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Sustainable Filmmaking: Understanding Image as Resource

Graig Uhlin
Oklahoma State University, graig.uhlin@okstate.edu

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Overview and Rationale

The term Anthropocene designates a new geological era and recognizes the substantial effects that carbon-emitting human activity has on the earth's climate. Media industries, no less than more recognizably "dirty" industries, play a role in this activity. A 2006 UCLA study indicated that the film and television industry was outpaced only by oil refining as a contributor to greenhouse gas emissions in the Los Angeles metropolitan area. Similarly, there is no shortage of examples of the wasteful use of natural resources or the despoliation of the environment entailed in film production; even when the film in question contain pro-environmental messages, productions are regularly accused of harming the landscapes where they film. Danny Boyle's *The Beach* (2000) destroyed sand dunes and local flora for the sake of a more pristine setting in the Thailand national park where the movie filmed, and recent productions including *The Lord of the Rings* trilogy, the *Pirates of the Caribbean* franchise, and *Mad Max: Fury Road* (2015) have all been criticized for the environmental impacts of their location shooting.

It is important that students develop an understanding about these environmental impacts, and consider the ecology of media industries beyond the representation of environmental crisis and climate change. It is easy to think of the moving image as something immaterial, and, as Richard Maxwell and Toby Miller have pointed out, the humanities have tended to focus on textual meaning and the event of media consumption rather than the entire life cycle of a media object from production to disposal. Treating the image as a potentially limited resource highlights the reliance of moving image culture on a hydrocarbon economy and natural resource extraction. Much recent scholarship has focused on the ecological effects of media infrastructures (Maxwell and Miller 2012; Bozak 2012; Hu 2015; Parikka 2015; Starosielski 2015; Parks and Starosielski 2015; Starosielski and Walker 2016). Their approach emphasizes the resource supply chains necessary for image production (lumber used on film sets, transportation costs, rare-earth metals for computing, water used for cooling data servers, chemicals and solvents used in manufacturing hardware, etc.) and the residual effects of media objects after they are consumed (e-waste, recycling and disposal, etc.). These factors underline the necessity of developing sustainable models of image production and reducing the carbon footprint of our media consumption.

This lesson plan – a short version with 2 class sessions, and a longer version with 2 additional class sessions – engages students to think about the materiality of media culture, which is difficult to "see" in the act of consuming images and is obscured by the "technological sublime" (Marx 1964; Maxwell and Miller 2012) of consumer electronics. This lesson plan is modified from a module scheduled late in the semester of an undergraduate course on ecocinema. At this point in the class, students have already considered perspectives on ecocinema that emphasize the depiction of the natural world (nature documentaries, representations of animals, depictions of landscape) and themes of environmental crisis (eco-disaster or eco-apocalypse films, toxic discourse, environmental justice). The lesson plan shifts the approach from images of environmental crisis to a consideration of how image production itself is implicated in the hydrocarbon economy.

The purpose of the classroom activities and assignment outlined below is to understand how media industries have responded to their carbon emissions and resource waste, and to consider potential avenues for sustainable filmmaking. Students are asked to utilize close reading skills that develop awareness of the resources entailed in the production of a scene, as well as how the specific formal choices made (long take versus analytical editing, analog versus digital) have implications for the "greening" of filmmaking. This lesson plan draws primarily on Nadia Bozak's *The Cinematic Footprint: Lights, Camera, Natural Resources*, which examines cinema's exploitation of and dependence on the biophysical world, and helps students to think about aesthetic choices in terms of the waste and expenditure of resources, on the one hand, and conservation, on the other hand.

Timeline

The assignments and classroom activities discussed below allow for a shorter timeline of 1-2 class sessions or a longer module, depending on the needs of the instructor. The longer module can supplement and extend the lessons of the shorter assignment into other areas of inquiry. I have utilized this lesson plan in an upper-division undergraduate class that meets twice a week for 85 minutes, with a separate weekly screening lab.

This lesson plan typically is scheduled later in the semester (weeks 11 and 12 of a 16-week semester), so students have already had opportunities to think about representations of non-human nature and environmental crisis. It is immediately preceded by an introduction to methodological approaches that address the environmental impacts of media infrastructures, including film production, e-waste disposal, and data servers. Students, for instance, read the "Screens" chapter from Maxwell and Miller's *Greening the Media* that provides an account of the environmental pollutants involved in the manufacture of celluloid film and consumer electronics.

