



Climate Across Curriculum: An Effort to Increase Climate Literacy Beyond STEM Disciplines

Julia Herzfeld¹, Bosiljka Glumac², Graeham Dodd³

Smith College, Northampton, Massachusetts 01063

¹Department of Sociology; jherzfeld@smith.edu

²Department of Geosciences; bglumac@smith.edu

³Campus School of Smith College; gdodd@smith.edu

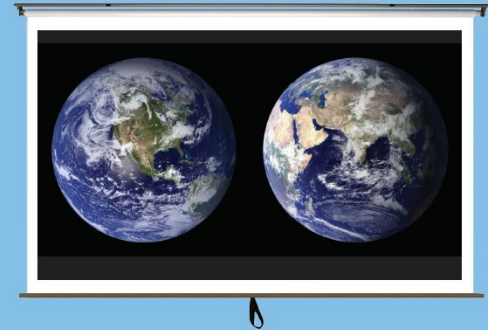
Objectives

- Discuss progress on a K-12 climate literacy project conducted in 2019/20 as part of Smith College's Year on Climate Change initiative
- Encourage K-12 teachers to incorporate ideas about climate beyond STEM subjects by creating and disseminating an open-access guide

Paleontological Research Institution, 2017
www.priweb.org

The **Teacher-Friendly** Guide™

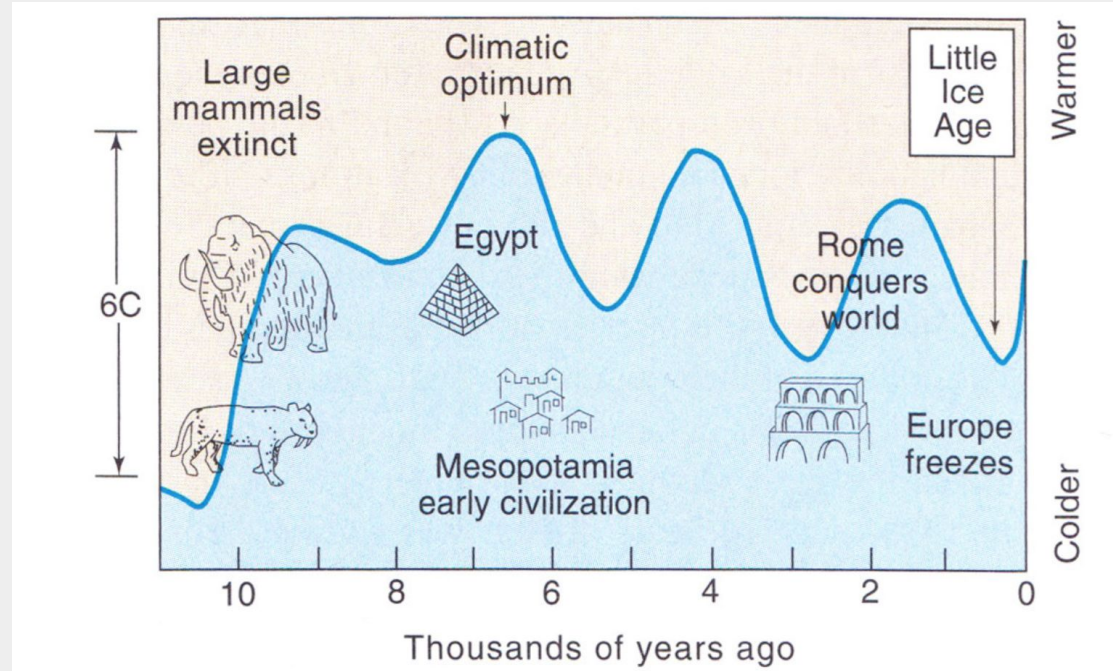
to Climate Change



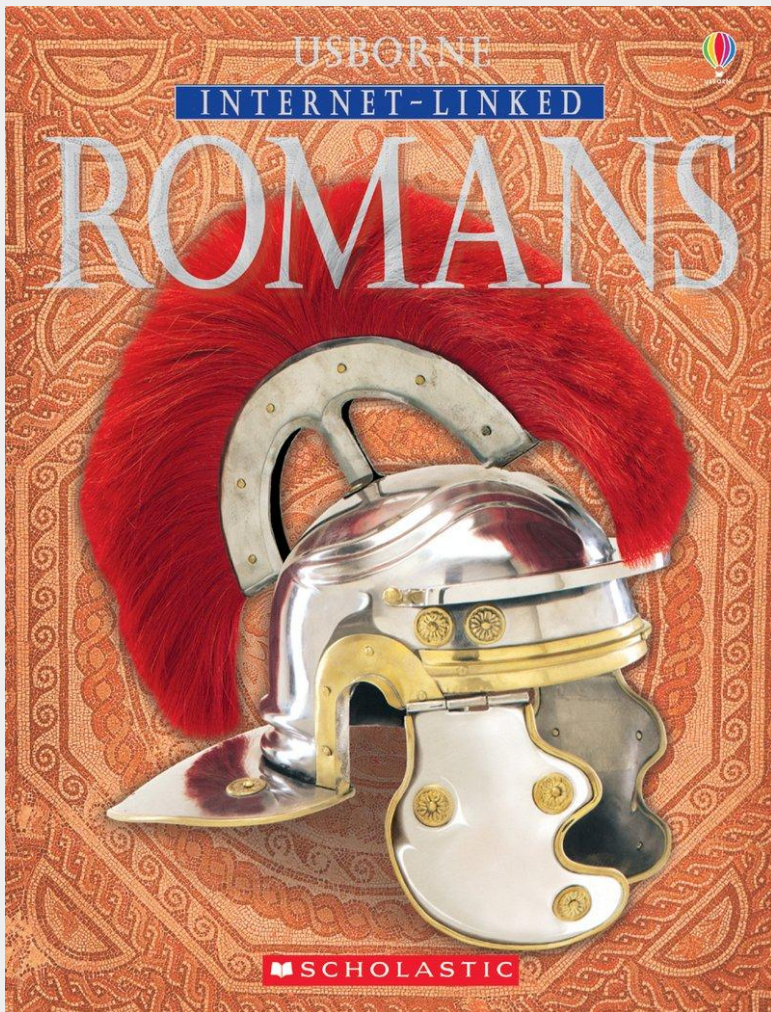
Edited by Ingrid H. H. Zabel, Don Duggan-Haas, & Robert M. Ross

Inspiration for the Project

- Smith College course GEO 106 Extraordinary Events in the History of Earth, Life and Climate



“Climate in Earth History” from
Prothero and Dott, 2010, *Evolution of the Earth*



Interviewing Teachers

- Have you ever heard that climate change played a role in the rise and fall of the western Roman Empire?
- Would you be interested in incorporating these ideas about climate change into your teaching and curriculum about the western Roman Empire?
- How important do you see this information and its inclusion in school curricula for fostering and developing climate change literacy?

Project Planning and Progress: Call for Participants

