

CLIMATE LITERACY AND ENERGY AWARENESS NETWORK PROJECT

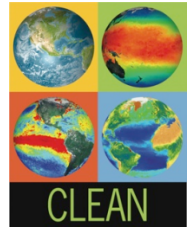
Developing an online reviewed collection of digital learning resources

Susan Buhr Sullivan, CIRES



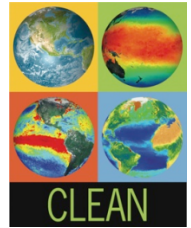
MRSEC Meeting, 9/16/2013 Santa Barbara,

Why online collections?



- Access to most recent science (fast changing fields)
- Incorporating real data
- Quick turn around
- Easy search
- Different resource types to augment instruction

CLEAN Collection



- Educational resources for grades 6-16 on climate, climate change and energy topics (583 as of 9/14/13)
- Resources scientifically/pedagogically peer-reviewed
- Annotations reflect reviewer comments
- Alignments
 - ▣ Climate Literacy Principles / Energy Literacy Principles
 - ▣ National Science Education Standards
 - ▣ AAAS Project 2061 Benchmarks for Science Literacy
 - ▣ Quantitative Skills / Regional focus
 - ▣ TBD: NGSS DCI, practices, cross-cutting concepts

Climate Literacy & Energy Awareness Network (CLEAN) collection



- NSF- Climate Change Education Program
- NOAA Core Funding, syndicated at climate.gov
- Long Term Ecological Research sites
- Dept of Energy



Your charge as I understand it



- Inventory existing materials sciences learning resources
- Includes learning resources, professional development and camps
- Resources held primarily through MRSEC
- No community-based literacy framework
- Identifying and tagging high-quality resources is a value.

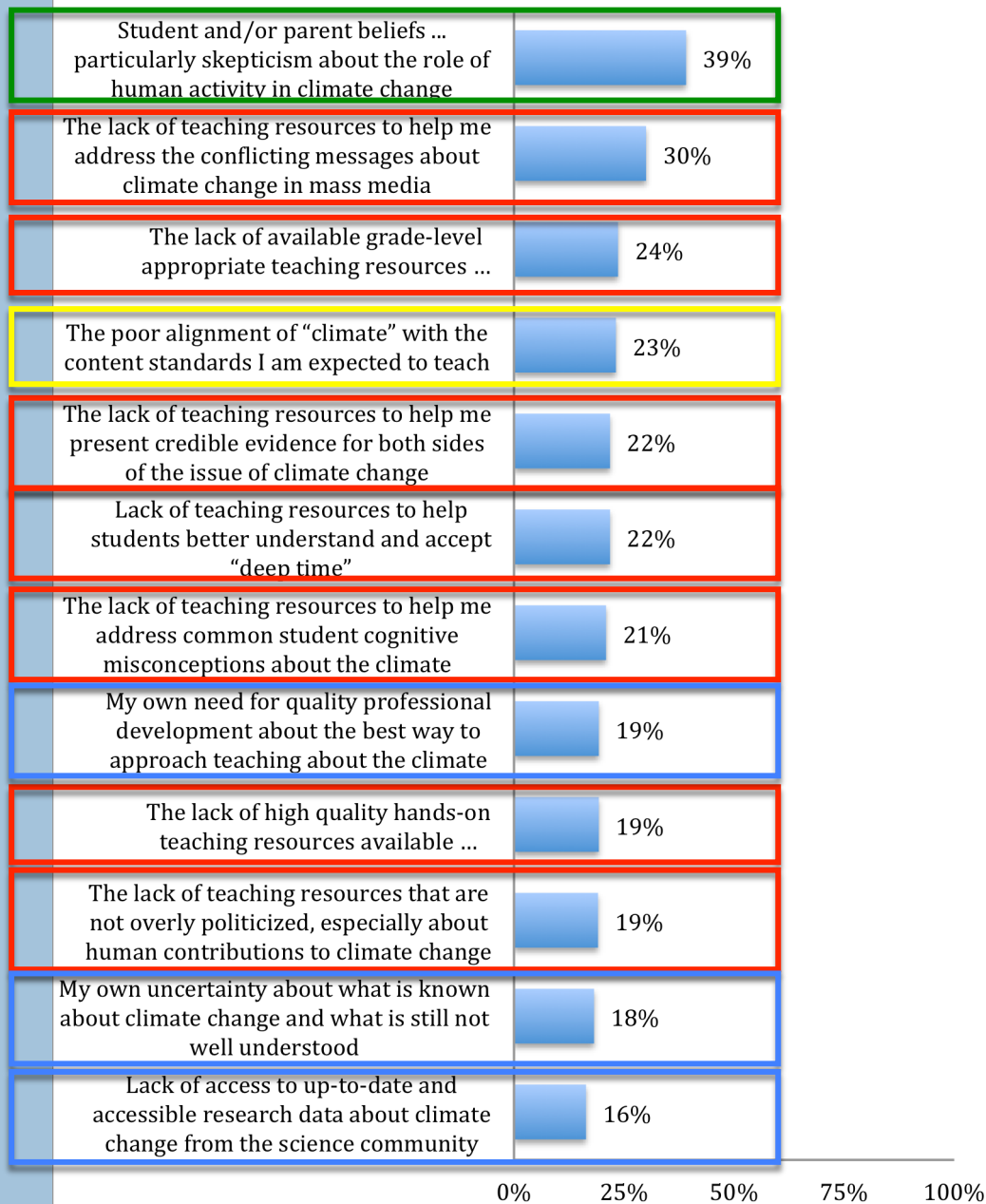
- What have I missed?