The combination of classroom discussion, course readings, take-home assignment, and film screenings included in this lesson plan is designed for students to think critically about the negative environmental impacts of media production and to consider possible alternatives and potential solutions to its footprint, including models of sustainable filmmaking. As I teach at a land-grant university distant from the usual media production centers, my students' exposure to the operations of media industries is limited. It is likely they have never been on a film set or worked in a production office, and as students in the humanities, it is also likely that they have not encountered the particulars of data centers or the unsafe working conditions at offshore manufacturing sites. Their experience of media consumption tends to be limited to multiplexes and home viewing; thus, their understanding of media stops at its use. This lesson plan aims to broaden their perception beyond this narrow framework, and to make media's resource dependency a continual feature of their daily encounter with it.

Short Lesson Plan (1-2 class sessions): The Carbon Footprint of Media Use

The purpose of this activity and assignment is to counter the typically assumed immateriality of media usage, particularly when it is involves digital technologies as the medium for storage and

transmission. The moment of media consumption – whether watching a movie, streaming an online video, or sending emails and text messages – is often the extent of the user's experience, rendering invisible the extensive material infrastructures on which that experience depends. The full extent of the environmental impacts of media technologies, from their reliance on natural resource extraction to their eventual recycling or disposal, remains off-screen and off-site. This is especially the case when developments such as cloud computing and video streaming appear to be "greener" or more environmentally friendly alternatives to previous forms of media consumption. These classroom activities are designed to make visible, at both an industrial and personalized scale, these environmental impacts.

Class One:

Classroom Activity
Students are divided into groups of 4-5, resulting in a total of 5-6 groups for a class size of approximately 30. Before class, students have access to PDFs of the following three reports:

- "Sustainability in the Motion Picture Industry," UCLA Institute of the Environment, November 2006, http://www.environment.ucla.edu/perch/resources/mpisreport.pdf
- "Clicking Clean: A Guide to Building the Green Internet," Greenpeace, May 2015, http://www.greenpeace.org/usa/wp-content/uploads/legacy/Global/usa/planet3/PDFs/2015ClickingClean.pdf
- "PGA Green: Unified Best Practices Guide," Producers Guide of America, http://www.green4ema.org/wp-content/uploads/2015/12/PGA-Green-Unified-Best-Practices-Guide.pdf

Assuming six groups, the instructor assigns two to each report. Groups meet for approximately 25 minutes to read and discuss the report, and develop a set of talking points for presentation to the class. Students are asked to identify the significant contributing factors to the environmental impact of media industries, whether of film production or Internet production. What aspects of these industries have been identified as resource-dependent or wasteful? What are the obstacles identified to the "greening" of these industries? What steps are being taken to change how these industries function, to move toward carbon neutrality and develop best practices for a minimal footprint?

After conferring and organizing, the class reassembles, and each group presents their findings, moving from the UCLA study, to the Greenpeace study, and finally to the PGA guide. The instructor maintains a list of the results, providing an overview of the perceived problems and potential solutions of media's carbon emissions. The instructor asks the class to consider what problems may have been overlooked and what other solutions might be available.

Take-Home Assignment: Estimate the Carbon Footprint of your Media Use
In order to make visible how media industries are implicated in carbon emissions, students are provided with a worksheet (included below) to take home. The worksheet identifies typical forms of media consumption for an undergraduate: email, texting, phone calls, video streaming, web surfing, and television viewing. It estimates the amount of carbon emissions for each activity, and asks the student to log all their activity for a single day and calculate their total

emissions. The estimates for these amounts were drawn from journalistic sources as well as from Mike Berners-Lee's *How Bad are Bananas?: The Carbon Footprint of Everything* (2011).

The goal for the assignment is not to frame individual media consumption as particularly wasteful, though it does serve to make students aware of how much and how often they utilize electronic media. The point rather is to underline that any act of media consumption is dependent on far-reaching material infrastructures that are largely invisible at the moment of use. Sending a text or watching a YouTube video might appear "cleaner" than driving a car, for example, but that is because, with driving, there is a more direct link between personal use and emissions. As the Greenpeace report on a green Internet makes clear, checking Facebook only appears as immaterial or merely virtual until the user can make the connections between their status update and the energy sources Facebook uses to power their data centers. Thus, the aim is not necessarily to reduce personalized media consumption, but to make visible its links to the policies and actions of media industries.

