International
JOURNAL OF SOCIAL,
HUMANITIES AND ADMINISTRATIVE SCIENCES
Open Access Refereed E-Journal & Refereed & Indexed
e-ISSN: 2630-6417

RESEARCH ARTICLE
Ecological Photography

The Material Paradox of Ecological Photography: Representation, Carbon Footprints, and Activist Practice

Ekolojik Fotoğrafçılığın Maddi Paradoksu: Temsil, Karbon Ayak İzleri ve Aktivist Uygulamalar

İsmail Erim Gülaçtı [1]

ABSTRACT

Environmental photography confronts an unresolved paradox: to document ecological crises, photographers must participate materially in the extractive systems generating those crises. This article develops a comprehensive framework for analyzing photography's "material-discursive' operation, examining simultaneously what photographs represent and the material infrastructures enabling their production, circulation, and storage. Drawing on material culture studies, Anthropocene scholarship, and photography theory, I demonstrate how photography is not merely a witness to environmental crises, but an Anthropocene medium deeply implicated in the same systems of extraction and consumption it seeks to critique. Through historical analysis, I trace how nature photography's material footprint has intensified even as its political consciousness has deepened from pictorialism's modest chemical processes to digital photography's energy-intensive global networks. Three case studies illuminate this paradox across different contexts and temporal scales: Subhankar Banerjee's Arctic National Wildlife Refuge documentation generated significant Congressional policy impact despite substantial travel carbon. Turkey's 2021 Marmara Sea mucilage crisis, where local digital documentation achieved relative material efficiency and rapid government response, and Hasankeyf's decades-long documentation before dam flooding, which created essential historical archives yet failed to prevent destruction. Comparative analysis reveals that photography's political effectiveness does not correlate simply with material costs, and that context—temporal scale, geographic proximity, and crisis type—fundamentally shapes cost-benefit dynamics. I propose frameworks for 'material-aware' practice including equipment longevity principles, local documentation priority, file optimization strategies, tiered archival curation, and infrastructure disclosure protocols. Rather than resolving photography's paradox, these frameworks enable conscious navigation of inevitable tensions, acknowledging photography's indispensability for environmental activism while accounting honestly for its ecological costs. By systematically comparing cases across geographic proximity, temporal scale, and political context, this article develops the first comprehensive framework for evaluating photography's material costs against political outcomes, demonstrating that effectiveness depends not on expenditure but on contextual alignment—a finding with implications for sustainable visual activism globally

Keywords: material culture studies, environmental photography, Anthropocene, photographic activism, Turkish photography

ÖZET

Çevresel fotoğrafçılık, çözülmemiş bir paradoksla karşı karşıyadır. Ekolojik krizleri belgelemek için fotoğrafçılar, bu krizleri üreten sömürü sistemlerine maddi olarak katılmak zorundadır. Bu makale, fotoğrafın "maddi-söylemsel" işleyişini analiz etmek için kapsamlı bir çerçeve geliştiriyor ve fotoğrafların neyi temsil ettiğini ve bunların üretimini, dolaşımını ve depolanmasını sağlayan maddi altyapıları eş zamanlı olarak incelemekte ve maddi kültür çalışmaları, Antroposen araştırmaları ve fotoğraf teorisinden yararlanarak, fotoğrafın sadece çevresel krizlere tanık olmakla kalmayıp, eleştirmeye çalıştığı aynı sömürü ve tüketim sistemlerine derinden karışmış bir Antroposen ortamı olduğunu göstermekte, tarihsel analiz yoluyla, doğa fotoğrafçılığının maddi ayak izinin, resimselciliğin mütevazı kimyasal süreçlerinden dijital fotoğrafçılığın enerji yoğun küresel ağlarına kadar siyasi bilinci derinleşirken nasıl yoğunlaştığını tartışmaktadır. Üç ayrı vaka çalışması, bu paradoksu farklı bağlamlarda ve zamansal ölçeklerde aydınlatmaktadır. Subhankar Banerjee'nin Arktik Ulusal Yaban Hayatı Koruma Alanı belgelemesi, önemli seyahat karbonuna rağmen Kongre politikasında önemli bir etki yaratmıştır. Türkiye'nin 2021 Marmara Denizi musilaj krizi, yerel dijital dokümantasyonun nispeten malzeme verimliliği ve hızlı hükümet müdahalesi sağladığı bir örnek iken, Hasankeyf'in baraj suları altında kalmadan önce on yıllarca süren dokümantasyonu ise önemli tarihi arşivler oluşturmuş ancak yıkımı önleyememiştir. Karşılaştırmalı analiz, fotoğrafın politik etkinliğinin yalnızca malzeme maliyetleriyle ilişkili olmadığını ve bağlamın (zamansal ölçek, coğrafi yakınlık ve kriz türü) maliyet-fayda dinamiklerini temelden şekillendirdiğini ortaya koymaktadır. Ekipman ömrü ilkeleri, yerel dokümantasyon önceliği, dosya optimizasyon stratejileri, kademeli arşiv küratörlüğü ve altyapı açıklama protokolleri de dahil olmak üzere 'malzeme odaklı' uygulama için çerçeveler önerilmektdir. Bu çerçeveler, fotoğrafın paradoksunu çözmek yerine, kaçınılmaz gerilimlerin bilinçli bir şekilde yönetilmesini sağlayarak, fotoğrafın çevresel aktivizm için vazgeçilmezliğini kabul ederken ekolojik maliyetlerini de göz önüne almaktadır. Bu makale, coğrafi yakınlık, zamansal ölçek ve siyasi bağlam açısından vakaları sistematik olarak karşılaştırarak, fotoğrafçılığın maddi maliyetlerini siyasi sonuçlarla karşılaştırmak için ilk kez kapsamlı bir çerçeveyi geliştirmekte ve etkinliğin harcamaya değil, bağlamsal uyuma bağlı olduğunu göstermektedir. Bu bulgu, küresel ölçekte sürdürülebilir görsel aktivizm için önemli sonuçlar doğurmaktadır.

Anahtar Kelimeler: Maddi kültür çalışmaları, Çevre fotoğrafçılığı, Antroposen, Fotoğrafik aktivizm, Türk fotoğrafçılığı

How to Cite This Article
Erim Gülaçtı, İ. (2026). The material paradox of ecological photography: Representation, carbon footprints, and activist practice. *Journal of Social, Humanities and Administrative Sciences*, 12(1), 1-21. DOI: https://doi.org/10.5281/zenodo.18417050

Arrival: 21 November 2025
Published: 29 January 2026

International Journal of Social, Humanities and Administrative Sciences is licensed under a Creative Commons Attribution-NonCommercial 4.0 International License.

This journal is an open access, peer-reviewed international journal.

INTRODUCTION: THE PHOTOGRAPHER'S DILEMMA

Opening Vignette

In February 2001, photographer Subhankar Banerjee boarded a flight from Albuquerque, New Mexico to Fairbanks, Alaska, the first leg of a journey to the Arctic National Wildlife Refuge. His mission was to document the ecological and cultural landscapes threatened by proposed oil drilling. Over two years, Banerjee returned repeatedly, enduring

[1] Asssist. Prof. Dr., Yıldız Technical University, Faculty of Art and Design, Department of Art, İstanbul, Türkiye. ORCID: 0000-0002-6786-479X

-50°C temperatures, creating a comprehensive visual archive across four seasons. His photographs eventually reached the United States Senate, influenced Congressional debates, and contributed to temporary policy victories delaying drilling operations.

Yet each round-trip flight generated approximately 1.5 metric tons of CO_2. The specialized equipment required rare earth elements mined under destructive conditions. The resulting digital files, stored across institutional archives, continue consuming energy in climate-controlled repositories and server farms. Banerjee's carbon footprint grew even as he documented the climate crisis. This is the photographer's dilemma, to *witness* environmental destruction, one must *participate* in it materially.

This paradox is structural, embedded in photography's material infrastructure. How do we evaluate photography's environmental activism when documentation itself carries ecological cost? Can photography justify its material footprint through representational power?

The Dual Crisis

Photography's relationship to ecological crisis operates simultaneously on two entangled planes. The first is representational: what we show, how we frame environmental problems, whose perspectives we privilege. Photography makes invisible crises visible, transforming slow, distant, abstract processes like climate change into visceral encounters. A photograph of a starving polar bear or dying coral reef generates affective responses that data alone simply cannot.

The second plane is material. Every photograph is an object with material history. Cameras embody complex global supply chains, rare earth mining, manufacturing waste, planned obsolescence. Digital photography, despite appearing 'dematerialized,' depends on energy-intensive infrastructure, data centers consuming 1-2% of global electricity, cloud storage requiring constant cooling, networks multiplying energy costs with each share and view.

These planes constitute what Barad (2007, p. 35) terms "material-discursive" entanglement, where meaning and matter co-produce each other. A photograph of environmental destruction both represents the crisis and participates materially in generating it. This intensifies a historical coincidence: photography's 1839 invention coincided with Industrial Revolution acceleration. Photography is both an Anthropocene witness and the product of the same extractive systems that created it.

Why This Matters Now

Digital photography's apparent 'cleanliness' conceals material reality. Smartphone democratization means billions of photographs produced daily, each adding to aggregate carbon burden. Instagram's geotagging has caused ecological damage at fragile sites. NFTs introduce blockchain technologies whose energy consumption rivals small nations. The 'upgrade culture', new cameras every three years, accumulating accessories, discarded equipment, feeds electronic waste crises disproportionately affecting Global South communities.

Article Structure and Contribution

This article argues for fundamental reorientation in theorizing and practicing ecological photography. Rather than analyzing images alone, we must examine photography's material-discursive operation, attending simultaneously to what photographs represent and how they are produced, circulated, stored, and discarded.

The argument unfolds through three moves. First, I develop a theoretical framework positioning photography within Anthropocene studies and material culture analysis. Second, I trace historical trajectory across three nature photography paradigms, showing how material costs intensified even as representational strategies became more politically sophisticated. Third, I analyze three case studies: Subhankar Banerjee's Arctic National Wildlife Refuge projects; and two Turkish environmental crises, the 2021 Marmara Sea mucilage outbreak and Hasankeyf's documentation before inundation.

Turkish case studies serve multiple purposes. Turkey occupies a critical position between Global North and South, experiencing climate impacts while navigating development pressures. Analyzing Marmara and Hasankeyf alongside Arctic work demonstrates how material awareness shifts by context: local documentation versus remote travel, acute crisis versus chronic loss.