What do educators tell you?



- Alignment with standards
- Perceived level of topic compared with student knowledge
- Need for professional development
- Student engagement and interest-high?
- Access to resources

Percentage of consultants who have altered their teaching of climate science as a result of specific possible barriers



Reported barriers to educators to teaching climate:

- Lack of high-quality resources
- Lack of professional development/personal knowledge
- Controversy of topic
- Alignment with Standards

New opportunities: Next Generation Science Standards

The screenshot shows the NSDL Science Literacy Maps website interface. A search bar at the top contains the text "material science literacy". The main content area displays a "Benchmark Details" window for the benchmark: "Increased knowledge of the properties of particular molecular structures helps in the design and synthesis of new materials for special purposes. 8B/H4 (ID: SMS-BMK-0526). Grade range: 9 - 12".

Below the benchmark title, there are tabs for "Top Picks", "Related Resources", "NGSS Standards", and "Related Benchmarks". The "NGSS Standards" tab is active, showing a list of standards under the heading "Crosscutting Concepts":

- Structure and Function
 - Investigating or designing new systems or structures requires a detailed examination of the properties of different materials, the structures of different components, and connections of components to reveal its function and/or solve a problem. (Grades 9-12)
 - Show Performance Expectation(s)

Callouts provide additional context:

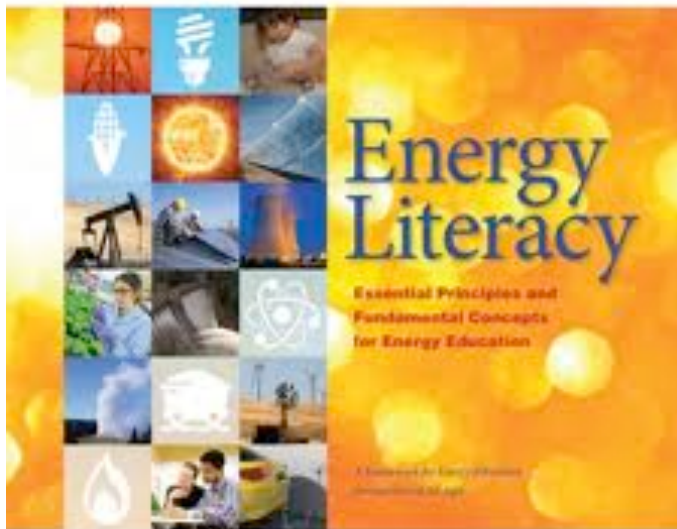
- A callout on the left discusses "waste management" and "increased use of existing materials".
- A callout at the bottom right states: "Increased knowledge of the properties of particular molecular structures helps in the design and synthesis of..."

On the right side of the page, there is a navigation pad and the text "physical properties". At the bottom right, a network diagram is visible, showing interconnected nodes and lines.

Getting started: Scope of collection



- Climate Literacy: Essential Principles of Climate Science
- Energy Literacy: Essential Principles of Energy Education

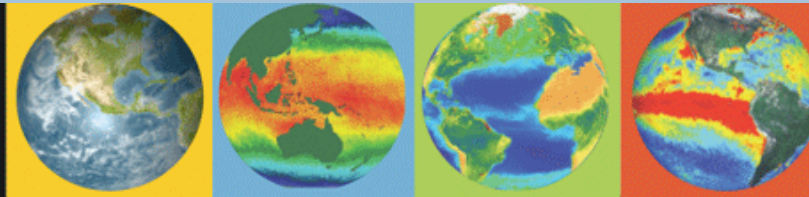


Web tour



- Browse resources
- Refine results
- Annotation
 - Scientific
 - Pedagogical
 - Ease of use
 - Teaching Tips
 - Expert science
- Jump to Activity

CLEAN



CLIMATE LITERACY & ENERGY AWARENESS NETWORK

5

Educational Resources: Search the CLEAN Collection

Scientifically and pedagogically **reviewed** digital resources for teaching about climate science, climate change, and energy awareness

[Help](#)

Results 1 - 10 of 344 matches



[Paleoclimates and Pollen](#)

http://www.ucar.edu/learn/1_2_2_10t.htm

In this activity, students examine pictures of pollen grains representing several species that show the structural differences that scientists use for identification. Students analyze model soil ...



[Seasonal Change on Land and Water](#)

http://www.globe.gov/documents/356823/356868/earth_la_se...

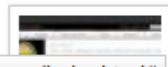
In this worksheet-based activity, students review global visualizations of incoming sunlight and surface temperature and discuss seasonal change. Students use the visualizations to support inquiry on ...



[How a Geothermal Power Plant Works](#)

http://www1.eere.energy.gov/geothermal/gpp_animation.html

This simplified animation of a geothermal power plant from the U.S. Department of Energy illustrates commonalities with traditional power-generating stations. While there are many types of geothermal ...



