.cgi?article=1364&context=hse_cp
- Lesson 8: Perfecting the Package (waste due to over packaging - see link attached below) (A,M,T)
    - https://digitalcommons.hamline.edu/cgi/viewcontent.cgi?article=1364&context=hse_cp

Pacing Guide

Unit #	*Title of Unit*	*Approximate # of teaching days*
1	**Earth's Systems, Resources and Human Impact**	25
2	**The Living World**	55
3	**Human Population and Land Use**	55
4	**Energy Resources and Sustainability**	45

Instructional Materials

A fully equipped Environmental Science Lab including but not limited to the following items:

- Java via CheerpJ simulations run in a browser on most devices. See full Java via CheerpJ system requirements
- PET plastic bottle
- CFL bulbs
- LED bulbs

Accommodations

Special Education: The curriculum will be modified as per the Individualized Education Plan (IEP). Students will be accommodated based on specific accommodations listed in the IEP.

Students with 504 Plans: Students will be accommodated based on specific accommodations listed in the 504 Plan.

English Language Learners: Students will be accommodated based on individual need and in consultation with the ELL teacher.

Students at Risk of School Failure: Students will be accommodated based on individual need and provided various structural supports through their school.

Gifted and Talented Students: Students will be challenged to enhance their knowledge and skills through acceleration and additional independent research on the subject matter.