“Information about climate change is commonly taught only in natural and environmental science classes in K-12 curricula. This project explores relationships between climate and human history and culture so that this information could also be included in history, social studies, literature, art, music, language and other classes.

Student researchers are needed to browse through schools’ curricular plans and standards in search of topics that may have relationships to climate information. Each student will choose one or more topics of their own interest and relate it to published information on climate. For each topic, a student researcher will prepare a short, bulleted list explaining how their topic is related to climate, together with links to credible resources for any additional, more detailed information. Student researchers will then work with teachers in local schools to create questions and activities to use in the classroom.”



Project Document DRAFT

Table of Contents: [we will be adding numerous examples here based on climate literature and teaching standards]

History/Social Science

[Climate in Human History](#) (in general and as an example)

Evolution, diversification, and migration of hominids out of East Africa

[Migration of humans into North America](#)

[The first great civilizations of Egypt, Mesopotamia and the Indus Valley](#)

[History of the Anasazi People in American Southwest](#)

The rise of highly complex, centralized governments (e.g., the Egyptian pharaohs and Babylonian kings)

Ancient Egypt:

[Megadrought and Collapse in Old Kingdom Egypt and Akkadian Empire](#)

Rise and fall of the Maya Empire

Collapse of the Mycenaean culture in Greece and the Hittite empire in Turkey

The rise and collapse of civilizations in Northern Africa

End of the Bronze Age in Europe

Hannibal's crossing the Alps

[Rise and Fall of the Western Roman Empire](#)