[Stabilization Wedges Game](#)

<http://cmi.princeton.edu/wedges/game.php>

This is a team-based activity that teaches students about the scale of the

Refine the Results ▾

Resource Type

- Activity [186 matches](#)
- Short Demonstration/Experiment [4 matches](#)
- Visualization [58 matches](#)
- Video [95 matches](#)
- Other [2 matches](#)

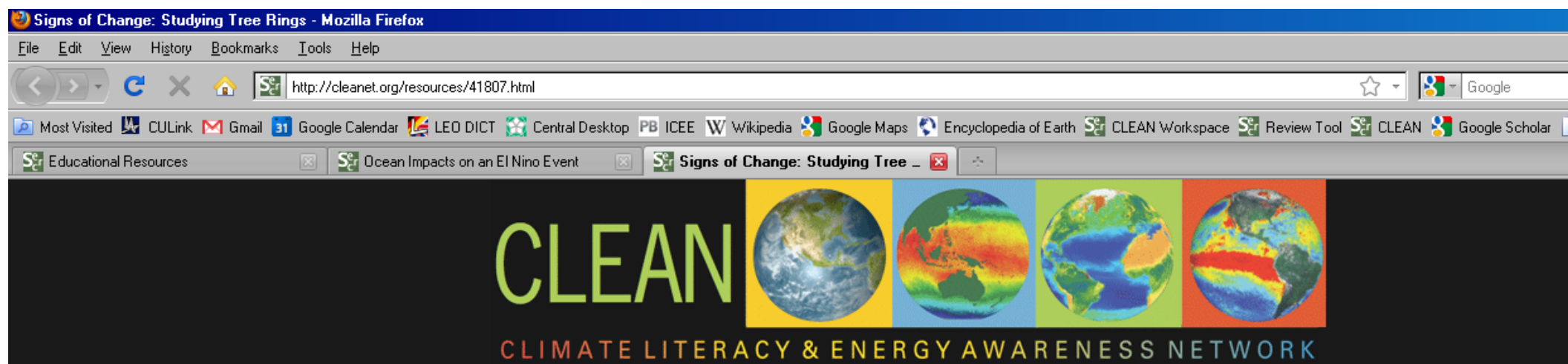
Climate and Energy Topics

- Climate System [135 matches](#)
- Causes of Climate Change [77 matches](#)
- Measuring and Modeling Climate [138 matches](#)
- Impacts of Climate Change [127 matches](#)
- Human Responses to Climate Change [60 matches](#)
- Nature of Climate Science [16 matches](#)
- Energy Use [95 matches](#)

Grade Level

- Intermediate (3-5) [13 matches](#)
- Middle (6-8) [243 matches](#)
- High School (9-12) [297 matches](#)
- College Lower (13-14) [171 matches](#)
- College Upper (15-16) [60 matches](#)
- Graduate/Professional [0 matches](#)

sources/index.html#



- CLEAN
- Teaching Climate & Energy
- Educational Resources**
- Community
- CLN
- About CLEAN

Signs of Change: Studying Tree Rings

http://www.climatechangenorth.ca/section-LP/LP_28_HI_M_nancy.html

Nancy Colberg, Northern Climate Change



In this hands-on activity, students will learn about dendrochronology (the study of tree rings to understand ecological conditions in the recent past) and come up with conclusions as to what possible climatic conditions might affect tree growth in their region. Students determine the average age of the trees in their schoolyard, investigate any years of poor growth, and draw conclusions about the reasons for the years of poor growth.

Activity takes about 2-3 hours. Tree disks or cores are needed and ideally one microscope.

[Learn more about Teaching Climate Literacy and Energy Awareness](#)

Notes From Our Reviewers The CLEAN collection is hand-picked and rigorously reviewed for scientific accuracy and classroom effectiveness. Read what our review team had to say about this resource below or learn more about how [CLEAN reviews teaching materials](#)
[Teaching Tips](#) | [Science](#) | [Pedagogy](#) | [Technical Details](#)

Teaching Tips

- If the suggested path of obtaining the tree samples is too complicated - go to a saw mill and ask them to cut tree disks or cut some of your own from a tree trunk.
- Educators should assign the extension on solutions to the students at the end of the lesson.
- If a coring borer is used - measure the diameter of the tree to determine how deep to core the tree.
- Obtaining local weather records for seasonal average rainfall and temperatures would provide a basis of

Topics

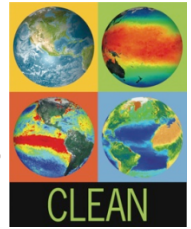
Proxy Data
See more on this topic.

Grade Level

Middle (6-8)
See more at this grade level.
High School (9-12)
See more at this grade level.

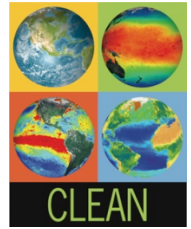
Activity can be modified to be used with high school students.