Following case studies, I examine interactive media's double edge, how digital storytelling promises enhanced engagement but often multiplies material costs. Finally, I propose frameworks for 'material-aware' practice, principles acknowledging photography's unavoidable material implications while seeking to minimize harm and maximize effectiveness.

This article makes three contributions. Theoretically, it brings material culture studies into sustained conversation with photography theory and environmental humanities. Methodologically, it models analysis refusing separation of representation from materiality. Empirically, it documents understudied Turkish cases, decentering Anglo-American scholarship. Three questions guide inquiry: How can photography justify material costs through representational impact? What production practices minimize ecological harm? Can interactive media offer sustainable models?

Case study selection followed systematic criteria enabling comparative analysis across key variables. First, Banerjee's Arctic work represents remote, carbon-intensive documentation requiring international travel, while Turkish cases represent local/regional documentation with reduced travel costs. Second, temporal scale: Marmara exemplifies acute crisis (two months of intensive documentation), Hasankeyf represents chronic loss (decades of documentation), and Arctic work occupies intermediate duration (eighteen months across multiple visits). Third, political outcomes: Arctic work achieved temporary policy victories, Marmara generated rapid government response, while Hasankeyf documentation failed to prevent destruction despite comprehensive archiving. Fourth, documentation structure: Banerjee represents the individual practitioner model, while Marmara involved distributed networks of local photojournalists. These cases collectively illuminate how context—proximity, temporality, crisis type, political environment—fundamentally shapes photography's material-political dynamics, enabling analysis beyond single-case particularity toward generalizable frameworks for material-aware practice.

I do not propose photographers abandon practice, nor offer ‘zero-impact’ fantasy. The paradox cannot be resolved, only navigated with consciousness. Photography remains necessary for environmental activism. Its capacity for empathy, evidence, and memory is difficult to replicate. But necessity does not exempt accountability. If we photograph to defend Earth, we must account for the Earth disturbed in making those images.

THEORETICAL FRAMEWORK: Photography's Material Turn

From Image to Object: Material Culture Studies

Photography studies have long privileged the image, its composition, semiotics, capacity to represent or reveal. Yet this focus on visual content has systematically obscured photography's material dimensions. Mitchell's (1995, p. 9) "picture theory" initiated a crucial shift by proposing that images are not merely representations but objects with material lives that demand analysis. An image is always embodied in paper, pixels, galleries, or screens, and these material substrates shape meaning as profoundly as visual content.

Parikka (2015, p. 21) extends this insight through "media ecology," demonstrating that electronic media must be understood as geology. The smartphone camera conceals a deep history of extraction: lithium mined in Chile's Atacama Desert, cobalt from Congo's conflict zones, rare earth elements from China's Bayan Obo. Parikka (2015) argues we cannot theorize digital media without theorizing the Earth itself, the planetary resources mobilized, landscapes transformed, geologies enlisted into technological systems.

Gabrys (2011, p. 16) pursues similar logic in examining "digital rubbish," the electronic waste produced by consumer technology's planned obsolescence. The average camera has a functional lifespan of three to five years, after which manufacturer support ends and newer models promise marginal improvements. This cycle generates an estimated 50 million metric tons globally per year, which disproportionately accumulates in Global South nations where workers extract valuable metals under conditions exposing them to lead, mercury, and cadmium.

These scholars converge on a key argument: we cannot analyze photographic meaning without analyzing photographic matter. The content of an image does not exist independently from its material substrate. This requires photography studies to engage material culture methodologies, asking not only ‘What does this photograph mean?’ but ‘What materials constitute it, where did they come from, what labor extracted them, what waste will they become?’

The Anthropocene and Photography's Complicity

The Anthropocene, the proposed geological epoch in which humanity has become Earth's dominant force, provides crucial context for understanding photography's material implications. Photography is not merely a medium documenting the Anthropocene. It is an Anthropocene medium, deeply implicated in the same systems of extraction, consumption, and waste characterizing this epoch. Edwards (2010) demonstrates how visual technologies have been essential to recognizing environmental change while simultaneously participating in industrial modernity's ecological costs. Mirzoeff (2016, p. 214) argues that photography must be understood as embedded within "the aesthetics of the Anthropocene," where visual culture both represents and reproduces planetary crises.

Yet ‘Anthropocene’ itself has generated critical debate. Jason W. Moore proposes ‘Capitalocene’ instead, arguing that planetary crisis results not from undifferentiated ‘humanity’ but from specific systems of capitalist accumulation

(Moore, 2016). Haraway (2016) similarly critiques ‘Anthropocene’ for obscuring differential responsibility, proposing ‘Chthulucene’ to emphasize multispecies entanglements.

Photography's entanglement with industrial modernity manifests through three temporal overlaps. First, photography's 1839 invention coincided with the Industrial Revolution's acceleration. Second, digital photography's emergence tracks the “Great Acceleration”, the post-1950 exponential increase in resource consumption and ecological degradation (Steffen et al., 2015, p. 81). Digital cameras became commercially viable in the 1990s precisely when climate change entered public consciousness. The shift from analog to digital appeared to ‘dematerialize’ photography, yet actually intensified material demands through electronics manufacturing and accelerated obsolescence cycles. Third, social media platforms emerged in the 2000s as scientific consensus on Anthropocene impacts solidified. Instagram now hosts over 2 billion monthly active users sharing approximately 95 million photos and videos daily (Happyfoodkitchens, 2024). Each upload initiates material processes: data transmission, server storage, redundant backups, content delivery networks. Photography has become infrastructural, a constant background process of planetary computation.

Representation vs. Materiality: A False Binary?

Traditional photography criticism treats representation and materiality as separate domains, but this separation is increasingly untenable. Barad's "agential realism" provides theoretical tools for thinking beyond this binary (Barad, 2007, p. 32). Barad (2007, p. 10) argues that matter and meaning are co-constituted through "intra-action." Applied to photography, this suggests images do not simply represent environmental crises from a neutral position. They participate materially in the conditions they depict.

Consider Edward Burtynsky's oil field photographs: massive aerial views of Alberta tar sands, simultaneously beautiful and horrifying. These images circulate widely as evidence of extractive capitalism's scale. Yet the photographs are printed on paper manufactured using petrochemical processes, shipped globally via fossil-fuel-powered logistics, illuminated in galleries with electricity often generated from the same oil fields they critique (Burtynsky, 2009). The photograph's material substrate derives from the substance it represents. This is not hypocrisy but inescapable entanglement.

This material-discursive reading refuses to separate content from infrastructure. An image of deforestation viewed on a smartphone connects directly to coltan mining that destroyed forests in Congo. A photograph documenting species extinction is stored on servers cooled by water drawn from aquifers. Representation and materiality are folded into each other; every act of showing is simultaneously an act of taking.

Activist Photography's Ethical Bind

Azoulay's (2008, p. 16) "the civil contract of photography" positions photography as inherently political, capable of creating relationships of responsibility between those who photograph, those photographed, and viewers. Environmental activist photography embraces this interventionist role explicitly. Photographs are produced to generate political pressure, shift public opinion, and influence policy.

Yet political intervention requires circulation. A photograph remaining on a hard drive has no political efficacy. To matter politically, images must move, through exhibitions, publications, social media, news outlets, advocacy campaigns. Circulation requires infrastructure like galleries with climate control, printing presses, shipping networks, data centers. Each mode of circulation carries material costs. The more widely an image circulates, the more ‘successful’ it becomes politically and the greater its cumulative carbon footprint.

This creates activist photography's ethical bind, the requirement that politically effective images multiply their material impacts through circulation. A photograph influencing thousands requires far less infrastructure than one influencing millions, yet political change often demands precisely that scale. Banerjee's Arctic photographs had an impact because they reached the US Senate and millions of viewers. Could photos have stopped drilling if seen only locally? Almost certainly not. But reaching that scale required infrastructure whose material costs we rarely calculate.

Sontag (2003) famously critiqued compassion fatigue, the desensitization occurring when viewers encounter too many images of suffering. To this I add ‘carbon fatigue’, the material exhaustion of producing, circulating, and storing ever-more crisis images. If compassion fatigue describes affective overload, carbon fatigue describes material overload, the point at which aggregate environmental cost of documenting crisis begins approaching the crisis documented.

This is not to argue for photographic silence or claim documentation's material costs outweigh political benefits. Rather, it insists we develop frameworks for conscious calculation. Which images justify their material costs? What

threshold of political effectiveness makes circulation worthwhile? Can we distinguish between necessary documentation and redundant reproduction?

Toward a Material-Aware Aesthetic

If photography cannot escape material complicity, what forms of practice might minimize harm while maintaining political efficacy? Recent movements toward 'slow photography' offer partial models. Birk (2019) advocates deliberate image-making resisting digital culture's quantity imperative. Slow photography emphasizes fewer, more thoughtfully composed images, extended engagement with subjects and equipment longevity rather than upgrade cycles.

Yet 'slow' remains insufficient without explicitly ecological consciousness. An environmental ethic developed for wilderness hiking, 'Leave No Trace', provides additional principles adaptable to photography: minimize impact, pack out waste, avoid disturbing wildlife. Extended to digital photography, this might mean: optimize file sizes to reduce storage energy, use equipment until it fails, avoid geotagging fragile locations, question whether travel to distant sites is necessary.

But even these principles operate primarily at the individual level, when photography's material crisis is fundamentally systemic. Material-aware photography must operate on multiple scales like individual practice, institutional policy, and structural critique. At the individual level, photographers can document and disclose their own material impacts. At the institutional level, museums and platforms could adopt sustainability standards: renewable energy for servers, carbon offsets for shipping, equipment libraries reducing redundant ownership. At the structural level, photographers can use their work to critique the material systems enabling their own practice, making infrastructure visible within the image.

The goal is not purity; the 'zero-impact' photograph remains fantasy. The goal is consciousness, developing aesthetic practices and theoretical frameworks accounting for both dimensions of photography's operation. We need models that refuse the separation of representation from materiality, that read images alongside their infrastructures, that evaluate political efficacy in relation to ecological cost.

