

CLEAN Learning Activities Review Form - 1st review

RC Initial Review - Learning Activity

This review is part of the review cycle of elementary resources starting in 2019/2020

Scientific Accuracy

Is an attribution provided that represents a credible source such as a university or government agency?

- yes
- no

Resource is free of scientifically out-of-date material.

- 4 definitely
- 3 somewhat
- 2 a little
- 1 no

Does the resource support an understanding of the scientific process?

- 4 definitely
- 3 somewhat
- 2 a little
- 1 no
- not applicable

Does the resource present valid/accurate and grade-level appropriate concepts, models, and skills?

- 4 definitely
- 3 somewhat
- 2 a little
- 1 no

Are links to the original data sources provided?

- 4 definitely
- 3 somewhat
- 2 a little
- 1 no
- not applicable

Where appropriate, are references, bibliographies and other supporting material provided?

- yes
- no

Draft Science Annotation - please include strengths and concerns (content to be used for catalog record):

**Overall Rating of Scientific Accuracy**

- Meets highest scientific standards, up-to-date e.g. IPCC 4th report
- Scientifically sound but does not meet highest standards
- Minor scientific short-comings that can be addressed in annotations
- Has major scientific short-comings or even conveys misconceptions
- Can't answer this

Pedagogic effectiveness

Are learning objectives clearly stated?

- yes
- no

Do the instructional strategies build toward mastering the learning objectives?

- 4 definitely
- 3 somewhat
- 2 a little
- 1 no

Is the resource free from material that might interfere with effective use by a wide range of learners (e.g. negative stereotypes or insensitive treatment of sensitive subjects)

- 4 yes
- 1 no
- can not answer

Does the resource effectively address common preconceptions/misconceptions?

- 4 definitely
- 3 somewhat
- 2 a little
- 1 no
- not applicable

Are effective assessment strategies suggested?

- 4 definitely
- 3 somewhat
- 2 a little
- 1 no

Is the resource engaging and motivating for students? Does it provide compelling and relevant reason to jump into the activity?

- 4 definitely
- 3 somewhat
- 2 a little
- 1 no

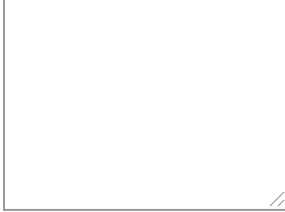
Are students engaged in inquiry, independent thinking or problem solving through this resource?

- 4 definitely
- 3 somewhat
- 2 a little
- 1 no

Does the resource provide a vehicle for asking questions or seeking further information beyond the activity?

- 4 definitely
 3 somewhat
 2 a little
 1 no

Draft Pedagogy Annotation - please include strengths and concerns (content to be used for catalog record). Please consider if resource will appeal to different groups and different learning styles:



Overall Rating of Pedagogic Effectiveness

- Pedagogically very effective and carefully designed, well documented, suitable target audience
 Pedagogic design is good and resource is useful as a learning tool for target audience, minor pedagogic short-comings
 Pedagogical design does meet basic standards but has considerable shortcomings
 Poor pedagogical design, not recommended as a learning tool for target audience
 Can't answer this

Ease of use & technical quality

Is the resource free of distracting or off-topic advertising?

- yes
 no


Is the resource complete in scope and ready for use?

- yes
 no

Are the materials used in the resource commonly found in science classrooms?

- yes
 no
 not applicable

List uncommon materials or computer access needs here (content will be used for catalog record):



Does the resource present the concept and content clearly?

- 4 definitely
 3 somewhat
 2 a little
 1 no

Does the resource provide a clear and comprehensive guidance for teachers to effectively teach the activity?

- 4 definitely
 3 somewhat
 2 a little
 1 no

Draft annotation about Technical Quality and Ease of Use - please include strengths and concerns (content to be used for catalog record):

Overall Rating of Technical Quality

- Technically robust and adequate for use in typical educational environment
- Technically good, minor shortcomings in technical aspects when used in typical educational environment
- Technically weak, minor problems when used in typical educational environment
- Technically weak, major problems when used in typical educational environment
- Not Applicable
- Can't answer this

Overall Rating of Ease of Use

- Very easy and intuitive to use for students and teachers, grade-level appropriate design
- Fairly easy to use for students and teachers
- Careful guidance of students through material needed
- Easy to get lost in material, counter-intuitive and/or not grade-level-appropriate
- Can't answer this

Teaching Tips

Teaching Tips (content will be used for catalog record):

Amount of time required for this activity (content will be used for catalog record - format example "three-four 45 min lesson periods"):

If the resource is part of a larger collection and there is a relevant parent URL please copy the URL here (format [URL]- content will be used for catalog record):

Essential Principles of Climate and Energy Literacy

Select the primary principle(s) that are addressed by the resource.