Reviewing online educational resources



- Online resources historically not subject to rigorous, formal, valid review
 - Additional considerations in review (e.g. multi-media elements, navigation, data access)
 - Additional dimensions (interactive learning, data manipulation etc.)
- Reviewers need wider methodological expertise than journal article reviewers

Existing educational review models



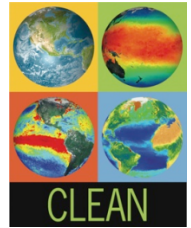
□ Review models

- Peer-review (Merlot, NASA product review, CLEAN)
- Editorial Board Review (NSDL-Pathways)
- Community review system (DLESE)
- User review (Merlot)

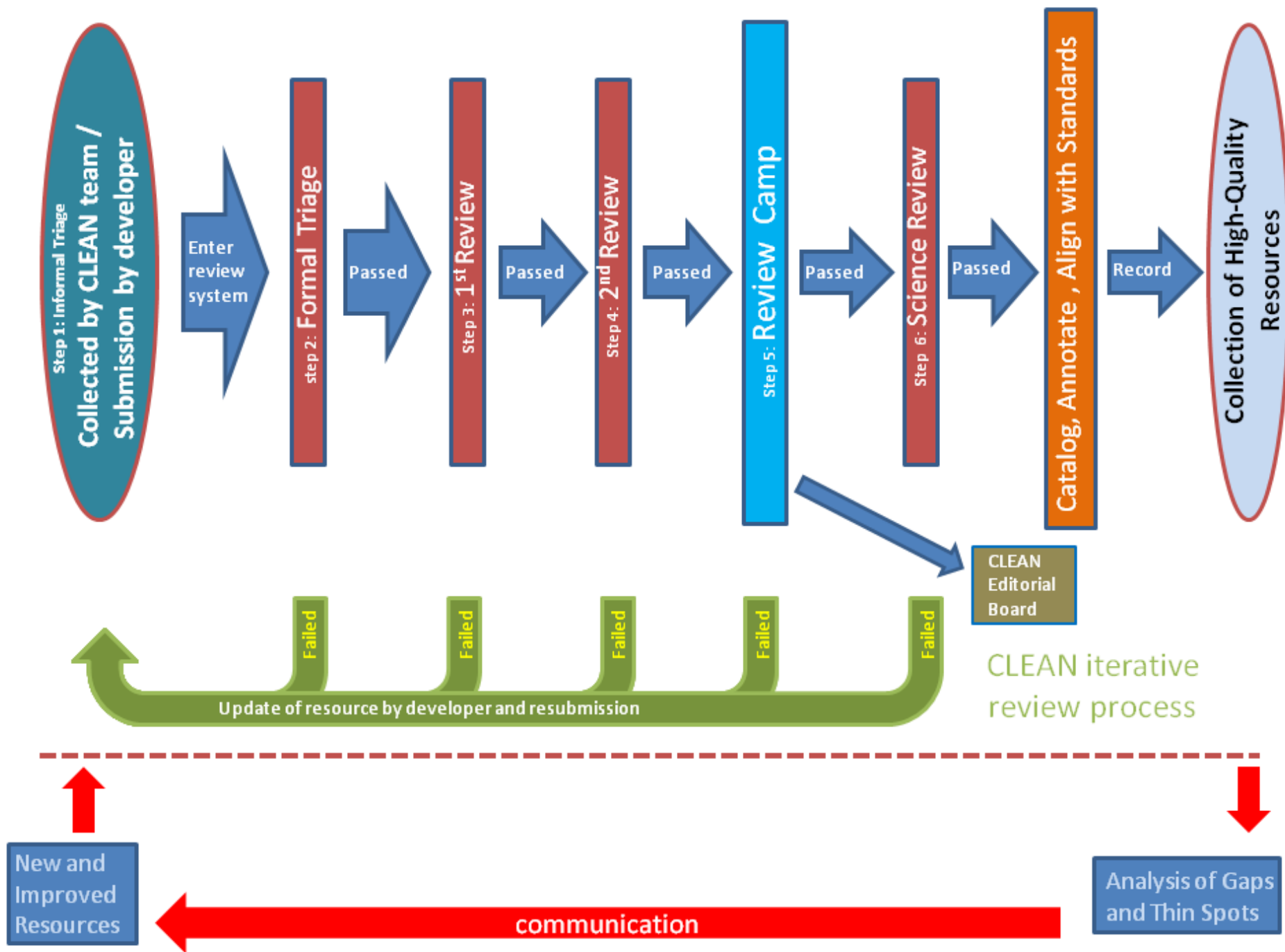
□ Issues

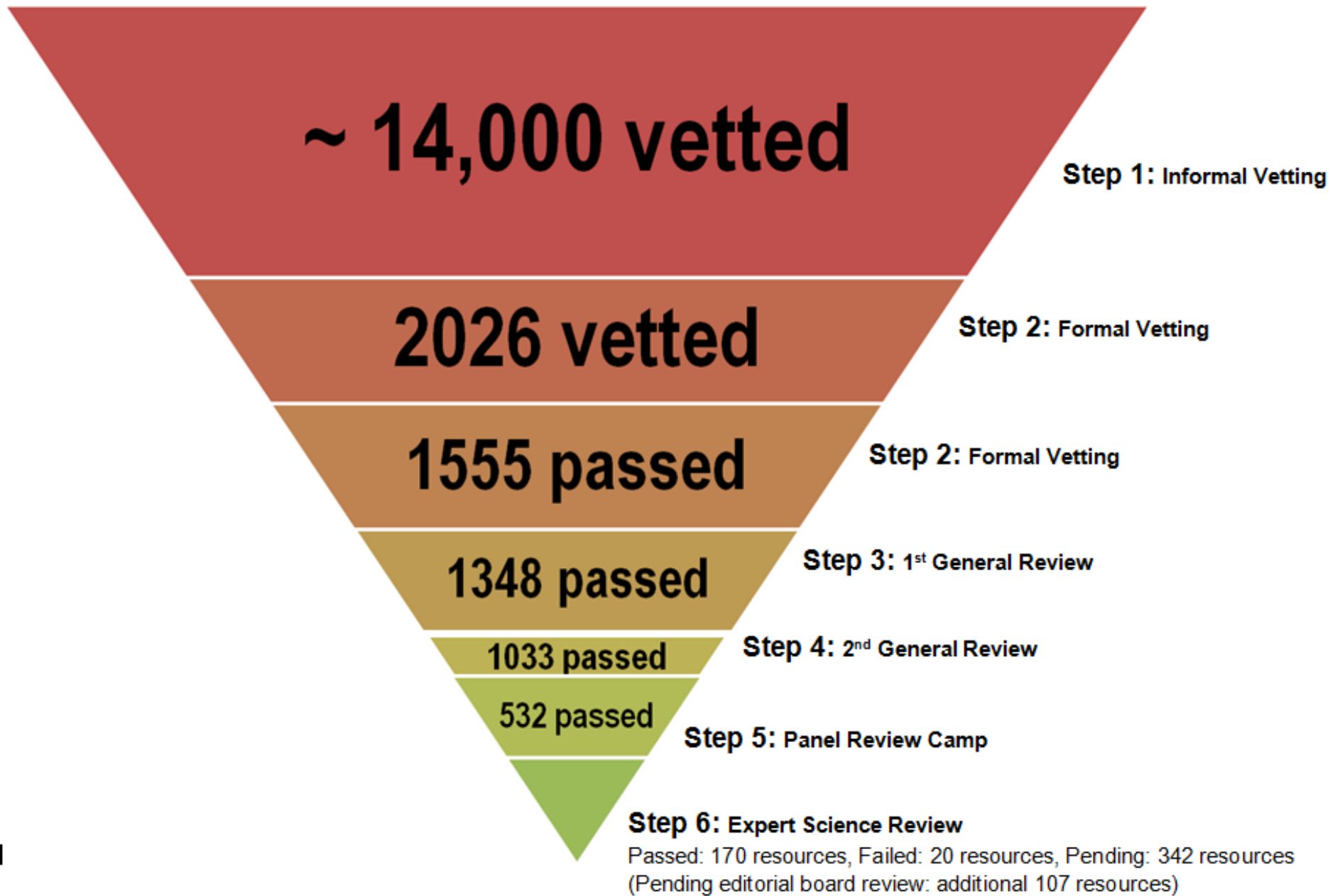
- Time-consuming
- Commitment by developer
- Scaling to large collection
- Many experts needed

What is an excellent resource?

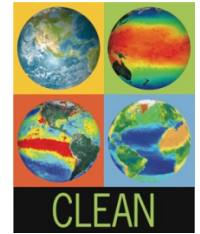


- Science
 - Addresses at least one of Climate or Energy Literacy Principles
 - Solid, current science
 - Original data cited, and from a quality source
- Pedagogy
 - Appropriate to target age group
 - Requires students to do independent/inquiry thinking, not just follow a recipe
 - Accommodates diverse learners (learning styles, language issues, cultural diversity)
- Ease of use
 - Engaging in subject and approach
 - Stands on its own – doesn't depend on related modules, lessons, etc.
 - Offers comprehensive guide to the resource for instructor (activities)
 - Uses software/tools/resources generally found in classroom or free to download
 - Digitally accessible resource



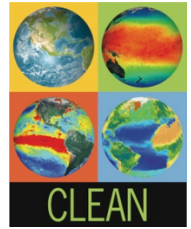


Collection Management



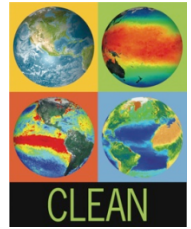
- Review Team – collects, reviews materials
- External Reviewers – recruiting and training for panel reviews (face-to-face, virtual)
- Science Reviewers – individual matching of expertise
- Cataloging Team – alignments, vocabulary, quality control
- Technical Team – website support
- Project Management Team

Developing Review Criteria



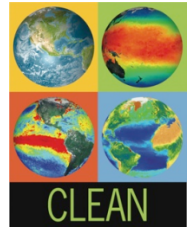
- Review criteria specific to resource type