THREE PARADIGMS AND THEIR MATERIAL FOOTPRINTS

Photography's relationship to nature has never been static. Across its nearly two-century history, nature photography has passed through distinct paradigmatic moments, each characterized by particular aesthetic strategies, political commitments, and material infrastructures. By tracing these paradigms chronologically, we can observe a troubling pattern. As nature photography has become more politically conscious and committed to activism, its material footprint has intensified dramatically.

Pictorialism and the Sublime (1880-1920)

The first paradigm emerged from nineteenth-century romanticism's conception of wilderness as sublime; vast, untouched, spiritually redemptive. Carleton Watkins's mammoth-plate photographs of Yosemite Valley, produced in the 1860s, presented the valley as cathedral-like space. These images helped convince President Lincoln to protect Yosemite in 1864, establishing precedent for national park designation (Palmquist, 1983). Photography, from its earliest engagement with nature, claimed political efficacy.

Ansel Adams perfected this aesthetic in the twentieth century, creating iconic images that defined American wilderness photography like 'Clearing Winter Storm' (1944), 'Moonrise, Hernandez' (1941). Adams's technical virtuosity produced prints of extraordinary tonal range, suggesting wilderness existed outside human time, eternal and unchanging (Alinder, 2014).

Yet this representational strategy carried profound ideological costs. The 'wilderness myth' that Adams and predecessors propagated rested on Indigenous erasure. Yosemite had been home to Ahwahneechee people for millennia before violent removal enabled parkland designation. By depicting landscapes as 'pristine' and 'uninhabited,' photographers participated in settler-colonial narratives naturalizing Indigenous dispossession (Spence, 1999). Moreover, this aesthetic privileged only 'scenic' nature, dramatic mountains, spectacular waterfalls, while wetlands, prairies, and deserts received little attention.

Materially, however, this paradigm's footprint remained relatively modest. Large-format cameras required significant equipment but production remained small-scale. Watkins traveled by horseback; Adams by automobile within the American West. Chemical processing used toxic substances but in limited quantities. Circulation occurred through exhibitions, books, and magazines, all relatively low-impact compared to contemporary digital distribution. Low material impact coupled with problematic representation. Political effectiveness in securing park protections must be weighed against ideological complicity in colonial erasure.

Scientific/Documentary (1900-1970)

The second paradigm approached nature through scientific documentation. Blossfeldt's (1928) *Art Forms in Nature* (1928) applied photography to botanical subjects, creating detailed images of plant specimens isolated against blank backgrounds. These photographs served dual purposes, scientific catalog and modernist art object. Edgerton's (Edgerton & Killian, 1954) high-speed photography captured hummingbirds mid-flight and milk drops forming coronas, making visible what human eyes could never see.

This paradigm claimed objectivity, photography as transparent medium recording natural facts. Yet this objectivity concealed ideological commitments. Reducing organisms to isolated specimens severed them from ecological relationships. This reductionist vision aligned with industrial modernity's approach to nature as resource, individual elements to be extracted, classified, and exploited.

Materially, this paradigm coincided with photography's democratization. George Eastman's Kodak cameras, introduced in 1888, made photography accessible to amateurs. By the 1960s, photography had become ubiquitous in industrialized nations (West, 2000). This democratization required massive industrial expansion like film manufacturing, chemical processing infrastructure, and eventually color film's complex chemistry.

Environmental costs accumulated across supply chains. Silver mining for photographic emulsions generated toxic tailings. Kodak's Rochester facilities consumed enormous water quantities and became significant pollution sources (Ackerman, 2007). Archive infrastructure also intensified material demands. Museums and libraries built climate-controlled storage requiring perpetual energy input. The result was moderate material impact through industrialization and archival infrastructure, coupled with reductionist representation fragmenting ecological wholes into specimen parts.

Environmental Activism (1970-present)

The third paradigm emerged from environmental movement consciousness, explicitly positioning photography as an activism tool. Rachel Carson's ‘Silent Spring’ in 1962 catalyzed environmental awareness, followed by the first Earth Day in 1970. Photographers responded by documenting not pristine wilderness but ecological crises: oil spills, clearcut forests, industrial pollution, species extinction.

Sebastião Salgado exemplifies this paradigm's global scope. His ‘Genesis’ project (2004-2011) documented regions largely unaffected by the influences of modern society, spending eight years photographing across five continents (Salgado, 2013). James Balog's ‘Extreme Ice Survey’ deployed time-lapse cameras across glaciers worldwide, creating visual proof of accelerated melting (Balog, 2012).

Subhankar Banerjee's Arctic work demonstrates this paradigm's integration of Indigenous collaboration and policy intervention. Contemporary environmental photographers increasingly center Indigenous perspectives, recognizing that conservation divorced from Indigenous sovereignty replicates colonial violence. Photographers like Kiliii Yüyan document Arctic communities' adaptive strategies, challenging narratives positioning Indigenous peoples as passive victims (Yüyan, 2020).

Yet even within activist photography's ethical sophistication, material contradictions multiply. Richard Mosse's work documenting Amazon deforestation (2020-2022) employs multispectral cameras, military technology adapted for Earth observation, to reveal subterranean fires and systematic environmental crimes invisible to human eyes (National Observer, 2022). While these scientific tools expose destruction at unprecedented scales, they also require specialized equipment, air freight logistics, and energy-intensive processing that paradoxically contribute to the climate systems driving the crises being documented. Contemporary photographers increasingly employ collaborative platforms attempting to distribute material burdens. James Whitlow Delano founded @everydayclimatechange on Instagram in 2014, creating a collective feed showcasing climate documentation from photographers across six continents, reaching over 143,000 followers (Sierra Club, 2020). This distributed model reduces redundant travel—multiple photographers need not visit identical locations—yet amplifies digital infrastructure demands through continuous social media circulation.

Turkish environmental photographers demonstrate how regional specificity intersects with global crisis documentation. Murat Yazar, a photographer from Turkey's eastern provinces, has spent years documenting the transformation of the Tigris and Euphrates rivers through government dam projects (Pulitzer Center, 2024). His images of Hasankeyf, the 12,000-year-old town submerged by Ilısu Dam in 2019, provided crucial visual evidence for activist campaigns, appearing in National Geographic's Out of Eden Walk project. Yazar's work exemplifies local documentation's advantages like intimate knowledge of regional ecology, linguistic access to displaced communities, and reduced travel costs compared to international photographers. Yet even regionally-focused practice faces material

demands. Documenting dam sites across Upper Mesopotamia required repeated trips to remote locations, drone equipment for aerial perspectives showing reservoir scale, and digital storage infrastructure for archiving displacement narratives.

Ali Kabas, an Istanbul-based photographer, won Bronze in Press/Nature/Environmental category at Px3 Prix de la Photographie Paris (2022) for aerial documentation combining environmental and architectural perspectives (Kabas, 2022). His work illustrates how Turkish photographers navigate between international recognition circuits, requiring exhibition travel, high-resolution file preparation, and local environmental documentation serving domestic audiences through more modest distribution channels.

This paradigm's representational sophistication, its attention to power, decolonial commitments, systemic analysis, represents genuine ethical advancement. Yet its material costs dwarf earlier paradigms. International travel became standard. Salgado's Genesis required flights to remote locations across continents. Balog's glacier cameras needed helicopter installation and repeated site visits. Digital photography enabled unlimited shooting, thousands of images per project where film imposed natural limits.

Equipment multiplication accelerated. Professional photographers maintain multiple camera bodies, diverse lens collections, backup systems, drone equipment, and constantly updated computers. The ‘digital revolution’ promised liberation from film's chemical burdens but created electronic waste and energy consumption. Social media circulation multiplied distribution's material costs exponentially. Instagram enables daily sharing, creating pressure toward quantity over deliberation.

Cloud storage appeared to ‘dematerialize’ archiving but actually centralized it in server farms consuming massive electricity. Google Photos, Amazon Photos, and iCloud maintain redundant copies across multiple data centers. The photographer uploading terabytes initiates ongoing energy consumption continuing indefinitely. The paradox of highest representational sophistication, politically aware, ethically reflective, committed to justice while generating highest material costs through travel, equipment, digital infrastructure, and circulation networks, reached its apex.

The Paradox Intensifies

This historical trajectory reveals an uncomfortable pattern. As nature photography evolved from aesthetic celebration to scientific documentation to activist intervention, its representational politics became more sophisticated while its material footprint expanded dramatically.

Democratization intensifies this paradox. While Watkins and Adams were individual practitioners with limited reach, contemporary photography involves billions of participants. An estimated 2.1 trillion photographs are expected to be taken in 2025, the vast majority on smartphones (Broz, 2025). Even if most are personal rather than political, the aggregate material burden is staggering.

This raises the article's central question: at what point does material cost outweigh representational benefit? A single powerful image shifting policy might justify substantial carbon expenditure. But what about millions of redundant images, another glacier photograph, another deforestation aerial, another polar bear on melting ice, that circulate without impact beyond incremental audience fatigue?

Moreover, historical progression is not simply chronological. All three paradigms coexist today. Pictorialist wilderness photography persists in calendar sales. Scientific documentation continues in biodiversity surveys. Activist photography dominates environmental NGO communications. Each paradigm's material infrastructure operates simultaneously, creating cumulative burden.

What this history demands is honest reckoning. We cannot return to pre-digital constraints without abandoning photography's genuine political capacities. But we also cannot continue accelerating production while claiming environmental consciousness. The case studies that follow examine how specific photographic projects navigate this bind, revealing both possibilities and limits of material-aware practice.

CASE STUDY 1: SUBHANKAR BANERJEE'S ARCTIC PRACTICE

Context: Arctic National Wildlife Refuge Campaigns (2000-2002)

The Arctic National Wildlife Refuge, established in 1960 and expanded to 19.6 million acres in 1980, represents one of North America's last large-scale intact ecosystems. Its coastal plain serves as calving ground for the Porcupine caribou herd of some 200,000 animals whose annual migration spans over 1,500 miles. The coastal plain also sits atop an estimated 10.4 billion barrels of technically recoverable oil, making it a site of intense political contestation since the 1970s (U.S. Geological Survey, 2001).

When Subhankar Banerjee arrived in Alaska in March 2001, Congressional debates over opening ANWR to oil development had reached critical intensity. The Bush administration prioritized domestic energy production and viewed ANWR drilling as key to reducing foreign oil dependence. Oil industry advocates characterized the coastal plain as a 'barren wasteland' and 'frozen wasteland' (PBS NewsHour, 2005). Environmental organizations and federal wildlife biologists countered that drilling infrastructure would fragment habitat and disrupt migration routes, with biologists warning that development could push caribou into areas where calves would face increased predation (U.S. Fish and Wildlife Service, 2001).

