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Green Shoots: Environmental Sustainability and Contemporary Film Production

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Abstract

This paper explores the emerging phenomenon of 'green filmmaking' in film production, whereby the process of filmmaking is conducted with a view to minimising environmental impact. Establishing the motivations behind green filmmaking and surveying a range of international developments in this area, sustainability initiatives are identified and considered as a means of environmentally-sustainable economic development for the film sector. After identifying challenges of consumption habits to be overcome by the film industry worldwide, recent and current initiatives are highlighted from within the international film industry and one is specifically explored in more detail: the emerging role of a designated crew member or 'eco-manager' to oversee environmental initiatives on-set. The paper then concludes on a range of brief policy proposals for the film sector following on from analysis of existing film industry policy towards environmental sustainability.

Keywords: Film; Environment; Sustainability

The Challenge of Sustainability

Climate change presents a monumental challenge to industries throughout the world. Industrial activities which require fossil fuel energy generate greenhouse gases which accelerate anthropogenic global warming.[1] The potential disruption to weather patterns and ecological integrity stemming from a destabilised climate carries a cost that would devastate the global economy if not human development itself. Alongside climate change are a range of less publicised but equally looming threats to the environment and human health, arising from how industries approach the management of waste, pollution, forestry, water resources and so forth.

With more and more scientific research affirming the imperative to cut down (and ideally eliminate) the use of fossil fuels,[2] there is a growing field of analysis, even from

[1] Intergovernmental Panel on Climate Change, *Climate Change 2013: The Physical Science Basis*, Fifth Assessment Report (Cambridge: Cambridge University Press, 2013).
[2] Intergovernmental Panel on Climate Change, *Climate Change 2014: Mitigation of Climate Change*, Fifth Assessment Report (Cambridge: Cambridge University Press, 2014).

analysts of the business world such as John Travers, urging industries to adopt more energy-efficient business practices and pursue the use of alternative energy.

John Travers notes that "the global market for renewable energy and clean technology and services was worth about €1.2 trillion in 2009"[3] and a 2013 report from Ernst & Young observed growth in the clean technology sector despite the global economic downturn. Gil Forer observed that "we've seen an annual gain of 18% in market capitalization (US$170b), and 12% increase in headcount" whilst confirming that "the corporate focus on energy efficiency continues to boost the segment, with the number of energy efficiency products companies jumping 14% to 50, and market capitalization increasing 25% to US34.6$b."[4]

If the pursuit of environmentally-sustainable technologies and business practices is emerging from a niche into a growing trend throughout the global economy, the film industry could identify this opportunity to position itself as an innovator in addressing consumption problems. Solutions that emerge could then be applied to other industries. However, the challenge to innovate solutions is particularly acute in an industry as energy-intensive as the audio-visual sector. This paper focuses on the context of feature film production.

The raw materials needed for production technologies, not to mention the power required for film shoots, can lead to a substantial environmental impact when one considers how feature films often take many weeks, if not months, of production. It is apparent that a lot of raw material is required for the development of sets and costumes during the pre-production phase, as are the logistics to organise scouting different locations and reserving them, in some cases disrupting the ecological integrity of remote outdoor locations. During the shoot there is a huge logistical challenge to provide transport and catering for the cast and crew (before disposing the waste they produce), to heat or cool sets as needed, to generate electricity for lighting and other equipment and to provide water to the set for consumption or in some cases for special effects' purposes. Productions with a larger budget could be employing hundreds if not thousands of people for many months, placing quite a significant demand on such resources and making sustainability a difficult objective.

Then the entire life-cycle of a film's environmental impact can be quite broad and far-reaching. What of the raw materials that were needed to manufacture the equipment used in film production? What of the printing, production and distribution of marketing materials to publicise the film? What of the distribution of the film itself in both cinemas and home video formats? What scope should we consider when discussing the full environmental impact of 'a film'?

The Environmental Footprint of the Film Industry

This paper follows the lead of a study by Green Screen Toronto, a Canadian group responsible for publishing a number of reports on sustainability in the film industry. Their 2008 report declared that "for the purposes of this study, only those environmental impacts occurring during the production process and by those involved in the production are evaluated; that is, those areas that are most feasible to address during the making of a production."[5]

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[3] John Travers, *Green & Gold: Ireland a Clean Energy World Leader?* (Cork: The Collins Press, 2010), 203.
[4] Ernst & Young, "Global cleantech industry grows by value and size, despite challenging market conditions," published August 8, 2013, http://www.ey.com/GL/en/Newsroom/News-releases/News_Global-cleantech-industry-grows-by-value-and-size.
[5] Felder et al., "Environmental Assessment: Environmental Assessment of the Film-Based Industries," *Green Screen Toronto*, published September 2008, http://www.greenscreentoronto.com/data/green_practices /00000003.pdf.