- Test reviews: good agreement for good resources, wide spread in answers for low quality resources
- Informed by NSDL and SERC guidelines, Merlot criteria, DLESE, Climate Change collection scorecard
- Review of e-learning materials requires additional considerations (multi-media elements, navigation etc.)

Review 1-4: questionnaire



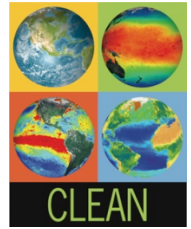
- Triage (collection scope, resource type)
- General Review
 - ▣ Scientific accuracy
 - ▣ Pedagogic effectiveness
 - ▣ Technical quality / Ease of use
 - 6-12 questions for each category, overall rating in rubric format, comment box for annotations
 - Questions help consider all relevant aspects > lead to overall rating
 - No quantitative, only qualitative recommendation (low – medium – high priority)

Review 5: Panel review



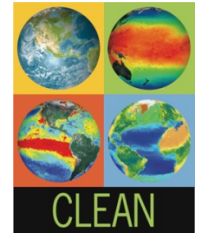
- Based on NSF-panel review system
- Panel: educators, scientists (necessary range of expertise)
- Teams of 4 review educational resource based on prior reviews, final decision about inclusion in collection
- Comments of reviewers are compiled into annotation including teaching tips
- Panels held face-to-face or virtually

Review 6: Expert Science Review



- External expert with PhD in relevant field reviews scientific quality and accuracy of resource
- Use Customer Relations Management techniques to make expert review efficient
- Challenges
 - Grade-level appropriate science
 - Recruiting scientists
- Results: August 2013
 - 21 total
 - 9 excellent/5 sound/4 needs clarification/3 fails

Avenues into Collection



- Online search by CLEAN reviewer
- Targeted after gap analysis
- Suggestion through public form
- Submission by developer (iterative review, partners)



CLEAN Collection: Call for Teaching Materials

The CLEAN collection will be a broad collection of educational activities and resources that will help students, teachers and improve their understanding of climate science and energy issues. Each resource in the collection will be linked to a specific climate and energy literacy.