Banerjee's intervention was methodological as much as political. Rather than producing isolated dramatic images, he committed to documenting ANWR across all four seasons, living on-site for extended periods. From 2001 to 2003, he spent approximately eighteen months in the refuge, experiencing temperature extremes from -50°F to 70°F (Banerjee, 2003). His resulting archive of over 10,000 images challenged dominant narratives by revealing year-round biological richness.

The photographs entered political circulation rapidly. In 2003, Senator Barbara Boxer invited Banerjee to brief Congressional staff and his images were incorporated into floor debates (Banerjee, 2012a). In 2003, the Smithsonian's National Museum of Natural History planned a major exhibition, but political pressure led to its controversial reduction, a censorship attempt that paradoxically generated extensive media coverage (Kennicott, 2003). The photographs contributed to Senate votes that narrowly defeated drilling authorization in 2002 and 2005.

Representational Strategies

Banerjee's representational approach departed from nature photography conventions in crucial ways. First, his seasonal structure emphasized temporal processes over static beauty. Rather than seeking singular perfect moments, he documented cycles, caribou arriving emaciated from winter (Banerjee, 2002a; see Figure 1), nursing young who must gain weight for autumn migration, snow geese arriving by thousands, raising vulnerable chicks; tundra plants flowering. This temporal emphasis made Arctic ecosystems' dynamism and complexity visible, which ‘wilderness’ rhetoric obscures (Banerjee, 2012b).

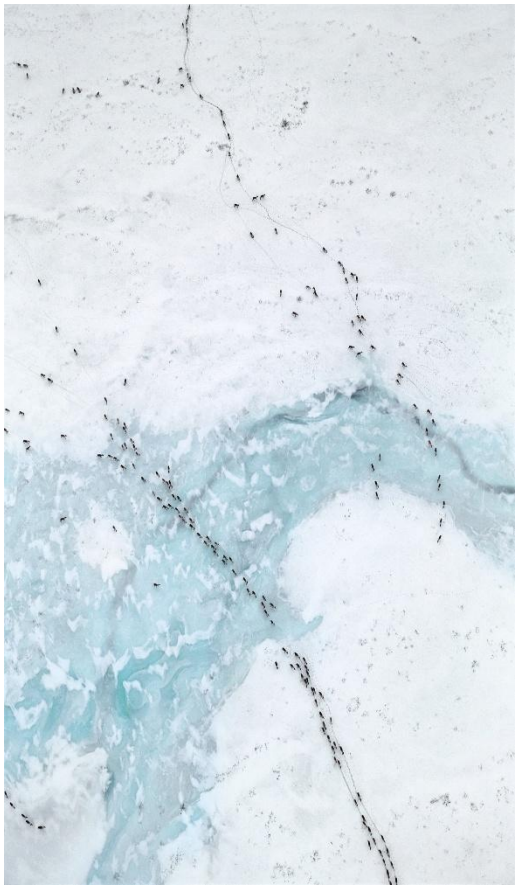

Figure 1: Subhankar Banerjee, *Caribou Migration I*, Coleen River valley, Arctic National Wildlife Refuge, 2002. Digital chromogenic print, 68 x 86 inches. Collection Hood Museum of Art, Dartmouth. This photograph was displayed on the U.S. Senate floor during drilling debates. © Subhankar Banerjee, used with permission.
Source: https://www.subhankarbanerjee.org/photohtml/arctic-photo-white-02.html

Second, he combined scales deliberately. Wide-angle landscapes established ecosystem context while telephoto closeups revealed individual animal behaviors and interspecies relationships (Banerjee, 2002b; see Figure 2). This scalar movement between expansive and intimate resisted both sublime abstraction and sentimental reduction.

Figure 2: Subhankar Banerjee, *Snow Geese I*, Jago River valley, Arctic National Wildlife Refuge, 2002. The image exemplifies Banerjee's seasonal documentation approach. © Subhankar Banerjee, used with permission.
Source: https://www.subhankarbanerjee.org/

Third, Banerjee collaborated extensively with Gwich'in communities whose subsistence depends on caribou (Banerjee, 2007; see Figure 3). Rather than photographing Indigenous peoples as romantic ecological natives, his portraits emphasized agency, modernity, and political sophistication. Gwich'in elders, activists, and hunters appear as contemporary political actors defending homelands against extractive industry (Banerjee, 2013).

Figure 3: Subhankar Banerjee, *Caribou Hunt—Charlie Swaney and Jimmy John*, from the series Gwich'in and the Caribou, 2007. 18 x 24 inches. This intimate-scale photograph demonstrates Banerjee's collaborative methodology with Gwich'in communities. © Subhankar Banerjee, used with permission.
Source: https://www.subhankarbanerjee.org/

Banerjee's Indigenous collaboration extended beyond visual documentation to collaborative knowledge production. His 2013 anthology *Arctic Voices: Resistance at the Tipping Point* compiled thirty-nine essays and testimonies by Indigenous cultural activists, scientists, and writers alongside sixteen artists' photographs and drawings (University of New Mexico, 2024). This editorial work redistributed platform access, centering Indigenous voices rather than speaking for communities. The archive's ongoing value demonstrates photography's temporal dimensions. Banerjee founded the Center for Environmental Arts & Humanities at the University of New Mexico in 2014, where his ANWR images now serve pedagogical functions, teaching environmental humanities students about visual politics and ecological justice (UNM Department of Art, 2024). His recent curatorial work, including "a Library, a Classroom, and the World" exhibited at the 2022 Venice Biennale, continues engaging with Arctic materials two decades after initial documentation (UNM Department of Art, 2024).

Climate change's acceleration intensifies the archive's significance. Arctic temperatures have risen twice as fast as global averages since 2000, transforming ecosystems Banerjee documented at baseline conditions (IPCC, 2021). His images now enable comparative analysis tracking transformation rates, a scientific application he could not have anticipated. The Gwich'in Steering Committee continues using Banerjee's photographs in ongoing campaigns, demonstrating sustained political utility beyond immediate policy battles (U.S. Department of State, n.d.). This extended lifecycle—pedagogical, scientific, and political—suggests that photography's value accumulates over time, complicating simple cost-benefit calculations that focus only on immediate campaign outcomes.

The aesthetic itself cultivated 'quiet witnessing', eschewing spectacular drama for sustained attention. Arctic light produces subtle tonal ranges and diffused luminosity. Banerjee's palette emphasizes blues, whites, tans, and occasional golds, the Arctic's actual color range rather than heightened saturation. Compositions often feature horizontal emphasis, with animals or humans appearing small within larger ecological contexts. This aesthetic refusal of domination worked politically to suggest the arrogance of imposing industrial infrastructure on landscapes whose scale exceeds human comprehension.

Material Analysis

Banerjee's Arctic practice generated substantial material costs requiring honest accounting. Air travel constituted the primary carbon burden. Round-trip flights from Albuquerque to Fairbanks covered approximately 3,600 miles. Using standard carbon calculators, each round trip generated roughly 1.5 metric tons of CO_2 per passenger. Over eighteen months involving multiple trips, estimated total air travel approached 15-20 metric tons of CO_2, equivalent to an average American's annual emissions from all sources (EPA, 2021).

Equipment requirements intensified costs. Arctic conditions demand specialized gear like cameras for extreme cold, batteries requiring redundancy, weatherproof cases, expedition-grade clothing, and emergency equipment. Cold-weather photography equipment has limited lifespan as seals crack, lubricants fail, electronics malfunction. Banerjee transitioned from film to digital during the project, requiring new camera systems and digital storage infrastructure. The shift to digital introduced ongoing energy costs. Banerjee's 10,000+ image archive, stored redundantly across multiple hard drives and cloud systems, requires perpetual energy input. Assuming conservative estimates of 50MB per RAW file, the archive totals approximately 500GB requiring continuous powered storage. Exhibition circulation multiplied material burdens. The Smithsonian installation required printing, mounting, framing, lighting, and climate control. Subsequent exhibitions nationwide necessitated shipping large-format prints. Book publication involved paper production, printing, binding, and global distribution. Digital circulation through websites and social media transmitted files through energy-intensive networks to millions of viewers.

Yet evaluating these costs requires examining outcomes. Banerjee's photographs demonstrably influenced Congressional debates, with senators referencing images during floor arguments. While drilling authorization passed in 2017 under different political conditions, protections were held for fifteen years partly due to sustained advocacy that Banerjee's images enabled. The photographs also generated funding for conservation organizations. Defenders of Wildlife, Sierra Club, and other groups incorporated images into fundraising campaigns collectively raising millions for Arctic protection. Perhaps most significantly, the archive provides irreplaceable documentation of ecosystems now transforming rapidly under climate change. Arctic temperatures have risen twice as fast as global averages (IPCC, 2021). Banerjee's 2001-2003 baseline images enable future comparisons documenting transformation rates.

A rough cost-benefit calculation might ask: did Banerjee's 20 metric tons of travel carbon generate political outcomes preventing extraction of 10.4 billion barrels of oil? If even 1% of ANWR oil remained unextracted due to delayed authorization, the prevented emissions would dwarf travel costs by orders of magnitude. Yet such calculations involve unprovable counterfactuals and risk reducing complex political processes to carbon accounting.

Could This Have Been Done Differently?

Examining alternatives illuminates what Banerjee's practice achieved. Could remote sensing have substituted for on-ground photography? Satellite data provides valuable ecosystem monitoring but lacks intimacy. It cannot capture a caribou calf's first steps or a Gwich'in hunter's concentration. The affective dimension enabling political empathy requires embodied presence. For Congressional persuasion and public mobilization, feeling proved essential.

Could local photographers have documented ANWR? Gwich'in communities include photographers whose work increasingly circulates through Indigenous media networks. However, in 2001, infrastructure supporting Indigenous photographers remained limited. Banerjee's position as an Indian immigrant with U.S. art world access enabled circulation local photographers might have struggled to achieve. This reveals structural inequities. Those with

mobility and institutional connections can impose their visions, while those with deepest place-knowledge face barriers to representation.