They acknowledge "that the impacts associated with the operations of a particular industry can be extraordinarily wide-ranging depending on the scope and time-scale that is pursued" but that their study shall "broadly identify the impacts of the film-based industries with the understanding that these represent but a small piece of the picture of the overall environmental footprint associated with operations."[6]

In any case, their study posits that a film production's consumption of resources is at its highest during the film shoot itself. They envisage a bell-curve where preparation for a movie starts off being office-based before gradually requiring more resources for shooting. After the shoot, work becomes largely office-based once again when it comes to post-production and co-ordinating distribution.

If this model is to be understood as focusing on those activities directly involved in film production then there may be some element of truth to it, although it is problematic when considering the impact of the consumption of films by audiences. However they have flagged this issue and made it clear that film production itself shall be the focus of their study.

It would be prudent to apply those parameters in this study as the production process is so energy-intensive that it would be a significant enough challenge to manage productions in an environmentally-friendly way, and one that, if successful, would be placing a great impetus on other industries to follow the example set by the film industry.

Approaching this challenge requires analysis of what resources film production demands, such as the research conducted by Green Screen Toronto. They propose that paper consumption and power for office spaces is a constant throughout every stage of the production process, then power for studios, set construction and film sets is required in the final stages of pre-production and throughout production: the demand for catering and transport also rises significantly during that time. Their research suggests that from post-production onwards the demand for resources decreases as most of this work is conducted from office buildings. They acknowledge limitations in such research of the post-production process:

> Post-production is largely associated with typical "office" activities of computer and office equipment use and other hardware, lighting, heating and cooling for offices, and paper generation. Electricity for editing and sound hardware, animation and CGI, and chemicals and film for hard copy processing, represent other possible impacts however are not treated in depth within this study.[7]

It is somewhat easier to address energy consumption issues in post-production with the increasingly common use of digital technology. The 'chemicals and film for hard copy processing' they refer to are becoming less commonplace and the more widespread digital post-production process conducted entirely through computer equipment can be potentially powered by clean energy sources. The introduction of digital to the shooting process itself somewhat reduces the shoot's environmental impact as film-stock cameras have in the past required industrial chemicals in their manufacturing, maintenance and produced them as a by-product of their operation. Digital cameras, of the kind that are increasingly more common for film production "reflect a pursuit of better environmental performance through light-weighting, increasing energy efficiency, incorporating parts made of recycled plastic,

[6] Ibid.
[7] Ibid.

and reducing packaging materials."[8] They also entail a significantly less cumbersome transfer process to prepare shot footage for the post-production process.

This paper shall focus primarily on the pre-production and production stages of the feature film production process as they arguably comprise the most energy-intensive part of film production and the part where reducing consumption and minimising environmental impact remains the most challenging. Two particular areas that pose a great challenge in this regard are the use of lighting and on-set generators.

Lighting on Film Sets

Film lights have historically been inefficient, often expending more of their energy on heat than light which can make film sets uncomfortably hot working environments with an occasional risk of fire hazards. Manufacturers of film lights have attempted to produce more energy-efficient lighting, whether it was the unique selling point of a start-up such as Kino-Flo and their fluorescent-tube lighting systems,[9] or the innovations of major manufacturers such as Arri who have branched out into LED lights.[10]

The film industry however is used to certain kinds of lights and switching to more efficient models such as LEDs will present a significant adjustment challenge. Irish cinematographer Penny-Merelle Gray explains how different types of lights can affect the colour temperature of a shot; "Basically because there are lots of different bulbs used to create one LED panel, you get weird colour temperatures off them; they are not the same as the tungsten or daylight colour temperatures which are the standard settings on most cameras."[11] She says a camera team could compensate for this effect by using colour gels but that the light itself is still noticeably softer than that which comes from conventional lights. This is because the quality of light they give is softer and more dispersed: different from the direct lighting offered by conventional tungsten bulbs.