Essential Principles of Climate Science

- GP Humans can take actions to reduce climate change and its impacts.**
- GP a Climate science improves informed policy and decision-making
- GP b Reducing human vulnerability to and impacts on climate requires multi-disciplinary, integrated understanding
- GP c Climate change affects global/national security
- GP d Greenhouse gas reduction and carbon dioxide sequestration to mitigate climate change
- GP e Strategies to reduce greenhouse gas emission (energy conservation, renewable energies, change in energy use)
- GP f Strategies of human adaptation to climate change

- GP g Actions taken by different levels of society can mitigate climate change and increase preparedness for current and future generations
- 1 The Sun is the primary source of energy for Earth's climate system**
- 1a Sunlight warms the planet
- 1 b Earth's Energy balance
- 1 c Axial tilt of Earth governs incoming sunlight and seasonality
- 1 d Milankovitch/orbital cycle
- 1 e Solar variability has no significant impact on Earth's current warming
- 2 Climate is regulated by complex interactions among components of the Earth system**
- 2 a World's climate definition
- 2 b Ocean as climate control, oceanic conveyor belt; abrupt changes in thermohaline circulation
- 2 c Greenhouse effect
- 2 d Biogeochemical cycles of greenhouse gases / Carbon cycle
- 2 e Role of aerosols in climate system
- 2 f Equilibrium and feedback loops in climate system
- 3 Life on Earth depends on, is shaped by, and affects climate**
- 3 a Climate's role in habitats ranges and adaptation of species to climate changes
- 3 b The Greenhouse effect supports the water cycle and makes life possible
- 3 c Climate impacts ecosystems and past species extinctions
- 3 d Holocene is unusually stable – human infrastructure vulnerable to change
- 3 e Biosphere drives the global carbon cycle
- 4 Climate varies over space and time through both natural and man-made processes**
- 4 a Definition of climate and climatic regions
- 4 b Climate is not the same thing as weather – defining difference
- 4 c Climate change vs. climate variability and patterns
- 4 d Changes in climate is normal but varies over times/ space
- 4 e Global warming and especially arctic warming is recorded in natural geological and historic records
- 4 f Evidence is that human impacts are playing an increasing role in climate change
- 4 g Natural processes of CO₂ removal from atmosphere is slow; Long residence time of some GHG
- 5 Our understanding of the climate system is improved through observations, theoretical studies, and modeling**
- 5 a Climate system is subject to the same physical laws as the rest of the Universe
- 5 b Observations are the foundation for understanding the climate system
- 5 c Observations, experiments, and theory are used to construct and refine computer models
- 5 d Meteorology and climatology are related but different sciences, and their processes are modeled and forecast differently
- 5 e Climate models are robust enough to be used for guiding decision and actions as response to climate change
- 6 Human activities are impacting the climate system**
- 6 a Global warming is "very likely" caused by human greenhouse gas emission
- 6 b Increased GHG concentrations in atmosphere will remain high for centuries and affect future climate
- 6 c Human activities have increased GHG levels and altered global climate patterns
- 6 d Evidence shows that human-caused global warming have impacted ecosystem resulting in reduced biodiversity and ecological resilience
- 6 e Negative impacts of global warming outweigh positive
- 7 Climate change will have consequences for the Earth system and human lives**
- 7 a Sea level rise and resulting impacts is due to melting ice and thermal expansion and increases the risk
- 7 b Effects of climate change on water cycle and freshwater availability
- 7 c Increased extreme weather events due to climate change
- 7 d Increased acidity of oceans and negative impacts on food chain due to increasing carbon dioxide levels
- 7 e Ecosystems on land and in the ocean have been and will continue to be disturbed by climate change
- 7 f Human health and well-being will be affected to different degrees from the impacts from climate change

- 1. Energy is a physical quantity that follows precise natural laws.**
- 1.1 Energy is a quantity that is transferred from system to system.
- 1.2 The energy of a system or object that results in its temperature is called thermal energy.
- 1.3 Energy is neither created nor destroyed
- 1.4 Energy available to do useful work decreases as it is transferred from system to system.
- 1.5 Energy comes in different forms and can be divided into categories.
- 1.6 Chemical and nuclear reactions involve transfer and transformation of energy.
- 1.7 Many different units are used to quantify energy.
- 1.8 Power is a measure of energy transfer rate.