Could virtual documentation like 360° photography, VR experiences have achieved similar impact with lower travel frequency? Such technologies enable immersive remote experiences potentially reducing visitor impacts. However, VR production requires specialized equipment and higher initial material costs. Moreover, in 2001, these technologies remained rudimentary.

The conclusion this case study suggests is uncomfortable. Some material costs may be justifiable when political stakes are high and alternatives are limited. Banerjee's Arctic project generated impacts on Congressional influence, conservation funding, archival documentation, Indigenous collaboration, which appear to warrant carbon expenditure. Yet this justification depends on exceptionalism. The stakes were genuinely high, the photographer was particularly skilled, the collaboration was relatively ethical, the outcomes were documentably significant. Most photography does not meet these thresholds.

The danger lies in generalizing from exceptional cases. What this case demonstrates is the necessity of weighing costs against outcomes, choosing projects carefully, maximizing impact per carbon unit rather than either unreflective production or paralyzed abstention. Banerjee's work models material-aware practice not because it achieved zero impact but because it achieved political efficacy proportionate to its costs and because he has subsequently reflected critically on those costs (Banerjee, 2020).

CASE STUDY 2: TURKEY'S ENVIRONMENTAL PHOTOGRAPHY

Marmara Mucilage Crisis

In May 2021, Türkiye's Marmara Sea experienced an unprecedented ecological crisis. A thick substance known as 'sea snot' or mucilage blanketed coastal waters, accumulating in harbors and suffocating marine life (European Space Agency, 2021; see Figure 4). Caused by phytoplankton blooms triggered by warming waters, untreated sewage, and agricultural runoff, the mucilage created oxygen-depleted zones threatening Istanbul's 16 million residents (Karadurmuş & Sarı, 2022).

Figure 4: Mucilage coverage in the Marmara Sea, Bostanci coastline, Istanbul, June 6, 2021. Copernicus Sentinel-2 satellite image. The thick film of sea snot extends several hundred meters from shore. Image courtesy European Space Agency/Copernicus Programme.
Resource: https://www.copernicus.eu/en/media/image-day-gallery/sea-snot-marmara-sea

The crisis became intensely visual. Turkish photojournalists documented through aerial drone footage showing harbor waters completely covered and underwater photography revealing dead fish trapped in mucilage layers. Photographer Özcan Yüksek's underwater images from Istanbul's Caddebostan coast went viral when opposition deputy Namık Havutça reshared them demanding government action (Daily Sabah, 2021a). When footage showing a Bandırma fertilizer factory discharging untreated wastewater went viral, authorities suspended the facility within days (Hürriyet Daily News, 2021b). Within three weeks, Environment Minister Murat Kurum unveiled a 22-point Marmara Sea Action Plan allocating 4.5 billion lira ($500 million) for cleanup and wastewater treatment upgrades (Anadolu Agency, 2021). The timeline from crisis emergence to government response demonstrated visual documentation's political efficacy.

Material analysis reveals relative efficiency. Istanbul-based photojournalists required no long-distance travel beyond normal commutes. Equipment consisted of existing cameras and consumer drones. Digital distribution through social media reached millions at minimal per-image cost. However, hundreds of photographers produced tens of thousands of images, raising archival sustainability questions. After initial images established the crisis's visual vocabulary, did additional thousands contribute meaningfully or create redundant storage burdens? Photography succeeded in

generating rapid response but primarily showed spectacular effects rather than systemic causes. Mucilage views dominated while underlying failures—inadequate wastewater infrastructure, agricultural runoff, industrial pollution—received less visual attention. Moreover, resolution remained partial. Mucilage blooms recurred in subsequent years (Türkiye Ministry of Environment, 2021), suggesting photography generated immediate action but not structural transformation.

Hasankeyf and Ilısu Dam

Hasankeyf, a 12,000-year-old settlement in southeastern Turkey along the Tigris River, hosted successive civilizations from Neolithic communities through Roman, Byzantine, and Islamic dynasties. Archaeological surveys estimated only 10% had been excavated (Smithsonian Magazine, 2009). In 2020, the Ilısu Dam flooded Hasankeyf despite decades of opposition, displacing 15,000-78,000 people and submerging 199 settlements (Kramer, 2020).

Photography documented Hasankeyf's disappearance across three phases. During the 1990s-2000s, activists created solidarity archives recording daily life. The Initiative to Keep Hasankeyf Alive, a coalition of 86 organizations founded in 2006, documented community life challenging narratives positioning the site as an expendable past (Hasankeyf Matters, 2015). During the 2010s, 'last chance' documentation intensified. Research documents Hasankeyf became a last chance tourism destination, with 429 surveyed visitors motivated primarily by threatened status (Çakar & Seyitoğlu, 2023). Professional photographers including Mathias Depardon produced extensive documentation for National Geographic before his 2017 arrest by Turkish authorities (National Geographic, 2018).

Archaeological documentation escalated as flooding approached. Batman University, University of Tsukuba, and Mardin Artuklu University conducted rescue excavations producing extensive photographic records (Miyake et al., 2012). The Hasankeyf castle underwent laser-scanning (CIPA Heritage Documentation, 2019). During 2019-2020, photographers documented the dam's filling in real-time. NASA satellite imagery tracked water levels as Hasankeyf disappeared (NASA Earth Observatory, 2020).

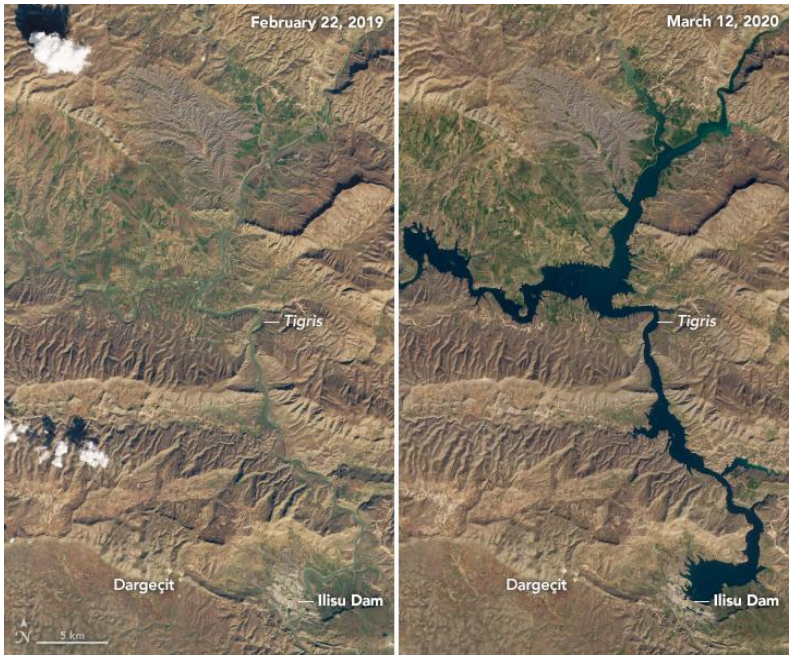

Figure 5: Hasankeyf before and after Ilısu Dam flooding. Natural-color satellite images from Landsat 8. NASA Earth Observatory images by Lauren Dauphin, using Landsat data from the U.S. Geological Survey.
Resource: https://earthobservatory.nasa.gov/images/146439/slowly-flooding-history

The material paradox emerged starkly. Hasankeyf's remote location, 100 kilometers from Batman, 1,300 kilometers from Istanbul, required carbon-intensive travel. International visitors needed intercontinental flights plus domestic transport. Last chance tourism accelerated site pressure as increased visitors strained fragile infrastructure (Dawson et al., 2011). Equipment escalation tracked technological advancement from film to digital to drones, each addition increasing material costs. Archives dispersed across Turkish universities, activist organizations, international museums, and social media created massive redundancy multiplying storage costs.

Political effectiveness proved minimal. Despite decades of documentation, international exhibitions, and UNESCO consideration, flooding proceeded. Photography created comprehensive memory but could not prevent destruction. Documentation became a substitute for prevention, preserving memory rather than place (Aykaç, 2023). Yet without these archives, Hasankeyf would vanish without visual trace. Material costs purchased not salvation but witness.

Comparative Analysis

Comparing Marmara and Hasankeyf illuminates how context shapes photography's material-political dynamics. Temporal structure differed fundamentally. Marmara was acute, intensive documentation over two months enabling concentrated effort and rapid response. Hasankeyf was chronic, decades of documentation accumulating costs without preventing loss. Geographic proximity shaped material costs dramatically. Marmara documentation occurred locally within Istanbul using existing infrastructure. Hasankeyf required remote travel multiplying carbon costs exponentially.

Despite Hasankeyf's vastly higher cumulative material costs, political impact proved minimal, while Marmara's modest costs achieved measurable response. This challenges assumptions linking material investment with political effectiveness. Crisis reversibility emerges as crucial. Marmara represented a potentially reversible crisis creating political opportunity. Hasankeyf represented irreversible transformation, $1.3 billion invested over 15 years created path dependency resisting photographic pressure.

Political context shaped outcomes significantly. Marmara emerged during a relatively open media environment enabling rapid circulation. Hasankeyf faced increasingly restricted civil society space, (Initiative to Keep Hasankeyf Alive, 2016). Photography's political efficacy depends substantially on institutional context enabling circulation, not merely image quality. Both cases reveal photography's ambiguous position, simultaneously witness and participant, document and burden. Neither fully succeeded. Marmara achieved immediate cleanup but systemic sources remain unaddressed. Hasankeyf achieved comprehensive documentation but failed to prevent destruction. Yet both created political traces of evidence, memory, accountability, remaining available for future struggles. Material costs purchased not victory but political possibility.

FRAMEWORKS FOR MATERIAL-AWARE PRACTICE

The Carbon Calculus

The case studies examined suggest that evaluating photography's material costs against political outcomes requires more nuanced frameworks than simple carbon accounting. A straightforward calculus might propose dividing political impact by material costs to determine efficiency. Banerjee's Arctic work, 20 metric tons of travel carbon producing Congressional influence that temporarily prevented extraction of billions of barrels of oil, appears highly efficient. Hasankeyf documentation, decades of travel accumulating hundreds of tons of carbon yet failing to prevent dam construction, appears highly inefficient. Yet this arithmetic obscures complexities resisting quantification.