Quite tellingly Gray says that, "I don't know of any rental houses in Ireland that can give you an entire lighting package made of LEDs. They don't have much throw the way larger wattage lights would."[12] This suggests that the industry needs to make more of an effort to provide alternative forms of lighting. However they may be deterred from doing this if there are practical concerns for how a camera team can work with them. There are some indications that such a transition may be possible, most notably from an initiative taken by Warner Bros. studios to convert the lighting systems in their studio facilities:

> Warner Bros. is installing new "house lights" equipped with energy-saving technologies on our stages. These induction lights are 240 watts compared to conventional 400 watt metal halide lights typically used in high bay applications. Also, these innovative lights turn on at only 40 watts to provide instant low level light. Then, each light has a motion sensor that, when activated, increases to full light levels. So, only stage areas in use are fully lit. It is estimated that this technology will save about 35,000 kwh of electricity per stage, per year.[13]

[8] Sony Pictures, "Sony Pictures - A Greener World," accessed July 20, 2014, http://www.sonypictures.com /green/act/promoting-digital/digital-workflow.php.
[9] www.kinoflo.com.
[10] www.arri.com/lighting/lighting_equipment/lampheads/led_lampheads.
[11] Penny-Merelle Gray, email to author, July 23, 2014.
[12] Ibid., July 29, 2014.
[13] Warner Bros, "Energy Conservation," accessed July 20, 2014, https://www.wbcitizenship.com/sustainability /energy/.

Generators on Film Sets

While energy savings may potentially be made in the area of lighting, generators that are used to power film sets typically run on diesel fuels at a huge cost to the environment. Green Screen Toronto highlight "fossil fuel use, particulate emissions, air quality, and smog formation"[14] from these generators as detrimental not only to the Earth's atmosphere but to the immediate working conditions of a film set.

Another report from Green Screen Toronto in 2009 advises that issues arising from the use of generators can be planned for if in consulting "with your generator operator, equipment supplier, gaffer, and respective crew members and departments" you can "set goals for how to optimize the use of generators."[15] They go on to list a range of potential solutions including:

> Use renewable energy options such as solar panels or other alternatives to power auxiliary energy loads when possible – When possible use grid electricity, or prioritize grid tie-in . . . Use biodiesel fuel in a B5 blend, and consider increasing this proportion in warmer months in keeping with the power quality demands of the production.[16]

The use of photovoltaic solar panels for generators may become more widespread if the technology such as that offered by the American supplier DC Solar[17] catches on, having already been used notably on the big-budget blockbuster *Inception*. When recommending a biodiesel blend for generators, Green Screen Toronto recognise that any blend higher than B5 (that is, 5% biodiesel, 95% petrodiesel) may not always be practicable.[18]

There could be an opportunity here for manufacturers to develop a workable B100 biodiesel generator to provide the alternative so sorely needed. It is questionable however whether biodiesel is the answer when its production has the environmental impact of creating monocultures on arable land that is otherwise needed for food production[19]. Professor David MacKay, a former Chief Scientific Advisor to the UK Department of Energy and Climate Change, has expressed scepticism that biodiesel is efficient enough to be considered an environmentally-sustainable fuel.[20]

The infrastructure is already in place for generators that run on petrochemicals so it may be worth considering whether there is some other alternative form of fuel that can work within this infrastructure. *Earthrise,* the environmental science series on Al-Jazeera English, highlighted two possibilities that could have a beneficial application to film-set generators.

Cynar plc[21] have a recycling plant in Portlaoise, Ireland. They have a process for heating plastic waste, liquefying it and distilling it back into a substance that has virtually all the same combustible properties of crude oil. Substituting petrol with this synthetic fuel would reduce carbon emissions by more than a third by harnessing the carbon molecules already in plastic which would have otherwise been contributing to pollution in landfills.

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[14] Felder et al., "Environmental Assessment."
[15] Green Screen Toronto et al., "Green Practices Handbook: Environmental Options for Film-Based Industries (2009 Guide)," accessed July 20, 2014, http://www.greenscreentoronto.com/data/green_practices/00000002.pdf.
[16] Ibid.
[17] www.dcsolardistribution.com/solutions/entertainment.
[18] Green Screen Toronto et al., "Green Practices Handbook."
[19] David MacKay, *Sustainable Energy: Without the Hot Air,* (Cambridge: UIT Cambridge, 2009), http://www.inference.eng.cam.ac.uk/sustainable/book/tex/sewtha.pdf.
[20] Ibid.
[21] www.cynarplc.com.