We are seeking nominations of materials to be included in the collection. We welcome submissions that:

- are directly focused on one of the [essential principles of climate literacy and the fundamental concepts](#) (open window)
- will help someone learn specifically about that principle.
- are educational activities or interactive tools, visualizations, maps or datasets that can be directly used to create classroom, lab or field activities.

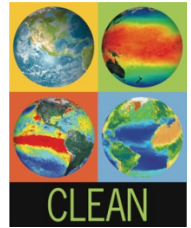
Note that general websites addressing many aspects of climate or energy science are not as useful as specific pages gear focused topic.

Some [example activities](#) (opens in a new window) are provided to provide an idea of the types of materials we are looking suggest a resource, please fill out the fields below. Each submission will be reviewed by a panel as the collection is assembled.

Your name

Institution or affiliation

Gap & Thin Spot Analysis



- Defined collection scope (Literacy principles, vocabularies) allow gap analysis
- Informs resource collector team as well as resource developers

Climate Literacy: The Essential Principles of Climate Science (USGCRP, 2009)	
Gap and Thin Spot Analysis of the CLEAN Collection of Educational Resources	
Essential Principle 5 (EP5) <i>Our understanding of the climate system is improved through observations, theoretical studies and modeling.</i>	
EP 5A Earth's climate system is subject to physical laws of the universe.	Activities: ★★★★★ (4) (2) (2) (2) Videos: (0) Visualizations: (0) Demos/Experiments: ● (1) (1) (1) (1) Total: ★★★★★ (5) (3) (3) (3)
EP 5B Observations are key to understanding climate.	Activities: ★★★★★ (49) (27) (40) (19) Videos: ★★★★★ (13) (10) (13) (20) Visualizations: (1) (0) (1) (0) Demos/Experiments: (2) Total: ★★★★★ (63) (37) (53) (39)
EP 5C Observations, experiments, and theory refine computer models.	Activities: ★★★★★ (12) (8) (9) (9) Videos: ★★★ (3) (0) (3) (3) Visualizations: ★★★★★ (6) (4) (6) (6) Demos/Experiments: (0) Total: ★★★★★ (18) (8) (18) (18)
EP 5D Our understandings of climate and weather differ.	Activities: ● (1) (0) (1) (1) Videos: ● (1) (0) (1) (1) Visualizations: (0) Demos/Experiments: (0) Total: ●● (2) (0) (2) (2)
EP 5E Climate change projections help	Activities: (0) Videos: ● (1) (0) (1) (1) Visualizations: ●● (2) (2) (2) (2)

Number of Resources in CLEAN Collection

- (R) Total Number of Resources
- (R) Middle School Some resources are relevant to multiple grade levels, therefore the total (R) is less than sum of (MS), (HS), (C).
- (R) High School
- (R) College

CLEAN Pathway Review

This is the review pool for the CLEAN project. Items enter the review pool through either the

- [Public Submission Page](#) or
- [Resource Collector Submission Page](#)

[Help](#)

Sort by: Best Match Descending

Results 1 - 10 of **2163 matches**

[csv dump of these records](#)

 go to Catalog

7	View Edit http://www.climate.gov/						
	1 Submitted by a Resource Collector	2 Chris Comer	3 Holding-Too Large (course, curricula)	4 Unreviewed	5 Not Screened or Assigned	6 Unreviewed	7 Not Reviewed by Scientist
	8 No Annotations	9 Unassigned	10 Not Yet Reviewed	11 Uncataloged	12 Not Accepted	13 Developer not contacted	14 No Editorial Review Needed
8	View Edit http://serc.carleton.edu/eet/globe/index.html Using GLOBE Data to Study the Earth System						
	1 Submitted by a Resource Collector	2 Marian Grogan	3 Highly Recommended for Review	4 High Priority	5 Accepted: Second Round Reviewers Assigned	6 Medium Priority	7 Not Reviewed by Scientist
	8 Initial Annotations Complete	9 Unassigned	10 Requires Further Review by Editorial Team: Annotations Complete	11 Cataloging Complete - Expert Science Review Pending	12 Not Accepted	13 Developer not contacted	14 Passed into Collection
10	View Edit http://serc.carleton.edu/eet/envisioningclimatechange/index.html Envisioning Climate Change Using a Global Climate Model						
	1 Submitted by a Resource Collector	2 Marian Grogan	3 Highly Recommended for Review	4 High Priority	5 Accepted: Second Round Reviewers Assigned	6 High Priority	7 Passed Scientist Review as Excellent
	8 Initial Annotations Complete	9 Unassigned	10 Passed Review: Annotations Complete	11 Cataloging Complete	12 Accepted	13 Developer contacted: waiting for response	14 No Editorial Review Needed