Attribution proves impossible. Photography rarely causes political outcomes alone; it participates within broader advocacy networks involving legal challenges, scientific research, community organizing, and economic pressure. Claiming photographs 'caused' policy outcomes overstates photography's agency while understating collaborative dimensions of environmental struggle. Temporal framing affects assessment dramatically. Evaluations conducted immediately after projects may miss delayed impacts. Hasankeyf documentation appeared futile in 2020 when flooding occurred, yet the archive may enable future accountability decades hence. Photography's political life extends beyond immediate campaigns. Non-quantifiable outcomes resist calculation. How do we measure the cultural value of preserving visual memory? Educational benefit of documentary archives? Inspiration photographs provide for future activists? These outcomes matter but elude carbon accounting's logic.

Rather than carbon calculus, I propose 'material mindfulness', conscious attention to costs without pretense of precise measurement. Material mindfulness requires documenting production processes including miles traveled, equipment purchased, energy consumed, waste generated. This documentation does not need to yield single efficiency scores but should create awareness enabling informed choices. Photographers can disclose these processes publicly, making visible what typically remains hidden. Exhibition labels might state 'This series required X flights generating Y tons of CO_2 to document Z issue.' Such disclosure acknowledges complicity while maintaining commitment to documentation's necessity.

Eight Principles of Production Ethics

Drawing from case studies and existing environmental ethics, I propose eight principles for material-aware photographic practice.

Resist upgrade culture's pressure toward constant equipment renewal. Cameras functional for documentation remain valuable even when newer models promise marginal improvements. Extended equipment lifespan reduces manufacturing demand, mining extraction, and e-waste generation. Photographer Sebastião Salgado used the same Pentax 645 camera system for over 15 years during his Genesis project (2004-2013), demonstrating that technical excellence depends more on skill than latest equipment (Salgado, 2013). When equipment fails, repair before

replacing. Organizations like The Restart Project and iFixit provide repair guides and workshops, extending camera lifespan significantly. Calculate 'true cost' including environmental externalities. A $3,000 camera used for 10 years costs $300/year; replaced every 3 years costs $1,000/year plus triple the manufacturing impact.

Prioritize documenting nearby environments over distant locations. Local documentation minimizes travel carbon while building sustained relationships with places and communities. Turkish photographer Cem Genco documented Istanbul's disappearing wooden houses (yalıs) over 20 years, traveling by public ferry and bicycle, producing a definitive archive without international flights (Genco, 2015). Before traveling for environmental documentation, ask 'Could local photographers tell this story? How can I support their capacity rather than imposing external perspective?'

Fewer, more considered images rather than unlimited digital shooting. Deliberation over quantity challenges platform logics demanding constant production but aligns with environmental rhythms requiring patient observation. Limit yourself to film-era constraints even when shooting digital, one 'roll' of 36 exposures per location/subject. This forces compositional consideration and reduces time spent culling thousands of similar images. Wildlife photographer Frans Lanting reports shooting 200-300 images per day during intensive fieldwork compared to amateur photographers' 2,000+, yet achieving higher publication rates through selectivity (Lanting, 2018).

Share equipment across photographer collectives, reducing redundant ownership. Coordinate travel when remote documentation proves necessary. Equipment libraries democratize access while minimizing total production. PhotoWings, a nonprofit supporting conservation photography, operates equipment lending libraries enabling emerging photographers to access professional gear without purchasing. When multiple photographers must document remote locations, coordinate single trips with shared logistics rather than redundant travel.

Compress images without perceptible quality loss. Delete unsuccessful attempts rather than archiving everything. Selective curation reduces storage infrastructure burden while improving archive usability. Use lossless compression algorithms (PNG optimization, JPEG quality 85-90 instead of maximum) reducing file sizes 40-60% without visible degradation. Photographer Edward Burtynsky's studio implements immediate culling. Only technically perfect images proceed to post-processing, cutting archive volume 70% (Burtynsky, 2018). For web distribution, generate 2000-pixel-wide versions (adequate for screens) rather than uploading full-resolution 6000+ pixel files, reducing transmission bandwidth 80%.

Make material costs visible in exhibitions, publications, and online presentations. Transparency enables audience awareness and shifts cultural expectations around photography's material dimensions. Follow institutional models like South Korea's Museum of Contemporary Art Busan, which displayed actual carbon calculations on exhibition walls "A total of six artworks depart from New York and arrive at the MOCA Busan. The combined weight of the artworks is 1,273 kg... During transportation by air, 15.98 tons of carbon dioxide emissions are generated" (CIMAM, 2022). The Institute of Contemporary Art San José publishes annual emissions reports tracking reductions: their 2024 report documented 7.49 tons CO_2 reduction through measures like eliminating printed gallery guides and limiting flights (ICA San José, 2024). Create 'Material Impact Statements' for photography projects. Calculate kilometers traveled, equipment carbon costs, and archive storage requirements using tools like the Gallery Climate Coalition's free online carbon calculator, which tracks emissions across shipping, travel, energy, and packaging (The Art Newspaper, 2024). Include this data in exhibition labels, artist statements, and online portfolios. For digital work, note hosting provider. Host images on renewable-powered servers or calculate digital carbon footprint using established metrics. World Cleanup Day research found that 100 stored photos plus videos equals approximately 17km of car travel in CO_2 emissions (World Cleanup Day, 2021). Tate demonstrates institutional transparency with "labels throughout the galleries explaining how we are making our work more sustainable," providing a model photographers can adapt for individual practice (Tate, n.d.).

Choose renewable-powered hosting services, carbon-conscious printers, and exhibition venues committed to sustainability. While individual choices cannot solve systemic problems, collective demand pressures institutions toward better practices. For website hosting, choose providers with documented renewable energy commitments: GreenGeeks partners with Bonneville Environmental Foundation to purchase renewable energy credits at 300% of consumption, effectively making websites 'carbon-reducing' rather than carbon-neutral (TechRadar, 2025). A2 Hosting has partnered with Carbonfund.org since 2007 for carbon offsetting and uses energy-efficient infrastructure including SSDs and optimized cooling systems (Bitcatcha, 2025). For printing, seek FSC-certified paper from mills using renewable energy and vegetable-based inks. Hemlock Printers in Vancouver became the first FSC-certified printer in the Pacific Northwest in 2004, with over 85% of paper purchases now FSC-certified and offers automatically carbon-neutral paper options through forest conservation projects (Hemlock Printers, 2024). Stormpress uses vegetable oil-based inks, chemical-free printing plates, and offsets through Woodland Trust's Carbon

Capture Scheme, neutralizing 54,714kg of CO_2 in two years while planting over 20,000m² of woodland (Stormpress, n.d.). When negotiating exhibitions, require venues demonstrate sustainability commitments like LED lighting (70% less energy than halogen), programmable climate control, renewable electricity contracts. Collectively, photographers can pressure major platforms to disclose environmental data and implement carbon tracking features in editing software.

Before every project, ask ‘Must this be photographed? By me? Now? In this way?’ Necessity questions interrupt reflexive production, creating space for genuine evaluation of whether material investment serves purposes justifying costs. Develop decision matrices evaluating the following: Necessity: Is visual documentation essential or would other media serve equally well? Positionality: Am I the appropriate person, or should local photographers lead? Timing: Is immediate documentation urgent or can it wait to coordinate with other necessary travel? Method: Does this require travel or can remote sensing/existing archives/local collaborators provide needed documentation? Photographer Laurent Teisseire, interviewed by Blind Magazine, focuses on "stories about ecology in my region, on the new national park that just opened, for example, rather than doing a story halfway around the world," and allows himself "the option of turning down clients whose ethics he doesn't share" (Blind Magazine, 2023). Wildlife photographer Will Burrard-Lucas recommends "taking fewer trips each year that are longer—rather than taking two, 10-day trips, consider taking a single 20-day trip instead," which "alone could halve the number of long-haul flights you take" (Burrard-Lucas, 2021). Create project justification templates requiring written answers before proceeding. When unsure, default to supporting local documentation capacity rather than traveling yourself.

These principles alone do not guarantee 'sustainable' photography but enable more conscious navigation of inevitable tensions. They also operate primarily at individual practice level, while photography's material crisis is fundamentally systemic. Individual ethical choices remain important but insufficient without institutional transformation and structural critique.

Representational Strategies

Material awareness should inform not only production practices but representational strategies, what we photograph and how we frame it. Moving beyond 'beautiful devastation' requires several shifts. First, foreground solutions alongside problems. Photography excels at documenting crises but struggles to represent patient work of restoration, policy reform, and community resilience. Yet solution-focused imagery provides hope and models for action, countering despair that crisis photography can induce. Second, focus on affected communities rather than imposing external perspectives. Environmental photography has historically privileged Western photographers documenting Global South subjects, perpetuating colonial dynamics. Material-aware practice supports local photographers documenting their own communities, distributing resources and platforms rather than concentrating them in traveling professionals.

Third, avoid 'last chance' fatalism. Photography framed as capturing disappearing worlds before extinction creates urgency but also resignation, implying loss as inevitable. Alternative framing emphasizes that outcomes depend on actions we take. Photography becomes a tool for mobilization rather than memorial. Fourth, make infrastructure visible. Rather than concealing photography's material conditions, integrate them into representation itself. Photograph data centers alongside glaciers, e-waste dumps alongside pristine landscapes, equipment production facilities alongside conservation areas. This reflexive approach acknowledges photography's participation in systems it documents, refusing false separation between observer and observed. Fifth, scale appropriately. Not every story demands global distribution. Local environmental issues may achieve greater impact through local platforms than international circulation. Matching distribution scale to issue scale minimizes unnecessary material burden while concentrating attention where action is possible.

The Archive Question

Digital photography's archival burden, perpetual energy consumption for storage and access, demands explicit attention. Current practice tends toward comprehensive preservation. Everything photographed gets archived indefinitely. This accumulation creates exponentially growing storage requirements consuming ever-more energy.

I propose tiered archiving systems distinguishing among three categories. Essential images, those with enduring historical, political, or cultural significance, receive full-resolution redundant storage with long-term preservation commitment. These might constitute 1-5% of total production. Criteria for essential designation could be based on images cited in peer-reviewed publications, used in successful policy campaigns, documenting species/places now extinct/destroyed, or representing unique historical moments. Technical specifications for such images could include RAW files plus high-resolution TIFFs, stored redundantly across three geographically distributed locations, migrated

to new formats every 5-7 years, with comprehensive metadata. Institutions like the Library of Congress, British Musem and Smithsonian should bear responsibility for essential preservation.