Establishment and abandonment of Viking settlements in Greenland and Labrador

Development of modern agriculture

[Black Death in Europe](#)

Abandonment of the Mughul city Fatehpur Sikri in India

[Potato Blight in Ireland](#)

Droughts in Africa, India, and Russia in the early 1970s

Political conflicts in Northern Ireland

Topic n

2018 HISTORY AND SOCIAL SCIENCE FRAMEWORK

Grades Pre-Kindergarten to 12

*Massachusetts
Curriculum
Framework –
2018*



www.doe.mass.edu/frameworks

DRAFT Entry Examples

Migration of humans into North America

[Return to Table of Contents](#)

How is this topic related to climate:

- The presence of a land bridge between Siberia and Alaska allowed migration of humans from Asia into North America at the end of the last Ice Age (about 12,000 to 10,000 years ago) when sea level was lower than today because of a large amount of water frozen into thick ice sheets or glaciers. When glaciers melted and sea level rose to its present-day position, the land bridge was flooded and became the Bering Strait.

Ideas for incorporation in teaching:

Examine Geography of the Americas figure from p. 187 in the World History textbook by Ellis and Esler 2014 (below; **better copy and permission to use needed**).

How and why was geography of the northern hemisphere about 18,000 years ago different from today? How may have this allowed people to migrate from Asia into North America?



Megadrought and Collapse in Old Kingdom Egypt and Akkadian Empire

How is this topic related to climate:

- C. 2200-1900 BCE: global abrupt climate change caused synchronous megadrought (a drought lasting over 10 years) across the Mediterranean, West Asia, the Indus, and northeast Africa
 - Caused by the direction and intensity of the cyclonic North Atlantic westerlies controlled by North Atlantic Oscillation, which also caused disruption and weakening of the Indian Monsoon and diminished northeast African precipitation
- Precipitation decreased 30-50%, temperatures dropped slightly
- The megadrought completely dessicated the dry-farming agricultural regions of the Mediterranean (especially the extensive dry-farming regions on the northern Akkadian Empire). It also reduced the flow of the Nile, Tigris and Euphrates rivers, causing irrigation agriculture yields to decrease sharply. Food shortages were extreme, and migration from the north to the southern irrigation-farming areas of the Akkadian Empire occurred.
- The beginning of the megadrought coincided with the collapse of Old Kingdom Egypt and the beginning of the First Intermediate Period; though not entirely responsible for the collapse, decreased agricultural yield certainly played a large role in the instability of this period.
- The megadrought is also thought to have been the primary cause of the relatively sudden collapse of the Akkadian Empire. Famine led to massive instability within the empire as northern populations moved south (the northern dry-farming regions remained uninhabited for 250 years, at the end of the megadrought), and is likely to have caused the Gutian invasion.
 - Three major building projects during this time were abandoned mid-construction, including Naram-Sin's fortress at Tell Brak
- Evidence for the presence of megadrought came from radiocarbon-dated lake-bed sediments (primarily), as well as tree-ring and speleothem data

Ideas for incorporation in teaching:

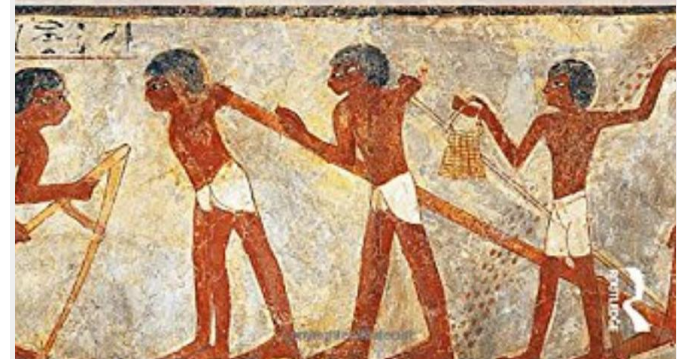
List of Resources:



Ancient Near Eastern History and Culture

THIRD EDITION

William H. Stiebing Jr. | Susan N. Helft



Routledge, 2017

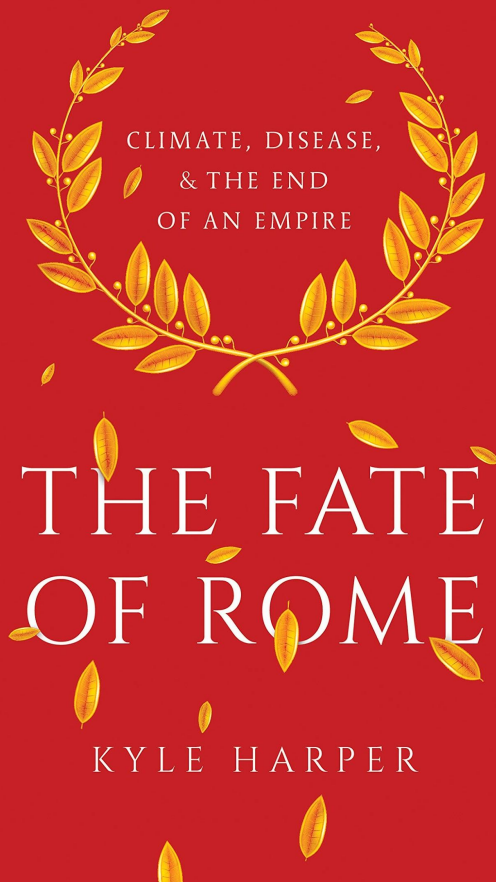
Rise and Fall of the Western Roman Empire

How is this topic related to climate:

- During the foundation of the Roman Empire, the weather was warm, wet, and stable, which was conducive to the growth of an agrarian society.
- Then, between ~200-600 C.E., this period of climate stability ended, leading to a period of climate variability that caused crisis and instability within the Roman Empire (spread of disease, dry weather caused agrarian issues, etc.), which coincided with and exacerbated political turmoil, cultural change, and socioeconomic instability, as well as the invasion of Persian and Germanic peoples during the Migration Period.
- These migrations were also triggered in part by climate change: in Northern Europe, Alpine passes melted during the end of the warm period in the early C.E., and the later climate variability created even less ideal temperatures and conditions in Northern Europe, so Germanic peoples migrated to the relative warmth of Mediterranean Europe. They were able to do so because of the newly created Alpine passes.
- Disease and climate were also connected: all three major pandemics faced by the Roman Empire occurred during times of climate instability and were facilitated by Roman connectivity and trade. Furthermore, Roman manipulation of the land around them (moving rivers, slashing and burning forests, draining basins, etc.) exposed unfamiliar parasites and triggered ecological change.

Ideas for incorporation in teaching:

List of Resources:

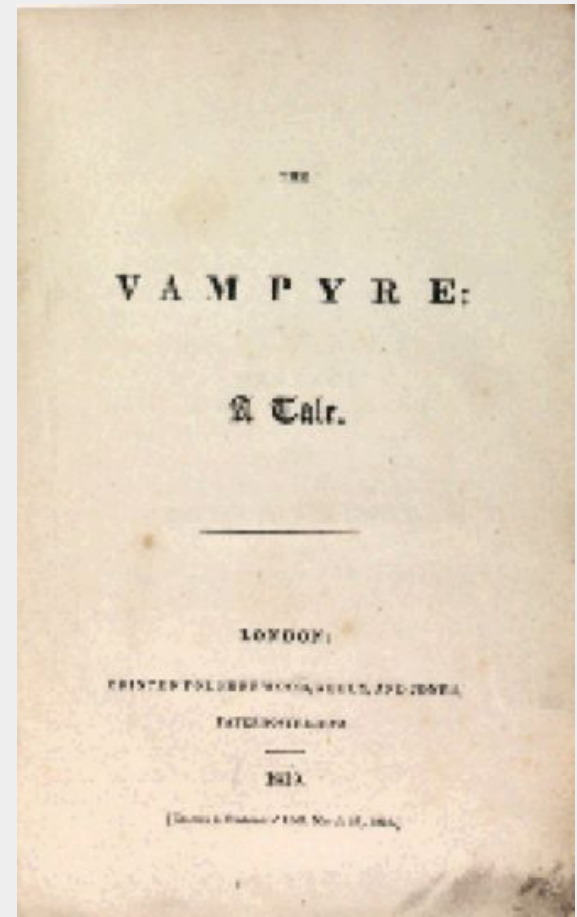


Princeton University Press, 2017

Literature Examples



“Frankenstein” by Mary Shelley



“The Vampire” by John William Polidori

Art Examples



Winter Landscape, 1601,
by Peter Brueghel the Younger



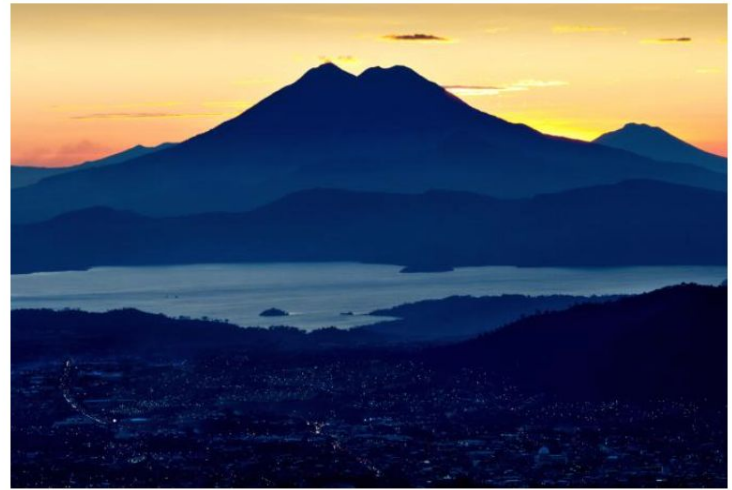
George Washington Crossing the Delaware, 1851,
by Emanuel Gottlieb Leutze

Additional examples needed for music, languages, etc.

Going Forward

- Keep compiling the document draft

www.nationalgeographic.com/science Aug. 2019;
Dull et al., 2019, Quaternary Science Reviews



The placid Lake Ilopango is the caldera of the Ilopango volcanic complex, which in 539 or 540 A.D. produced one of the largest volcanic eruptions in the last 7,000 years. The lake was also present then; as lava boiled the water into steam, the eruption became even more explosive.

PHOTOGRAPH BY JON ARNOLD IMAGES LTD, ALAMY STOCK PHOTO

| SCIENCE & INNOVATION |

Colossal volcano behind 'mystery' global cooling finally found

The eruption devastated local Maya settlements and caused crop failures around the world.

BY MICHAEL GRESHKO



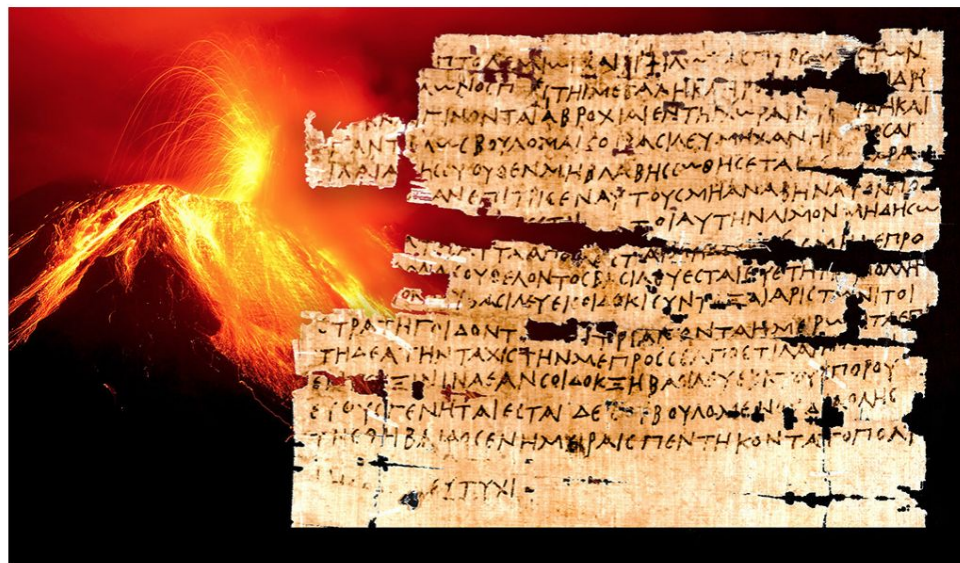
PUBLISHED AUGUST 23, 2019

Going Forward

- Keep compiling the document draft
- Consult with experts

Joseph Manning wins major NSF grant to study climate change, human history link

By Bess Connolly | SEPTEMBER 24, 2018



(© Department of Papyrology, Institute of Archaeology, University of Warsaw)