Another company in Spain, Biopetroleo[22], have a similar principle of reusing carbon and have developed their own synthetic fuel through the chemical reactions between carbon molecules from CO_2 pollution, algae and high levels of barometric pressure. This synthetic fuel not only has the same combustible properties of crude oil but actually consumes carbon pollution from the atmosphere; a fuel that is not just carbon-neutral but which reduces carbon dioxide in the atmosphere.

According to Earthrise, if either of these fuels became mass-produced they could be used in some models of existing generators the same way conventional diesel is. This could help reduce a film set's environmental footprint until such a time that alternatives such as solar-powered generators or adequate grid capacity became economical.

Introducing Sustainability to Filmmaking

It seems as though reducing the environmental footprint of film production is a monumental challenge even when dealing with an inelastic amount of resources. If this were accomplished to a significant degree, it could have a knock-on effect encouraging sustainability across other industries. Indeed other industries seem to be moving towards sustainability initiatives and global political, economic and technological momentum could see legislative frameworks emerging around them. Preparing for this shift would be beneficial for the film industry, as the British Standards Institute outlines: "Exemplary sustainability performance leads to recognition from peers, audiences, investors, stakeholders and NGOs. It reduces reputational risk and enhances competitiveness. It helps organizations get on top of existing regulatory requirements and ahead of future legislation."[23]

Indeed their document outlining the BS 8909 sustainability standards for the British film industry explicitly highlights how future environmental legislation is something the film industry, like others, will be expected to accommodate:

> To help the industry stay ahead of any changes in legislation and regulation – the value for companies buying into BS 8909 would be that they could plan their activities and investment in such a way as to minimise the costs and disruption that would otherwise arise when environmental and other standards are increased, either at UK or at European level.[24]

Sustainability for Studio Facilities

There are indications from around the world that different sectors of the international film industry are prepared to invest in sustainability initiatives.[25] A high-profile example from the United States is the directing team the Wachowskis investing in Kinowerks, a facility housing their pre-production and post-production work in their home city of Chicago. They "invested $6.8 million to make the building environmentally responsible" under the direction of "VOA

[22] www.biopetroleo.com/english.
[23] British Standards Institution, "Sustainable Film," accessed July 20, 2014, http://shop.bsigroup.com /Browse-By-Subject/Environmental-Management-and-Sustainability/Sustainability/Sustainable-film-with-BS-8909/.
[24] British Standards Institution, "BS 8909 Guidance Notes," published May 2011, http://shop.bsigroup.com /upload/Standards%20&%20Publications/Environment /BS%208909%20Guidance%20Notes%20-%20finalV4.pdf.
[25] http://greenfilmshooting.net/.

Associates, Incorporated, the distinguished Chicago-based, international architectural firm."[26] While this constituted a large investment, it appeared to pay off when "the building's innovative design won a coveted a LEED Gold rating for energy and environment design from the U.S. Green Building Council" as well as several other environmental and architectural awards.[27]

Writing for *Reel Chicago*, Mae Simonsen describes how the push for energy efficiency has not hampered how well-equipped the Kinowerks building is, with "editing suites, a sound studio, a green screen studio, a 409-seat screening room, offices, conference room, an Italian cafe/lounge and an indoor basketball court. A considerable amount of the interior and furnishings were constructed from recycled materials."[28] She goes on to describe other environmental initiatives throughout the building: "The old roof was replaced with a 1,500-sq. ft. green roof, full of vegetation. Rainwater is collected for irrigation of the roof's plant life. To provide 30kW of solar power, 150 photovoltaic (PV) cells, which convert the energy of light into electricity, were added to the roof."[29]

Such innovations can be recognised in America with LEED certification from the U.S. Green Building Council. On a website promoting their social enterprise activity, Warner Bros. promote their achievements in renovating their own studio facilities:

> Warner Bros. received the first LEED™ certification for green building in our industry in 2009. Our Studio now has four LEED™ certified buildings as awarded by the US Green Building Council (USGBC). Green building principles include energy efficiency, water efficiency, improved indoor air quality, waste reduction and utilization of locally sourced, recycled and sustainably produced materials.[30]

Their website explores a range of ways through which they have achieved these standards including the use of solar panels, efficient heat regulation and many other technical adjustments to their buildings. There is further evidence to suggest that production facilities for the film shoot itself can be made environmentally sustainable and not just through smart planning of new facilities but by renovating existing facilities.