Students select a typical day that is representative of their general media use. Instructors can select a subsequent class session for students to share and compare their results. These results can be presented in a number of ways: calculating averages in various categories (average number of emails or text messages sent, average amount of video streaming, etc.); identifying the least and greatest amount of media consumption; and extrapolating a daily amount to a monthly or yearly measure. Because the worksheet includes a conversion from grams of carbon emitted to the equivalent number of miles driven in a car, the instructor can present the findings about the shortest distance potentially traveled by a student, the longest distance, and the total distance travelled by the class (in a day, a week, or year). This metric is less abstract than the total number of grams, and helps students to visualize their footprint.

Class Two:

Short Essay Response

On the class session when students report the results of their worksheets, they are required to submit a short essay of 2-3 pages in length. This response paper allows them to think through the implications of the classroom activity and take-home assignment. Specifically, this assignment asks them to reflect on how the ease and accessibility of media technologies tends to obscure its environmental impacts.

The response should address the following questions:

- As indicated by the various industry reports, what are some of the most significant contributing factors to media's reliance on natural resources or energy production, whether filmmaking or digital media? What steps can media industries take to mitigate this dependence?
- As for your own media consumption, did the results of your media usage surprise you in any way? Was it more or less than you were expecting? What contributed most to your results: work, school, or personal use? What steps can an individual take to lower their personal carbon footprint?

- When considering the relation between media and the environment, why is important to pay attention to infrastructure as much as representation?

Longer Lesson Plan (2 class sessions): Sustainable Filmmaking

These additional class sessions extend the conclusions of the previous sessions – primarily, that representations of the environment depend on material infrastructures and media technologies which themselves have environmental impacts – and apply them to questions of sustainable filmmaking. Through selected readings from Bozak's *The Cinematic Footprint* and discussion of selected film clips, this lesson plan engages the connections between aesthetics and resource extraction, understanding the image itself as a resource.

Class Three:

Assigned reading: Nadia Bozak, "Energy," from *The Cinematic Footprint*

In order to engage the question of what a sustainable mode of filmmaking might look like, beyond the industry's best practices emphasized in the previous class sessions, this class session asks how the formal properties of media might be linked to their resource dependence.

Discussion centers on the key terms from Bozak's chapter and selected film clips to promote student engagement with these terms.

Students are asked to define and consider the following concepts:

- Carbon neutrality as the equilibrium between carbon emitted and carbon captured
- The idealized form of carbon neutral filmmaking as one that leaves "no physical residue," that relies on no material infrastructure for its production and consumption
- The transition from the solar image (reliance on natural sunlight) to the electric image (reliance on artificial studio lighting) in early cinema
- The "sunless image" as a mode of filmmaking that reflexively engages cinema's dependence on light by staging a neo-primitivist filmmaking (making the viewer aware of film's reliance on light by utilizing it as a scarce resource)

In order to emphasize how students might think about the image as a type of resource, I utilize two film clips to guide discussion.

Clip One: This is a well-known long-take sequence near the conclusion of Andrei Tarkovsky's *The Sacrifice* (1986). Instructors should note the length of the clip – just under ten minutes; however, its duration is part of the point. The clip features a single take of a house burning to the ground, while the family's patriarch is placed in the custody of attendants for his seeming insanity. The camera continues filming the burning house until its basic structure collapses. Students are asked to respond to the following discussion questions:

- What are the identifiable natural resources that were required for the production of this sequence?

- Despite this use of resources, can we consider Tarkovsky's long-take aesthetic as an "aesthetic of conservation," meaning that it aims to minimize the ratio of footage shot to footage included in the film?
- Students are then informed that on the first attempt to film this sequence, the camera jammed, requiring Tarkovsky to convince industry authorities to finance the rebuilding of the set. Does this fact undermine our sense of an "aesthetic of conservation"? Does the elaborate staging of the scene's single take contribute to waste or conserve it?

Clip Two: The second clip comes from Jafar Panahi's *This is Not a Film* (2012). This film, students are informed, was made while Panahi was under house arrest as a punitive measure by Iranian authorities for his vocal support of dissident filmmakers. The clip starts as Panahi, having given up trying to narrate his screenplay to his collaborator, creates a bare-bones set in his living room with little more than tape to indicate the layout of his protagonist's bedroom. He continues to narrate scenes from his screenplay, indicating on his minimal set how actors would be staged and where the camera would be placed. Students are asked to respond to the following discussion questions:

- Though Panahi's film is the outcome of political oppression, can we also understand this film – and this scene in particular – as a model for sustainable filmmaking?
- How does this scene potentially realize Bozak's concept of a carbon-neutral cinema as one that leaves "no physical residue," a filmmaking of pure imagination?