Going Forward

- Keep compiling the document draft
- Consult with experts
- Work with Campus School of Smith College and other area schools to test topics and integrate teaching strategies

Campus School
of SMITH COLLEGE



Going Forward

- Keep compiling the document draft
- Consult with experts
- Work with Campus School of Smith College and other area schools to test topics and integrate teaching strategies
- Disseminate the open access document

Campus School
of SMITH COLLEGE



Northampton Public Schools

Ideas for Document Dissemination

- Professional Conferences

AGU Fall Meeting



ED014: Climate Literacy Effort Showcase

<https://agu.confex.com/agu/fm19/prelim.cgi/Session/78569>

ED015: Climate Literacy: Bringing climate change science curriculum, pedagogy, and research to K-12 educators, preservice teachers, and students.

<https://agu.confex.com/agu/fm19/prelim.cgi/Session/82100>

ED016: Climate Literacy: Informal education, youth initiatives, community impact work, and reaching broad audiences

<https://agu.confex.com/agu/fm19/meetingapp.cgi/Session/78516>

ED017: Climate Literacy: Inspiring student and public action through effective science/arts/sustainability engagement

<https://agu.confex.com/agu/fm19/prelim.cgi/Session/82593>

- Conferences and Workshops for Teachers



CLIMATE GENERATION
A WILL STEGER LEGACY

www.climategen.org

Who We Are ▾ | Our Core Programs ▾ | Take Action ▾ | Engage with Us ▾

Humanities Content for Your Classroom

Check out our [Summer Institute for Climate Change Education](#), a 3-day conference to gain the tools and skills to teach climate change!

Climate Change Education has historically been tied to the STEM (Science, Technology, Engineering, and Math) disciplines, but, climate change is an issue that impacts political, social, and economic dimensions and can be used as an integrating context for all subjects. [Read our Humanities Statement from our Education Program.](#)

Explore our free resources for incorporating climate change into your humanities classroom!

[DOWNLOAD HUMANITIES RESOURCES](#)

Humanities Content for Your Classroom

- Humanities Overview
- Water Scarcity and Perseverance: A Humanities Module
- Innovation and Renewable Energy: A Humanities Module
- Climate Fiction and Other Important Readings to Support Climate Change Education
- Download Resources
- #TeachClimate Network
- Curriculum Suite

- Educational Organizations



Massachusetts Council for the Social Studies
Non-Profit Educational Organization Supporting Social Studies Educators

LOG IN CONTACT     

[WHY JOIN?](#) [JOIN NOW](#)

Search this website ... [Search](#)

Home About ▾ Advocacy Resources ▾ Newsletters Conferences ▾ Calendar ▾ Prof. Development ▾ News Get Involved ▾

[WHY JOIN MCSS](#) [JOIN NOW ▾](#) [LOGIN / MY ACCOUNT](#) [SUBMIT YOUR PICK](#) [MEMBER BLOGS & ARTICLES](#) [MCSS AWARDS](#) [CONTACT](#)

www.masscouncil.org



Emerging America
Emerging America
Collaborative for Educational Services
97 Hawley Street
Northampton, MA 01060

LIBRARY OF CONGRESS
TEACHING WITH PRIMARY SOURCES
Consortium Member

Content created and featured in partnership with the
TPS program does not indicate an endorsement by the
Library of Congress.

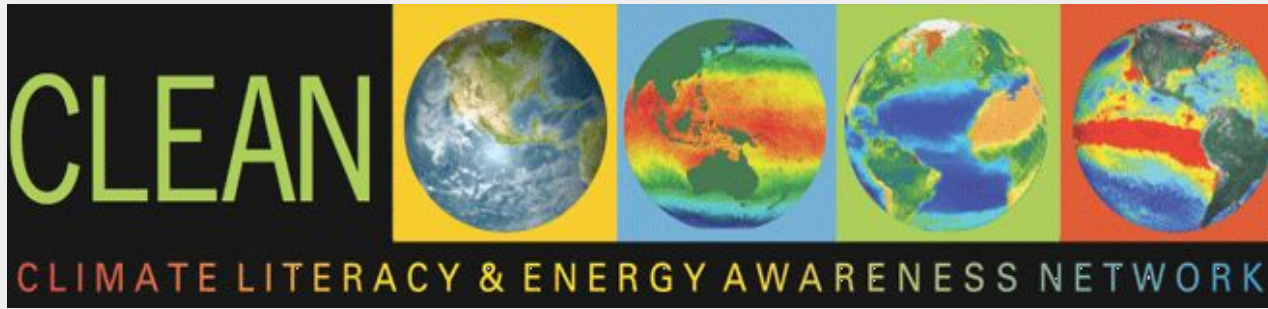


collaborative.org
Collaborative for Educational Services

Everyone is a learner!