Ealing Studios, one of Britain's oldest studios, drafted sustainability policies in compliance with BS 8909 and strive to practice them on all future productions.[31] Another one of Europe's oldest film studios, Bavaria Film Studios in southern Germany, have capitalised on Germany's position as a world leader in green energy, to virtually eliminate its carbon impact. Bavaria Film Studios is a sprawling studio complex housing large-scale national and international film productions. It consists of many old buildings and yet is now almost entirely zero-carbon in its production activities after extensive renovation work that is already precipitating massive savings in energy efficiency.

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[26] Mae Simonsen, "Wachowskis' Kinowerks the best of green technology," *Reel Chicago,* July 25, 2011, http://www.reelchicago.com/article/wachowskis-kinowerks-best-green-technology.
[27] Ibid.
[28] Ibid.
[29] Ibid.
[30] Warner Bros, "Green Building," accessed July 20, 2014, https://www.wbcitizenship.com/sustainability/green-building/.
[31] British Standards Institution, "BSI Case Study Ealing Studios Enterprises," accessed July 30, 2014, http://shop.bsigroup.com/upload/Standards%20&%20Publications/Environment/case_studies/BS8909Ealingstudioscasestudy.pdf.

> Bavaria Film has invested about 30 million euros into modernization. With a combination of measures, they have succeeded in reducing carbon emissions by 97 percent over the course of two years: from 7,000 tons per year in 2011 to 200 tons projected by the end of 2013. The remaining emissions are offset by an investment in a geothermal energy project in Indonesia. The heating system on the Bavaria Film lot was converted to geothermal energy from a nearby source in the summer of 2012.[32]

Funding Incentives for Green Filmmaking

The success stories of Bavaria film and many others throughout Europe are highlighted by the Green Film Shooting journal, an annual journal published at the Berlinale Film Festival by the Green Film Initiative out of Germany. Founder of the Green Film Initiative Michael Geidel explains that their goal "is to cooperate with the industry to create guidelines for sustainable film production. We have, for example, collaborated on the Best Practice Guide issued by the Filmförderung Hamburg Schleswig-Holstein for the Green Shooting Card."[33]

This Green Shooting Card scheme appears to be promising, as it is a standardised way of assessing the green credentials of a film production. It is awarded to film productions that achieve a certain level of resource-efficiency, in much the same way energy ratings are given to buildings. In order to achieve this distinction and the rewards it comes with, film productions must submit reports on what efficiencies they have achieved in at least 3 of the 5 following areas: Production Design, Catering, Equipment/Transport, Production Office/Crew, producing an eco-balance sheet.[34]

Writing for the Green Film Shooting journal, Birgit Heidsiek highlights a variation on this approach to come out of Belgium. Rather than assessing the environmental impact of a production after it has wrapped, the Flanders regional funding authority is asking producers to estimate upfront how much carbon emissions the production will produce and have made a section of allowable funding contingent on the submission of such a report."Besides raising awareness of green production, VAF is asking producers to deliver a carbon footprint of their productions in order to receive the final instalment for production funding (€47,500 to €65,000)."[35] While it may be harder to estimate a shoot's environmental impact before it has even started, this could well be an effective way of getting producers to consider such issues from the outset.

Heidsiek also writes about another funding scheme from the Provence-Alpes-Côte-d'Azur (PACA) region in southern France:

> PACA offered producers a green incentive that is unique in the European film funding landscape. Film projects supported by the region received additional support of up to €50,000 if they signed up for the sustainability deal. Altogether, 36 productions took advantage of this green incentive, among them not only short films and documentaries but also internationally renowned feature films.[36]

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[32] Bernd Jetschin, "On A Green Mission: Bavaria Film features the first zero-carbon film studio," *Green Film Shooting*, February, 2013, 13.
[33] Bernd Jetschin, "Reduce, Re-Use, Recycle," *Green Film Shooting*, February, 2013, 11.
[34] Filmförderung Hamburg Schleswig-Holstein, "Green Shooting Card," accessed May 15, 2014, http://www.ffhsh.de/en/film_commission/gruener_drehpass.php.
[35] Birgit Heidsiek, "An important incentive: The Flanders Audiovisual Fund in Belgium is asking producers for a carbon footprint," *Green Film Shooting,* February, 2014, 9.
[36] Birgit Heidsiek, "Sustainability reloaded," *Green Film Shooting,* February, 2014, 13.