A clip from Lars von Trier's *Dogville* (2003), which likewise features minimal or non-existent sets, might also be used as a substitute to Panahi's film.

Outcomes: The desired goals for class discussion about the reading and clips include:

- Close attentiveness to the resource use of film production; the ability to recognize how media depends on the biophysical world in order to produce representation
- An understanding of how the filmmaking process and the aesthetic choices made by a director are implicated in this resource use
- An understanding of carbon-neutral cinema beyond the conventional notions of greening production, that is, Bozak's notion of film as leaving no material trace

Class Four:

Assigned reading: Nadia Bozak, "Waste" from *The Cinematic Footprint*

This class session addresses the various forms of waste produced by media industries, and with the understanding that images themselves can be devalued and thus "wasted," it considers possible forms of sustainable filmmaking. Discussion centers on the key terms from Bozak's chapter and selected film clips to promote student engagement with these terms. Students are asked to define and consider the following concepts:

- What are the aspects of what Bozak calls "the residual ecology of the image"?

- How has home viewing – whether via VCR, DVD, or digital technologies – contributed to the "recycling" of media properties? How is the "secondary wrapping" of media content comparable to the waste products of industrial society?
- What role does digital documentary play in Bozak's notion of sustainable filmmaking?

Discussion of Agnes Varda's *The Gleaners and I* (2000): Agnes Varda's *The Gleaners and I* is a documentary about gleaning, in its traditional and modern forms. Gleaning originally refers to the practice of collecting excess crops left on the field after a harvest. Varda expands the metaphorical reach of the term, tracing the history of the practice in law and art, and links it both to trash-pickers in contemporary France and to filmmaking itself. The film is a playful and thoughtful exploration of the aesthetic possibilities of digital cinema. Varda's film can be seen as a possible model for sustainable filmmaking. This course holds separate screening times each week, but students might also watch the film on their own time.

Discussion Questions:

- What are the links Varda makes between the act of gleaning and the act of filming?
- What is the central importance of the use of a digital camera to this analogy? How does the ease and accessibility of digital filmmaking – Varda's idea of "one hand filming the other" – change the type of images that are produced and collected?
- How does Varda's "secondhand cinema," to use Bozak's phrase, constitute a political cinema, one concerned with "expendable" people and things in society?
- To what extent can Varda's film be considered an act of image recycling?
- Are there other forms of amateur moving-image production similar to Varda's, which makes use of what is immediately available as the resource for its story?

When I have conducted this discussion, I have had students meet in small groups first to develop short, organized responses to these questions. The instructor can choose to collect these responses or not. Following that, the class meets as a whole to address their responses, and any additional comments students might have had about the film.

CALCULATING YOUR MEDIA CARBON FOOTPRINT

NAME _____

Keep a log of all of your media and Internet usage in a single day, including surfing the web, Google searches, email, and video streaming. Use this log to fill in the corresponding categories below and calculate the amount of CO_2 emissions.

EMAIL:

Number of emails sent or received: _____ x 4 g =

Number of attachments sent or received: _____ x 50 g =

INTERNET:

Number of Google searches: _____ x 3 g =

Web surfing in minutes: _____ x 60s x 0.2 g / s =

VIDEO:

Video streaming in hours: _____ x 400 g =

CELL PHONES:

Number of texts sent and received: _____ x 0.014 g =

Phone calls in minutes: _____ x 57 g =

TELEVISION:

Number of hours of television: _____ x 88 g =

TOTAL GRAMS =

(Total Grams/7) x (52 feet in a car) =

_____

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Biography

Graig Uhlin
Oklahoma State University
graig.uhlin@okstate.edu

Graig Uhlin is an assistant professor of Screen Studies at Oklahoma State University. His research interests include ecocinema, particularly its modernist and avant-garde variants, film-philosophy, and the filmmaking of Andy Warhol and David Fincher. His scholarship has been published in *Cinema Journal*, *Quarterly Review of Film & Video*, *Games & Culture*, and edited anthologies related to ecocriticism.