Refine the Results ↴

Review Cycle	
Round 1 Review (early 2010)	282 matches
Round 2 Review (late 2010)	521 matches
Round 3 Review (spring 2011)	657 matches
Round 4 Review (late 2011)	333 matches
Round 5 Review (summer 2012)	209 matches
Round 6 Review (fall 2012)	12 matches
Not Part of Review Cycle	212 matches

Assigned Collector	
Unassigned	21 matches
Britt Aragow	34 matches
Monica Bruckner	67 matches
Scott Carley	374 matches
Chris Comer	61 matches
Candace Dunlap	173 matches
Anne Gold	315 matches
Marian Grogan	111 matches
Cynthia Howell	3 matches
Rebecca Katsh Singer	91 matches
Karin Kirk	30 matches
Jeffery Lockwood	453 matches
Cheryl Manning	36 matches
Mark McCaffrey	53 matches
Kristin Record	192 matches
Richard Shin	18 matches
Beth Simmons	140 matches

Initial Vetting	
Highly Recommended for Review	810 matches
Recommended for Review	745 matches
Holding	258 matches

CLEAN Pathway Review

[All Review Items](#) > http://youngvoicesonclimatechange.com/movie_plant-for-the-planet.php

Plant for the Planet

1866 http://youngvoicesonclimatechange.com/movie_plant-for-the-planet.php [view in new window](#) [view catalog record](#)

► [Edit URL/Title](#)

Step 1: **Item Added to Review Pool**

[Submitted by a Resource Collector](#)

Step 2: **Assign to Resource Collector**

[Beth Simmons](#)

Step 3: **Initial Vetting by Resource Collector**

[Recommended for Review](#)

Step 4: **Initial RC Review**

[High Priority](#)

Step 5: **Accept for Camp and Assign Secondary Reviewers**

[Accepted: Second Round Reviewers Assigned](#)

Step 6: **Second Round Review**

[Medium Priority](#)

Step 7: **Science Review**

[Not Reviewed by Scientist](#)

Step 8: **Annotation**

[Initial Annotations Complete](#)

Vocabs

Resource Type:

Audio/Visual: Animations/Video

▼ Hide

- Activities
 - Problem Set
 - Classroom Activity
 - Short Activity
 - Socratic Questioning
 - ConcepTests
 - Think-Pair-Share
 - Demonstration
 - Clicker Question
 - Jigsaw
 - Gallery Walk
 - Studio Teaching
 - Just in Time Teaching
 - Process Oriented Guided Inquiry
 - Lab Activity
 - Project
 - Investigative Case Studies
 - Independent Research
 - Service Learning
 - Field Activity
 - Field trip



[Search All](#) View in New Window: [This URL](#) -- [Public View of this Record](#) -- [This Record as Plain Text](#) -- [Cataloging Help](#)

Plant for the Planet

http://youngvoicesonclimatechange.com/movie_plant-for-the-planet.php

[edit url](#)

[Jump to Different Master Id](#) [Previous](#) [Next](#)

[Save All Changes >](#)

Title

Plant for the Planet

Description

This video describes the foundation Plant for the Planet, a foundation created by a 9-year-old German boy, Felix. This foundation has planted more than 500,000 trees in Germany, which he says help sequester carbon and reduce greenhouse gas emissions. The student rallies, first his community and then other children, to plant millions of trees to offset our energy-use emissions.

Short_description

Keywords

Comma separated list of terms and phrases

Annotations

About Record 43160

This record is derived (at least in part) from external catalog sources.

State:

[more info](#)

Sharable:

[more info](#)

Locally Reviewed/QA'd:

[more info](#)

Unvetted External:

[more info](#)

Record Needs Work:

[more info](#)

Last Editor: Sarah Hill

Last Edit Date: 2012-09-06 13:22:20

Date Created: 2012-01-05 15:22:49

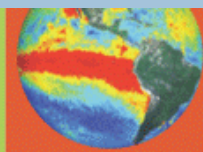
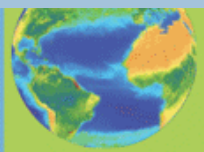
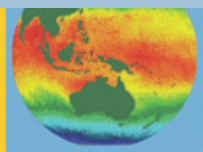
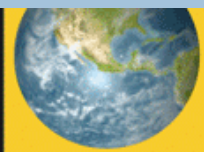
Project Responsible:

Catalogers' Notes

Imported from review system, review item 1866 January 5, 2012, 3:22 pm.

Master Catalog Id: 43160 -- Internal Catalog Id: 21584

CLEAN



CLIMATE LITERACY & ENERGY AWARENESS NETWORK

Plant for the Planet

http://youngvoicesonclimatechange.com/movie_plant-for-the-planet.php

Young Voices on Climate Change



This video describes the foundation Plant for the Planet, a foundation created by a 9-year-old German boy, Felix. This foundation has planted more than 500,000 trees in Germany, which he says help sequester carbon and reduce greenhouse gas emissions. The student rallies, first his community and then other children, to plant millions of trees to offset our energy-use emissions.

Video length 5:38 min.