Although this funding scheme ended in 2013, there has since been a "Sustainability Development Training Program for local professionals in Nice and Marseille" which "includes a workshop on stage lighting as well as sustainability training sessions for stage managers and production managers."[37] So even though the financial incentive from the regional funding body is no longer there, there is still important work being done in that region to up-skill crews in how to conduct their shoots in an environmentally-conscious way, illustrating the persuasive impact the funding scheme must have had on professionals working in that region.

Developing Standards for Green Filmmaking

International experience so far would suggest that environmental initiatives are more successful when there is buy-in from industry practitioners. The development of the BS 8909 guidelines in the UK are an example of the industry collaborating to promote sustainability, having emerged from a drafting process that involved "representatives from production (Production Managers Association), exhibitors (Cinema Exhibitors Association), distributors (Film Distributors Association), facilities (UK Screen Association), sales (Film Export UK), trades unions (Federation of Entertainment Unions) and archives (British Film Institute) and the UK Film Council."[38] This committee also agreed to focus on the context of feature film production:

> The view of the meeting was that for reasons of practicality it would be better to work with a drafting group drawn from the feature film industry and to focus on issues of concern to the feature film industry, while recognising that much of what was discussed would be equally applicable to a wider range of screen media. The ambition is that, over time, BS 8909 will provide a useful template for other screen media.[39]

In order to comply with BS 8909 a production would have to outline objectives in sustainability as well as an action plan to achieve them. This is so their action plan could be measured in terms of its effectiveness through meticulous standardised record-keeping. This initiative differs from the Hamburg funding authority's Green Shooting Card scheme as they felt this model would not be workable in the UK:

> The drafting group's view was that because of the long and often complex life-cycle of a feature film, it does not make sense to give a film a 'green badge', but it should be possible for producers to include a claim, as part of a film's credits, along these lines – "This film was produced by [insert name of organization], which operates a sustainability management system that conforms to BS 8909."[40]

Awarding a film that distinction is not quite as salient as the benefits associated with a Green Shooting Card or similar distinction but it would be practiced in the hope that these sustainability standards become more widespread throughout the British film industry. It does

[37] Ibid.
[38] British Standards Institution, "BS 8909 Guidance Notes."
[39] Ibid.
[40] Ibid.

demonstrate awareness on the drafting committee's part that the environmental footprint of a film production's entire life-cycle can be problematic to determine.

Such long-sightedness could possibly emerge in the United States where the major Hollywood studios formed together to create their own guidelines in collaboration with the Producers' Guild of America (PGA).

> The Green Production Guide features a searchable database of vendors with information about their green products, services, their production experience and what locations they serve. The new site also offers a Carbon Calculator [which] can be downloaded to help producers determine their production's carbon footprint and the "PGA Green Unified Best Practices" guide, which details best practices for sustainable film and television production.[41]

The Green Production Guide consists of suggestions on how to improve environmental initiatives in film production, rather than a standardised framework of the kind developed for BS 8909. Nevertheless, "a database of 2,000+ companies that provide sustainable and energy saving products and services for film, television and commercial productions"[42] is made available through a website and an App for mobile devices. This eases efforts to green film productions whilst also promoting green enterprise throughout the United States in one searchable database. This should have a positive impact on both the organisation of film shoots and the broader economic development of the green sector.

Major studios such as Warner Bros. and Sony Pictures seem to be beginning a transition towards more sustainable business practices. Sony Pictures also have website listing a number of green initiatives. They are too numerous to explore here but notably include extensive re-use of sets, the successful implementation of a waste-to-energy programme at their Culver City studio facilities and their adoption of ISO 14001, "a set of international guidelines that set standards for businesses' environmental management efforts."[43] They claim that following these guidelines has vastly improved their "treatment of hazardous and solid waste; energy use; water use; contracts with vendors; purchase of hazardous materials; frequency of management review and internal audits" resulting in a scenario where "the rate of hazardous waste disposal for Sony Pictures Studios has decreased 95% since 2007."[44]

International Promotion of Green Filmmaking

Technical frameworks of greater clarity such as ISO 14001 or BS 8909 can motivate management to comply effectively with ambitious goals. But that is not to dismiss the impact documents with more general suggestions and aspirations can have: sometimes it is a matter of highlighting what practical, simple measures can be taken to maximise sustainability in order to raise awareness of these opportunities among industry practitioners in the first place.