Supporting images, contextual documentation valuable but not essential, receive compressed single-location storage with moderate preservation commitment. These might constitute 20-30% of production. Criteria might be images providing context for essential images, documenting methodology, showing alternative perspectives on documented subjects, or maintaining personal/institutional records. Technical specifications might include high-quality JPEG compression, single-location storage with annual backup verification, minimal metadata. University archives and research institutions can typically maintain supporting tiers.

Ephemeral images, time-sensitive content losing relevance after specific campaigns conclude, receive temporary storage with scheduled deletion. These might constitute 65-80% of production. Criteria for these images could include duplicate angles of documented subjects, technically flawed images retained during projects, social media content tied to time-sensitive campaigns, and outtakes unlikely to have future research value. Technical specifications might be compressed web-resolution versions, scheduled deletion after 2-5 years depending on campaign duration. Individual photographers and campaign organizations manage ephemeral tiers.

The Smithsonian Environmental Research Center implemented tiered archiving in 2019, reducing storage requirements 60% while improving researcher access to essential materials (SERC, 2020). Photographer James Balog's Extreme Ice Survey project established clear preservation tiers: time-lapse sequences showing glacier changes (essential), contextual landscape views (supporting), and expedition logistics photos (ephemeral with 5-year retention), enabling targeted long-term preservation of scientifically valuable material (Balog, 2012).

This tiered approach requires judgment about significance, inevitably involving difficult choices and potential errors. Some images deemed ephemeral may prove historically valuable decades later. Yet avoiding curation decisions does not eliminate problems. It simply defers them while accumulating unsustainable storage burdens. Better to make imperfect conscious choices than unconscious comprehensive accumulation. Institutional policies could establish archival standards. Museums and research institutions might commit to preserving essential tiers perpetually while implementing deletion schedules for ephemeral material. Photography education should teach archival consciousness alongside technical skills, preparing practitioners to make informed preservation decisions.

These frameworks of material mindfulness over carbon calculus, eight production principles, representational strategies, tiered archiving do not resolve photography's material paradox. They offer instead navigational tools for conscious practice acknowledging tensions rather than denying them. Implementation requires individual commitment, institutional transformation, and structural critique operating simultaneously. No single photographer or institution can solve systemic problems individually, but collective adoption of material-aware principles might shift cultural norms, creating momentum toward less destructive practices while maintaining photography's political capacities.

CONCLUSION: LIVING WITH THE PARADOX

No Pure Position

This article has traced photography's material paradox across theory, history, and practice, demonstrating that ecological photography simultaneously documents environmental crises and participates materially in the conditions generating that crisis. There exists no pure position from which to photograph without material implications. Every image requires infrastructure, cameras manufactured from mined minerals, electricity powering storage systems, networks transmitting files, archives consuming perpetual energy. These costs are inescapable consequences of photography's physical existence.

Yet the inverse also holds. We cannot not photograph. Environmental crises demand documentation for political mobilization, legal accountability, scientific understanding, and historical memory. Photography's unique capacities of arresting temporal processes, generating empathy across distance, creating evidence, crossing linguistic barriers make it indispensable for environmental communication.

The paradox cannot be resolved but must be navigated. This requires rejecting two inadequate responses. First, we cannot retreat into purity politics claiming material complicity invalidates activist photography. All action under capitalism involves compromise. Demanding impossible purity paralyzes necessary work. Second, we cannot ignore material dimensions through ‘dematerialization’ fantasies treating digital photography as costless. Consciousness about complicity, rather than denial or paralysis, enables ethical navigation of inevitable tensions.

7.2. From Paradox to Praxis

Material awareness transforms photographic practice in concrete ways. It changes what we photograph, prioritizing local over distant, urgent over redundant, collaborative over extractive. It changes how we photograph, deliberately rather than reflexively, with conscious equipment choices, optimized files, and strategic archiving. It changes how we circulate photographs, matching distribution scale to issue significance, choosing platforms carefully, questioning viral expansion as inherent good. Crucially, material awareness should become visible within photographic discourse itself. Disclosure emerges as ethical practice, photographers acknowledging carbon costs enabling their work, infrastructure supporting circulation, materials constituting equipment. Exhibition labels stating 'This series required X flights to document Y crisis' make transparent what typically remains hidden. Such disclosure establishes ethical transparency while maintaining commitment to documentation's value. This transparency challenges viewers as well as practitioners. Audiences must reckon with their own complicity in demanding constant visual novelty, sharing images reflexively, storing photographs indefinitely in cloud systems whose material costs they never consider. Collective material consciousness of practitioners and audiences together acknowledging photography's infrastructure creates conditions for cultural transformation beyond individual ethical choices.

Photography's Irreplaceable Contributions

Despite material costs, photography achieves outcomes difficult to replicate through alternative media. It arrests time, making visible processes occurring too slowly for human perception like glacial retreat, forest loss, species decline. This temporal manipulation transforms abstract change into visceral evidence. It generates empathy through visual encounters, creating affective connections that statistics cannot achieve. Photography produces evidence usable across legal, political, and scientific contexts. Finally, photography crosses language barriers, enabling transnational circulation and solidarity. These capacities justify continued photographic practice despite material burdens, provided that practice operates consciously and strategically.

Turkey's Opportunity

Turkey's position straddling Europe and Asia, experiencing Mediterranean climate change while navigating rapid urbanization, offers particular opportunities for modeling alternative photographic practices. Turkish environmental photographers already demonstrate strategies worth examining globally.

Regional documentation networks minimize redundant travel. The Marmara mucilage crisis was documented primarily by Istanbul-based photojournalists like Özcan Yüksek, whose proximity enabled sustained coverage without long-distance flights (Daily Sabah, 2021b). This hyper-local model contrasts with international parachute journalism's carbon intensity while providing deeper contextual knowledge through sustained community relationships.

Murat Yazar's decade-long documentation of Euphrates and Tigris transformations exemplifies how regional photographers with linguistic and cultural access produce documentation international photographers cannot replicate (Pulitzer Center, 2024). His images of communities displaced by Ilısu Dam appeared in National Geographic while maintaining roots in affected regions, bridging local and global circulation through digital networks rather than print infrastructure.

Turkish education institutions can integrate material literacy into photographic education from inception. Teaching carbon calculations alongside composition, discussing archival sustainability alongside aesthetic principles, examining infrastructure alongside image analysis could produce practitioners conscious of photography's dual operation from career start. Turkey might thus contribute not only documentation of its own environmental struggles but also methodological innovations applicable globally.

Turkey's rich photographic heritage from Ara Güler's Istanbul documentation to contemporary environmental photographers like Ali Kabas provides historical models for ethically-grounded practice attentive to place and community. As Turkey negotiates between development imperatives and ecological preservation, its photographers might pioneer approaches balancing documentation's necessity with material consciousness, contributing methodological innovations applicable globally while addressing urgent domestic environmental challenges from agricultural transformation to coastal development pressures.

Future Horizons

Future research should develop comprehensive carbon accounting methodologies for photographic projects, enabling more precise cost-benefit evaluation. Impact studies examining whether crisis photography actually changes behavior would clarify effectiveness. Investigation of alternative technologies promising lower material impacts deserves sustained attention, as do community-based documentation models distributing production across local participants. Pedagogically, photography education must evolve to include material literacy as fundamental competency. Students

should learn to calculate projects' carbon footprints, evaluate archival implications, critique extractive practices, and design material-conscious work.

Final Provocation

Perhaps the question is not 'How do we photograph sustainably?' but rather 'What world do we want to photograph?' This reframing shifts attention from production methods to political vision. If photography's purpose is merely documenting ongoing destruction, it becomes witness to inevitable catastrophe. But if photography can imagine and help construct alternative futures, documenting not only crisis but resistance, not only loss but regeneration, not only endings but beginnings. It becomes co-creator rather than mere observer.

This requires aesthetic and political courage of photographing restoration alongside devastation, solutions alongside problems, resilience alongside vulnerability, joy alongside grief. It means recognizing that photography's greatest contribution may not be showing what's being destroyed but envisioning what might be built. The material costs we accept today should serve not nostalgia for disappearing worlds but commitment to worlds we're struggling to create. In this reorientation, photography becomes less witness and more midwife, helping birth the sustainable futures we desperately need while acknowledging honestly the material implications of that necessary work.

REFERENCES

Ackerman, J. (2007). The genius of photography: How photography has changed our lives. BBC Books.

Alinder, M. S. (2014). *Ansel Adams: A biography*. Bloomsbury.

Anadolu Agency. (2021, June 6). Turkey unveils action plan to clean Sea of Marmara. https://www.aa.com.tr/en/environment/turkey-unveils-action-plan-to-clean-sea-of-marmara/2265768

Aykaç, P. (2023). Absent presents: Musealisation of the historic town of Hasankeyf as a manifestation of 'absent heritage.' Journal of Architectural Conservation, 29(3), 241-260. https://doi.org/10.1080/13556207.2023.2180715

Azoulay, A. (2008). *The civil contract of photography*. Zone Books.

Balog, J. (2012). *Ice: Portraits of vanishing glaciers*. Rizzoli.

Banerjee, S. (2002a). Caribou Migration I, Coleen River valley, Arctic National Wildlife Refuge [Digital chromogenic print]. https://www.subhankarbanerjee.org/photohtml/arctic-photo-white-02.html

Banerjee, S. (2002b). Snow Geese I, Jago River valley, Arctic National Wildlife Refuge [Photograph]. https://www.subhankarbanerjee.org/

Banerjee, S. (2003). *Seasons of life and land: Arctic National Wildlife Refuge*. Mountaineers Books.

Banerjee, S. (2007). Caribou hunt—Charlie Swaney and Jimmy John [Photograph]. From the series Gwich'in and the Caribou. https://www.subhankarbanerjee.org/

Banerjee, S. (2012a). *Arctic voices: Resistance at the tipping point*. Seven Stories Press.

Banerjee, S. (2012b). Gathering Arctic voices. Institute for Advanced Study. https://www.ias.edu/ideas/2012/banerjee-arctic-voices

Banerjee, S. (2013). Gwich'in voices: Indigenous rights and the Arctic National Wildlife Refuge. In S. Banerjee (Ed.), *Arctic voices: Resistance at the tipping point* (pp. 28-47). Seven Stories Press.