- 2. Physical processes on Earth are the result of energy flow**
- 2.1 Earth is constantly changing as energy flows through the system.
- 2.2 Sunlight, gravitational potential, decay of radioactive isotopes, and rotation of the Earth are the major sources of energy driving physical processes on Earth.
- 2.3 Earth's weather and climate are mostly driven by energy from the Sun.
- 2.4 Water plays a major role in the storage and transfer of energy in the Earth system.
- 2.5 Movement of matter between reservoirs is driven by Earth's internal and external sources of energy.
- 2.6 Greenhouse gases affect energy flow through the Earth system.
- 2.7 The effects of changes in Earth's energy system are often not immediately apparent.

- 3. Biological processes depend on energy flow**
- 3.1 The Sun is the major source of energy for organisms and the ecosystems of which they are a part.
- 3.2 Food is a biofuel used by organisms to acquire energy for internal living processes.
- 3.3 Energy available to do useful work decreases as it is transferred from organism to organism.
- 3.4 Energy flows through food webs in one direction, from producers to consumers and decomposers.
- 3.5 Ecosystems are affected by changes in the availability of energy and matter.
- 3.6 Humans are part of Earth's ecosystems and influence energy flow through these systems.

- 4. Various sources of energy are used to power human activities**
- 4.1 Humans transfer and transform energy from the environment into forms useful for human endeavors.
- 4.2 Human use of energy is subject to limits and constraints.
- 4.3 Fossil and biofuels are organic matter that contain energy captured from sunlight.
- 4.4 Humans transport energy from place to place.
- 4.5 Humans generate electricity in multiple ways.
- 4.6 Humans intentionally store energy for later use in a number of different ways.
- 4.7 Different sources of energy and the different ways energy can be transformed, transported, and stored each have different benefits and drawbacks.

- 5. Energy decisions are influenced by several factors**
- 5.1 Decisions concerning the use of energy resources are made at many levels.
- 5.2 Energy infrastructure has inertia.
- 5.3 Energy decisions can be made using a systems-based approach.
- 5.4 Energy decisions are influenced by economic factors.
- 5.5 Energy decisions are influenced by political factors.
- 5.6 Energy decisions are influenced by environmental factors.
- 5.7 Energy decisions are influenced by social factors.

- 6. Human use of energy**
- 6.1 Conservation of energy has two very different meanings.
- 6.2 One way to manage energy resources is through conservation.
- 6.3 Human demand for energy is increasing.
- 6.4 Earth has limited energy resources.
- 6.5 Social and technological innovation affects the amount of energy used by human society.
- 6.6 Behavior and design affect the amount of energy used by human society.
- 6.7 Products and services carry with them embedded energy.

- 6.8 Amount of energy used can be calculated and monitored.
- 7. Energy affects quality of life The quality of life of individuals and societies is affected by energy choices**
- 7.1 Economic security is impacted by energy choices.
- 7.2 National security is impacted by energy choices.
- 7.3 Environmental quality is impacted by energy choices.
- 7.4 Increasing demand for and limited supplies of fossil fuels affects quality of life.
- 7.5 Access to energy resources affects quality of life.
- 7.6 Some populations are more vulnerable to impacts of energy choices than others.

Audience Level

Please select the grade level for which this material is most appropriate (in your judgement) Check all that apply.

- Primary (K-2)
- Intermediate (3-5)
- Middle (6-8)
- High School (9-12)
- College Lower (13-14)
- College Upper (15-16)
- Graduate or Professional
- Informal Education (museums, park displays)

Grade level notes (content will be used for catalog record):

Overall Rating of Relevance to CLEAN

- High Priority (Resource likely to be included in CLEAN collection of excellent resources)
- Medium Priority (Resource meets basic CLEAN standards)
- Low Priority (Resource meets basic CLEAN standards but is of lower priority)
- Hold for Later Review (Keep in pool for another review at later stage)
- Excellent but Incomplete (Excellent and relevant but needs improved activity sheet)
- Do Not Include (Resource doesn't meet basic CLEAN standards)
- Review in process (not yet complete)
- Unvetted (Review not yet complete)

Other Reviewer Comments (for internal use only - not used for catalog record)