We see such documents produced in Australia where the Good Green Production Bible was published by Greenshoot Pacific, a consultancy firm for sustainability in the

[41] Green Production Guide, "About the Green Production Guide," accessed July 20, 2014, http://www.greenproductionguide.com/about/.
[42] Green Production Guide, "Get the App," accessed July 20, 2014, http://www.greenproductionguide.com /mobile-app/.
[43] Sony Pictures, "ISO 14001 - Environmental Management," accessed May 15, 2014, http://www.sonypictures.com/green/act/corporate-operations/ISO14001.php.
[44] Ibid.

Australian entertainment industry.[45] In New Zealand, the Ministry for the Environment collaborated with New Zealand's Screen Production and Development Association in 2005, to produce the Greening the Screen sustainability toolkit. Based on study of initiatives taken on film sets in New Zealand and internationally, the Greening the Screen website outlines suggestions on how to maximise sustainability during film productions.[46] It is now maintained by Film New Zealand, the national film business and shooting locations agency.

In the UK, the British Film Institute have established Greeningfilm, an online resource which "aims to help professionals working in every part of the film industry – studios, locations, distribution, exhibition, special effects, post-production and archives – implement a sustainable strategy as part of their ongoing activity for environmental, ethical and economic reasons."[47]

These initiatives all sound comparable to Green Screen Toronto, whose research has informed this paper, though Green Screen Toronto have done more than publish reports based on their research. They offer eco-consultancy services and have published a Green Screen Resource Directory which provides information on businesses in the green sector who can assist the film and television industry of Canada.[48] This is similar to the database of American green businesses published by the PGA.

The Irish Film Board (IFB) have a produced a toolkit document similar to ones that have emerged in Australia and New Zealand. It outlines various practical measures film productions can take "to limit their environmental impact, whilst also saving money."[49] It was produced assuming that the inter-connected nature of the relatively small film industry in Ireland would precipitate the familiarity of green practices from one set to another throughout Ireland: "The very nature of screen production in Ireland, where groups of professionals come together for a few months and then disperse to other projects, provides a great opportunity for green practices to spread throughout our industry."[50]

A Specific Crew Role for Sustainability

Film industries around the world should identify substantive ways to contribute to this emerging field if they do not wish to be left behind by other resourceful film industries. A novel approach would be the appointment of an eco-manager to set: a crew member with the specific role of maximising sustainability.

Efforts to maximise the environmental sustainability of film sets will be difficult to implement and hard to measure without assigning a specific person or team of people to organise them. Conceivably, the unit production manager could be assigned the additional duty of overseeing sustainability policies on the film set but there could be concerns that this would add to an already considerable workload. Production accountants could also be tasked with some kind of auditing of a set's waste production, energy consumption and carbon footprint but implementing the environmental measures necessary to mitigate these is most likely outside the skill-set of accountants. Thus a relatively new phenomenon has emerged on certain film sets whereby a single crew member oversees environmental initiatives on-set.

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[45] http://www.greenshootpacific.com/downloads/good-green-production-bible/.
[46] http://www.greeningthescreen.co.nz/about/project/.
[47] British Film Institute, "About GreeningFilm," accessed July 20, 2014, http://www.greeningfilm.com/about.
[48] http://www.greenscreentoronto.com/.
[49] Irish Film Board, "IFB Green Production Toolkit," accessed July 30, 2014, http://www.irishfilmboard.ie /files/IFB%20Green%20Production%20%20Guidelines.pdf
[50] Ibid.

This role has been referred to variably as "eco-manager", "eco-supervisor" and "green production manager". A specified term has not yet emerged nor has a recognisable framework for how this crew member does their job. But a clearer definition of this role may emerge in years to come if film productions seek to maximise their environmental sustainability. This challenge persists partly due to a common perception identified by Green Screen Toronto:

> The film-based industries are increasingly recognized as wasteful in terms of their environmental impact. This outcome has been in part due to productions being constrained by budget and especially by the value of time - meaning that also addressing environmental impacts is sometimes perceived as unrealistic and expensive.[51]

If however a single person were responsible for sustainability on-set they would have the expertise to know what policies would be the most effective whilst causing the least inconvenience to crews. If this person were fully integrated into the crew they could then demonstrate and pass on their expertise to crew members. This person would be responsible for researching and implementing sustainability solutions and facilitating ease of compliance on-set. They could oversee the responsible disposal of waste during and after the shoot. They could even promote this work being done on-set through social media, press engagement and where possible, the application of celebrity endorsement, in the hopes that it would raise awareness for the feasibility of green filmmaking.