www.emergingamerica.org

- Climate Education Networks



www.cleanet.org

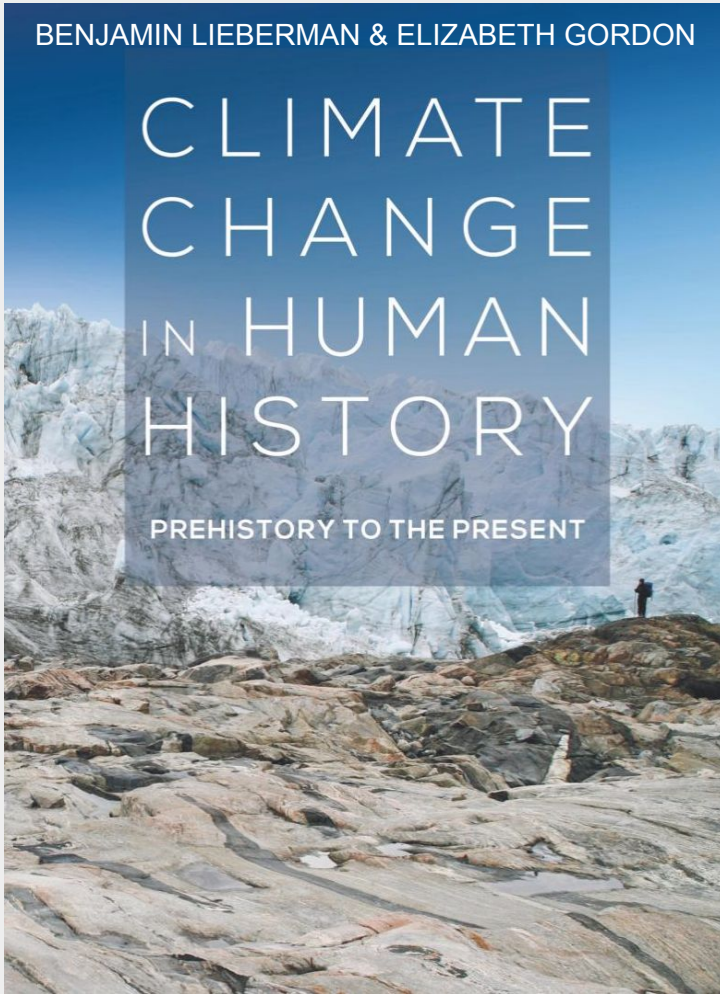


www.climateecos.org

BENJAMIN LIEBERMAN & ELIZABETH GORDON

CLIMATE CHANGE IN HUMAN HISTORY

PREHISTORY TO THE PRESENT



Bloomsbury Academic, 2018

Conclusions

- Incorporating information about climate change beyond STEM subjects in K-12 curricula could greatly improve overall climate literacy and increase general understanding of the impact of climate on human societies
- Such approach is vital for providing comprehensive climate education for the next generation

Acknowledgements

- Ms. Tiphareth Ananda (Campus School of Smith College, 4th grade supervising teacher)
- Ms. Tracy Dawson-Greene (Northampton JFK Middle School, 7th grade social studies teacher)
- Mr. Rich Cairn (Program Director, Emerging America)
- Smith College Education Department, particularly Prof. Al Rudnitsky
- Don Duggan-Haas (Director of Teacher Programming, The Paleontological Research Institution)
- Center for the Environment, Ecological Design and Sustainability (CEEDS), Smith College
- Smith College Geoscience Department
- Smith College student volunteers
- Prof. Joseph Manning (Professor of Classics & History, Yale University)
- Prof. Lewis Dartnell (Department of Life Sciences, University of Westminster, London)