[Discuss this Resource»](#)

[Learn more about Teaching Climate Literacy and Energy Awareness»](#)

Notes From Our Reviewers

The CLEAN collection is hand-picked and rigorously reviewed for scientific accuracy and classroom effectiveness. Read what our review team had to say about this resource below or learn more about how

[CLEAN reviews teaching materials](#)

[Teaching Tips](#) | [Science](#) | [Pedagogy](#) | [Technical Details](#)

Teaching Tips

- Plant for the Planet program could be used within a classroom to inspire students to make changes by witnessing what other students are doing around the world. Oftentimes individuals don't know what to do to help make a difference.
- Teachers could utilize this video in a motivational context or as an example of ways in which individuals can make a difference in organizing community projects.

About the Science

- Through this video, students can witness other students making a difference and actively addressing climate issues. Planting trees may or may not be an effective carbon sequestration strategy – science seems to be changing on this.

Topics

Sources and Sinks

See more on this topic.

Mitigation Strategies

See more on this topic.

Personal Responsibility

See more on this topic.

Human Responses to Climate Change

See more on this topic.

Energy Use

See more on this topic.

Grade Level

Middle (6–8)

See more at this grade level.

High School (9–12)

See more at this grade level.

Partnering with CLEAN: Long Term Ecological Research (LTER)



Search

ABOUT

RESOURCES

CONTACTS

PARTICIPATING LTER SITES

SUGGEST A RESOURCE

You are here: [Home](#)

Grade: keyword: Topics:

Resource Image

Time Required

The Web of Inquiry

Description: This investigation has students studying the animal behavior, ecology and evolution of the black widow spider (*Latrodectus hesperus*). Students research addresses the impact of altered factors that might be found in urbanized areas on black widows, relative to undisturbed desert populations. Students are given the chance to research the organisms' natural history, identify adaptations and understand the behavioral repertoire. Exercise can be adapted to other arthropods....

4 50-minute class periods at least

Now you Sea Ice Now you Don't: Investigating Penguin Communities Shifting on the Western Antarctic Peninsula

Description: In this activity students are placed into base groups to investigate the effects of climate change on penguin populations from five specialized perspectives. Individuals from each base group reorganize into five specialist groups that each contain one type of scientist. Each specialist group receives a data sheet which supplies them with only a few facts to guide their research. This data is analyzed by the students who create data tables brainstorm explanations

3.5 hours or 5 45-minute class periods

User login

Username:

Password:

[Request new password](#)

Different goals



- LTER (\$12K)
 - Goal: LTER Community Collection, some CLEAN resources
 - Inputs: Lots of resources, 21 through CLEAN camp, 12 in CLEAN
 - Limits: Resources not built for classroom, scope
- Department of Energy (\$38K)
 - Goal: CLEAN resources
 - Inputs: Hundreds of energy resources, DOE reviewers, energy literacy community
 - Outputs: ~ 80-90 new CLEAN resources

Next steps for MRSEC?



- Scope statement
- Pools of resources
- Collaborative funding, like LTER?
- Reviewers for camp
- Contacts for iteration

Questions?

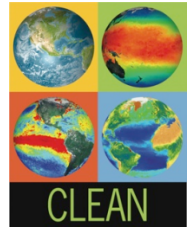


Contact



- Susan Buhr Sullivan, susan.buhr@Colorado.edu,
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Summary



- Collection supports educators (search options, alignments, annotations)
- Rigorous and transparent review process
- Ensures reliable and high-quality resources
- Framework of Climate and Energy Literacy Principles allow for collection gap analysis

CLEAN - Mozilla Firefox

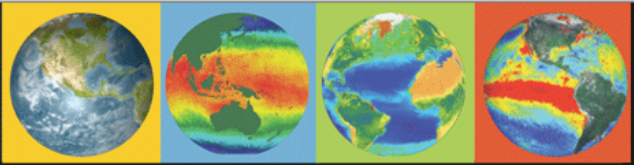
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CLIMATE LITERACY & ENERGY AWARENESS NETWORK

Welcome to the Climate Literacy and Energy Awareness Network Pathway. The portal provides a reviewed collection of resources that can help educators, students, and citizens increase their understanding of climate and energy science, coupled with the tools to enable an online community to share and discuss these issues to enable responsible decision making about our environment.

Teaching Climate Literacy and Energy Awareness


How do we develop climate literacy and energy awareness in our students? Here you can find more information about the science behind each essential principle, and a discussion of strategies for bringing together lessons to create deep understanding of the principle.

Browse the Reviewed Educational Resources

This hand-picked collection of teaching activities is appropriate for grades 6-12 as well as undergraduate classrooms. Learn more about [how we select materials](#).

Join the CLEAN Community

Meet your colleagues, find an overview of discussion taking place across the site, comment on an activity, become a reviewer, join the clean-ed announcement email list. You can also learn more about [The Climate Literacy Network](#) where scientists, policymakers, educators, and the public are working together to improve climate literacy in the United States and around the world.



Featured Resource: Graphing the Extent of Sea Ice in the Arctic and Antarctic

This activity from Windows to the Universe focuses on measuring sea ice extent in both the Arctic and Antarctic, starting by forming a hypothesis on the variability of sea ice, testing the hypothesis by graphing real data, and finishing with a discussion of results and predictions. [Discuss this activity](#).

About this Project

Learn more about the project, including [information about our review process](#).

Call for Teaching Materials

Know of an excellent activity that address the principles of climate literacy? Please let us know.

Done

CLEAN collection: www.cleanet.org