The advantage of assigning these duties to a specific role is that responsibility can be delegated to a crew member of expertise who can monitor the progress of green initiatives in order to audit savings in energy, waste and finances and to identify the practices that would be most effective when applied elsewhere in the industry. If net savings can be secured for the production then this should justify the salary of some kind of eco-specialist who understands the particular challenges faced by film. The PGA have suggested that, "if no one is available to oversee a production's sustainability efforts from the onset, success rates are much lower. The emerging role of the Eco Supervisor is proving crucial to that success."[52]

This role has already emerged in a variety of production contexts. It has been performed on big-budget Hollywood productions such as *Noah* and *The Amazing Spider-Man 2*[53] by Emellie O'Brien, whose New York-based social enterprise Earth Angel NYC offers sustainability consulting and on-set eco-supervisors for film and television productions.[54] In a micro-budget context, students based in Dublin on the Filmbase MSc in Digital Feature Film Production awarded by Staffordshire University, produced two feature films in 2014: *Poison Pen* and *The Light of Day*. Sustainability on these films was overseen by a student and former Green Party politician John Gormley who acted as a green production manager. The Filmbase students were eventually recognised by winning 1st prize in Strawberry Earth's international Green Filmmaking Competition.[55] Productions of all sizes could make significant reductions in cost and environmental impact if this role becomes more commonly practiced and accepted within the industry.

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[51] Green Screen Toronto et al., "Green Practices Handbook."
[52] Green Production Guide, "Eco Management," accessed July 19, 2014, http://www.greenproductionguide.com /eco-management/.
[53] http://earthangelnyc.com/impact/diversion-rates/.
[54] http://earthangelnyc.com/services/eco-crew/.
[55] http://www.greenfilmmaking.com/competition/edition-2014/participants-2014/.

The Opportunity of Sustainability

Aside from facilitating and promoting some kind of 'eco-manager' role on film productions, there are other measures a national or local film industry could pursue to position itself as a global centre for green filmmaking:

- Promote itself internationally as a place to make 'green' films.
- Renovate existing film industry facilities.
- Where State bodies exist with separate remits for film, television and other aspects of the audio-visual sector, amalgamation could lead to more cohesive industry development between the film industry and TV stations, not just in environmental standards but in producing quality content.
- Consider recognising certain shoots with a Green Shooting Card, much like an energy-rating system for buildings, as practiced in Hamburg.
- Consider making some funding contingent on submitting a report on the environmental impact of one's production, as practiced in Belgium.
- Assign someone at your studio/organisation with the role of fostering green innovations.
- Lobby government, industry and communities to invest in green technology.

This paper began by outlining the social imperative for environmental sustainability. While environmental issues entail profound consequences for society, there is a growing consensus that more environmentally responsible activity is not only necessary to avoid calamity but a novel way to benefit from more efficient forms of conduct. Economic benefits from pursuing sustainability would particularly accumulate under emerging frameworks to regulate the environmental impact of industry. Productions that had either an ethical or financial concern around environmental impact, energy consumption and waste management would be attracted to any country that actively developed an infrastructure for green filmmaking. Indeed there was acknowledgement that the British film industry developed their BS 8909 guidelines partly "to give the UK industry a possible point of competitive advantage internationally – operating to good environmental standards would help the industry keep its costs down and make it more attractive to environmentally conscious investors, producers and talent from abroad."[56]

Being a global centre for green film production would be a valuable selling point for any film industry. Practical steps towards achieving this are emerging and industries that are slowest to adopt them are likely to miss out. The audio-visual sector is an adaptable industry that has had to adjust to many shifts in technological, economic and cultural circumstances of recent years. It is an energy-intensive industry but if it were to accomplish a transition such as this, it would be setting an example for other industries to follow. The film industry after all, often likes to think of itself as being ahead of the curve on important social issues: the environment is an issue of pervasive social importance and one that they now have an opportunity to lead on.

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