Banerjee, S. (2020). Photography and the extractive economy. *Orion Magazine*, Spring 2020. https://orionmagazine.org/

Barad, K. (2007). *Meeting the universe halfway: Quantum physics and the entanglement of matter and meaning*. Duke University Press.

Birk, L. (2019). *Slow photography: Finding meaning in a fast world*. Self-published.

Bitcatcha. (2025, August 11). 11 best green web hosting 2025. https://www.bitcatcha.com/web-hosting/green/

Blind Magazine. (2023, May 31). Must we stop taking pictures to save the planet? https://www.blind-magazine.com/stories/must-we-stop-taking-pictures-to-save-the-planet/

Blossfeldt, K. (1928). *Urformen der Kunst* [Art forms in nature]. Ernst Wasmuth.

Broz, M. (2025). Photo statistics: How many photos are taken every day? Photutorial. https://photutorial.com/photos-statistics/

Burrard-Lucas, W. (2021, March 25). Photographer carbon footprint offset. https://willbl.com/photographer-carbon-footprint-offset/

Burtynsky, E. (2009). *Oil*. Steidl.

Burtynsky, E. (2018). Edward Burtynsky: The photographic archive as environmental practice. Aperture, 231, 34-41.

Çakar, K., & Seyitoğlu, F. (2023). Motivations and experiences of tourists visiting Hasankeyf as a last chance tourism destination. Journal of Ecotourism, 22(2), 237–259. https://doi.org/10.1080/14724049.2021.1965151

CIMAM. (2022). Exhibitions explore idea of 'sustainable museum'. International Committee for Museums and Collections of Modern Art. https://cimam.org/news-archive/exhibitions-explore-idea-of-sustainable-museum/

CIPA Heritage Documentation. (2019). Newsletter 15: Heritage documentation and dam projects. https://www.cipaheritagedocumentation.org/portfolio-item/newsletter_15/

Daily Sabah. (2021, May 30). Sea snot continues to expand in Marmara Sea. https://www.dailysabah.com/turkey/istanbul/sea-snot-continues-to-expand-in-marmara-sea

Daily Sabah. (2021, June 8). Protecting the Marmara Sea against mucilage menace. https://www.dailysabah.com/turkey/protecting-the-marmara-sea-against-mucilage-menace/news

Dawson, J., Johnston, M. J., Stewart, E. J., Lemieux, C. J., Lemelin, R. H., Maher, P. T., & Grimwood, B. S. R. (2011). Ethical considerations of last chance tourism. Journal of Ecotourism, 10(3), 250–265. https://doi.org/10.1080/14724049.2011.617449

Edgerton, H. E., & Killian, J. R. (1954). *Moments of vision: The stroboscopic revolution in photography*. MIT Press.

Edwards, P. N. (2010). *A vast machine: Computer models, climate data, and the politics of global warming*. MIT Press.

EPA (Environmental Protection Agency). (2021). *Greenhouse gas emissions from a typical passenger vehicle*. https://www.epa.gov/greenvehicles/

European Space Agency. (2021, June 6). Sea snot in the Marmara Sea [Copernicus Sentinel-2 satellite image]. https://www.copernicus.eu/en/media/image-day-gallery/sea-snot-marmara-sea

Gabrys, J. (2011). *Digital rubbish: A natural history of electronics*. University of Michigan Press.

Genco, C. (2015). Kaybolmadan: Istanbul's disappearing wooden heritage. Yapı Kredi Publications.

Happyfoodkitchens. (2024, June 17). 113 Instagram statistics you cannot miss in 2024: Unleash growth! *Medium*. https://medium.com/@happyfoodkitchens/113-instagram-statistics-you-cannot-miss-in-2024-unleash-growth-727057f68463

Haraway, D. J. (2016). *Staying with the trouble: Making kin in the Chthulucene*. Duke University Press.

Hasankeyf Matters. (2015). About the campaign. http://www.hasankeyfmatters.com/

Hemlock Printers. (2024, November 26). Sustainable print options, FSC certified. https://www.hemlock.com/sustainability/print-options/

Hürriyet Daily News. (2021, June 15). Authorities take concrete steps to save mucilage-covered Marmara Sea. https://www.hurriyetdailynews.com/authorities-take-concrete-steps-to-save-mucilage-covered-marmara-sea-165536

ICA San José. (2024). Environmental sustainability: 2024 emissions report. Institute of Contemporary Art San José. https://www.icasanjose.org/sustainability/

Initiative to Keep Hasankeyf Alive. (2016). About us. https://www.hasankeyfgirisimi.net/sample-page/

IPCC (Intergovernmental Panel on Climate Change). (2021). *Climate change 2021: The physical science basis*. Cambridge University Press.

Kabas, A. (2022). Awards. Ali Kabas Photography. https://alikabas.com/ali-kabas-professional-photographer-in-turkey

Karadurmuş, U., & Sarı, M. (2022). Marine mucilage in the Sea of Marmara and its effects on the marine ecosystem: mass deaths. Turkish Journal of Zoology 46 (1): 93-102. https://doi.org/10.3906/zoo-2108-14v

Kennicott, P. (2003, April 7). Politics and the National Museum. *The Washington Post*, C1.

Kramer, A. E. (2020, August 10). A 12,000-year-old settlement vanishes under the water. *The New York Times*. https://www.nytimes.com/

Lanting, F. (2018). The deliberate eye: Wildlife photography and environmental consciousness. National Geographic, October 2018.

Mirzoeff, N. (2016). How to See the World: An Introduction to Images, from Self-Portraits to Selfies, Maps to Movies, and More. Basic Books.

Mitchell, W. J. T. (1995). Picture theory : essays on verbal and visual representation. University of Chicago Press.

Miyake, Y., Maeda, O., Tanno, K., Hongo, H., & Gündem, C. Y. (2012). New excavations at Hasankeyf Höyük: A tenth millennium cal. BC site on the Upper Tigris, southeast Anatolia. Neo-Lithics, 1(12), 3-7. https://www.exoriente.org/repository/NEO-LITHICS/NEO-LITHICS_2012_1.pdf

Moore, J. W. (Ed.). (2016). *Anthropocene or Capitalocene? Nature, history, and the crisis of capitalism*. PM Press.

NASA Earth Observatory. (2020, March 13). Slowly flooding history [Satellite images by Lauren Dauphin, using Landsat data from the U.S. Geological Survey]. https://earthobservatory.nasa.gov/images/146439/slowly-flooding-history

National Geographic. (2018, November). In Turkey, a power play will leave ancient towns underwater. https://www.nationalgeographic.com/magazine/article/turkey-flooding-dams-displaced-antiquities-mesopotamia

National Observer. (2022, December 6). Photographer tells the story of climate change through lens of scientific camera. https://www.nationalobserver.com/2022/12/06/opinion/photographer-story-climate-change-scientific-camera

Palmquist, P. E. (1983). *Carleton E. Watkins: Photographer of the American West*. University of New Mexico Press.

Parikka, J. (2015). *A geology of media*. University of Minnesota Press.

PBS NewsHour. (2005, November 2). The ANWR drilling debate. https://www.pbs.org/newshour/show/the-anwr-drilling-debate

Pulitzer Center. (2024, November). A Kurdish photographer records the brutal transformation of the rivers that nurtured the cradle of civilization. https://pulitzercenter.org/stories/kurdish-photographer-records-brutal-transformation-rivers-nurtured-cradle-civilization

Salgado, S. (2013). *Genesis*. Taschen.

SERC (Smithsonian Environmental Research Center). (2020). Smithsonian Digital Asset Management System (DAMS). https://www.si.edu/dams

Sierra Club. (2020). How one photographer uses Instagram to document #everydayclimatechange. https://www.sierraclub.org/sierra/2020-5-september-october/mixed-media/how-one-photographer-uses-instagram-document-james-whitlow-delano

Smithsonian Magazine. (2009, March). Endangered site: The city of Hasankeyf, Turkey. https://www.smithsonianmag.com/travel/endangered-site-the-city-of-hasankeyf-turkey-51947364/

Sontag, S. (2003). *Regarding the pain of others*. Farrar, Straus and Giroux.

Spence, M. D. (1999). *Dispossessing the wilderness: Indian removal and the making of the national parks*. Oxford University Press.

Steffen, W., Broadgate, W., Deutsch, L., Gaffney, O., & Ludwig, C. (2015). The trajectory of the Anthropocene: The Great Acceleration. *The Anthropocene Review*, *2*(1), 81–98. https://doi.org/10.1177/2053019614564785

Stormpress. (n.d.). Eco-friendly production. https://www.stormpress.co.uk/about/environment/

Tate. (n.d.). Tackling the climate emergency. Tate. https://www.tate.org.uk/about-us/tate-and-climate-change

TechRadar. (2025, August 27). Best green web hosting of 2025. https://www.techradar.com/web-hosting/best-green-web-hosting

The Art Newspaper. (2024, December 19). Fairs are one of the art world's biggest sources of emissions, so how can they become more green? https://www.theartnewspaper.com/2024/10/11/fairs-are-on-the-art-worlds-biggest-sources-of-emissionshow-can-they-become-more-green

Türkiye Ministry of Environment, Urbanisation and Climate Change. (2021). *Marmara Sea action plan*. https://csb.gov.tr/

University of New Mexico Department of Art. (2024). Subhankar Banerjee. https://art.unm.edu/profile/subhankar-banerjee

U.S. Department of State. (n.d.). Subhankar Banerjee. Art in Embassies. https://art.state.gov/personnel/subhankar_banerjee/

U.S. Geological Survey. (2001). *Arctic National Wildlife Refuge, 1002 area, petroleum assessment*. USGS Fact Sheet FS-028-01. https://pubs.usgs.gov/fs/fs-0028-01/fs-0028-01.pdf

U.S. Fish and Wildlife Service. (2001). Potential impacts of proposed oil and gas development on the Arctic Refuge's Coastal Plain: Historical overview and issues of concern. https://arctic.fws.gov/

West, N. M. (2000). *Kodak and the lens of nostalgia*. University Press of Virginia.

World Cleanup Day. (2021). Capturing moments, consuming energy: The environmental impact of photos. https://www.worldcleanupday.org/post/capturing-moments-consuming-energy-the-environmental-impact-of-photos

Yüyan, K. (2020). *Kinship: Stories from the North*. Self-published.