CLWSTWR POLICY BRIEF NO 4

GREEN INNOVATION FOR THE SCREEN SECTOR

THE ROLE OF R&D IN WALES AND FINDINGS FROM CLWSTWR

Ruxandra Lupu, Marlen Komorowski, Gregory Mothersdale & Justin Lewis

June 2022

Contents

Introduction

The United Nation's Sustainable Development Goals[1] call for action to tackle climate change and to preserve our oceans and forests. Goal 13 (Climate Action) in specific, stresses the fundamental importance of environmental sustainability today. But environmental sustainability remains challenging for an energy- and travel-intensive sector like film and television.[2]

The latest data published by albert[3] shows that one hour of TV produced in the UK contributes the equivalent of 5.7 tCO2e, representing a 30% increase from 2020, but remaining significantly lower than 2019's average figure of 9.2t CO2e – and indicating COVID-19 restrictions on TV production had positive effects on emissions. Even the lowest figure, however, shows that one hour of TV has a larger carbon footprint than a typical passenger vehicle (about 4.6 tCO2e) over the course of an entire year. However, the carbon cost of blockbuster films with budgets of more than $70m (£53.5m) is strikingly high, producing an average of 2,840 tCO2e per production[4] – a figure 150 to 250 times higher per viewing hour of content than TV – and equivalent to the amount absorbed by 3,700 acres of forest in one year. Around 51% of these emissions are related to transport, with much of the rest due to energy consumption.

There have been a number of initiatives to tackle the environmental impact of the screen sector. These include very specific actions, such as 'Green Shooting', deploying net zero technologies for media production, hiring an eco-manager[5], or shifting behaviour and attitudes on the production set.

THIS POLICY BRIEF EXPLORES THE OPPORTUNITIES AND CHALLENGES SURROUNDING GREEN SCREEN SOLUTIONS AND HOW GREEN

---

1 https://sdgs.un.org/goals

2 https://esource.dbs.ie/bitstream/handle/10788/2957/28-14-1-PB.pdf?sequence=1&isAllowed=y / https://iopscience.iop.org/article/10.1088/1755-1315/794/1/012075/meta / https://www.mdpi.com/1027810

3 https://wearealbert.org/wp-content/uploads/2022/06/albert-AR-2021_Final.pdf

4 https://www.arup.com/perspectives/publications/research/section/a-screen-new-deal-a-route-map-to-sustainable-film-production

5 Netflix's 'Havoc' in Wales is a good example of environmental stewardship in this area. Another example is, Screen Ireland who has set out to fund a Sustainability advocate up to five days on all SI-funded projects to encourage better practices and to use more circular methods of production on set.

INNOVATION IN THE WELSH SCREEN SECTOR CREATES NEW POSSIBILITIES. WE DEFINE GREEN INNOVATION AS THE PROCESS THROUGH WHICH NEW PRODUCTION, SERVICES AND TECHNOLOGIES ARE CREATED, WITH THE AIM OF REDUCING NEGATIVE ENVIRONMENTAL IMPACTS.[6]

We provide evidence from a variety of studies and reports published by organisations such as the BFI, the Welsh Government, BAFTA and Clwstwr, as well as our own quantitative survey data[7] and case studies from Wales and beyond. Based on this review, we will make recommendations on policy measures to better address specific 'green' screen sector needs through green innovation, and present our agenda for the future.

Current practices and policies for a greener screen sector

Europe

The European Commission aims to make the EU climate neutral by 2050. In 2020 it approved the **Green Deal**[8], which includes a set of measures reviewing existing laws and introducing new legislation. This enforces already existing EU regulations that impact the screen sector such as the Energy Performance of Buildings Directive (EPBD) and the Ecodesign Directive that production sets/cinemas need to comply with, as well as The New Directive on Single-Use Plastic Products.

The need for a more cohesive and collaborative approach to tackle the climate impact of the screen sector has seen the rise of several European organisations and initiatives.

- In 2012 **Cine Regio**, a network of 43 regional film funds in Europe, established a sub-group called "Green Regio" to raise awareness and share knowledge on sustainable film production tools, measures and

---

6 Castellacci, Fulvio, and Christine Mee Lie. "A taxonomy of green innovators: Empirical evidence from South Korea." Journal of Cleaner Production 143 (2017): 1036-1047.

7 A survey was conducted by the Clwstwr program involving 389 Welsh creative business from 2019-2021.

8 https://ec.europa.eu/info/strategy/priorities-2019-2024/european-green-deal_en

policies. Collective approaches to rating systems and certifications for the film sector have been developed to create pan-European tools. This includes Green Film[9], Eureca[10] and the ECOPROD Charter[11] which offer certification systems for film productions, carbon calculators as well as access to green providers.

- **Creative Europe MEDIA** encourages competitiveness, innovation, and sustainability of the audiovisual sector in Europe. One of the four strands of the MEDIA programme for 2022-2026 is Policy Support[12], which aims to create a holistic European audiovisual policy by fostering the greening of the industry and encouraging inclusion, equality, diversity and participation.

- The **European Film Commissions Network (EUFCN)**[13], which is a non-profit association committed to foster and promote a more sustainable and efficient film industry in Europe by sharing all green protocols, best practices and tools.

- The **European Film Agency Directors association (EFAD)**[14] through its Sustainability working group, exchanges best practices and information on sustainable initiatives launched by national film funds and other partners.

- The **Film.eu Alliance**[15] has set environmental sustainability as the core challenge for 2023, through a series of joint measures that put green practices at the core of education: micro-credential courses to certify green consultancy for film/media industries following creative Europe, EU and national laws; explicitly embedding sustainability in undergraduate and postgraduate programs across allied universities.

A study undertaken by the Green Screen partnership[16] analysed 30 EU funded projects and innovations (2014-2019) finding practices along the whole value

---

9 https://www.green.film

10 https://www.eurecafilm.eu

11 https://www.ecoprod.com/fr/les-outils-pour-agir/ressources-utiles.html

12 https://culture.ec.europa.eu/creative-europe/creative-europe-media-strand/policy-support-cluster

13 https://eufcn.com/green-filming/

14 https://europeanfilmagencies.eu/policy/working-groups/sustainability

15 https://www.filmeu.eu/research-and-innovation/about-rit

16 https://www.cineregio.org/dyn/files/pdf_download/11-file/CineRegio_GreenReport2020_25022020_SinglePages.pdf

chain that can reduce the environmental impact of the screen sector. This includes, for example, setting up video conferences to reduce travel emission during pre-production, using hydrogen-powered gensets instead of diesel-powered generators at the production stage, employing automated scripts and Virtual Machines in post-production, using machine-learning dispatchers and high-performance computing data centres to save rendering time/ costs and using a hybrid content delivery network (CDN) which combines standard unicast with Peer-to-Peer (P2P) to reduce bandwidth for video content in broadcasting. These innovative solutions are not yet deployed on a large scale across Europe.

The UK

There is UK legislation in place to ensure that UK businesses meet the minimum standards required to reduce their impact on the environment. The **Climate Change Act** and a series of policies around waste and recycling[17] encourages businesses to better monitor their impact on the environment.

Aiming for a unified **Green Taxonomy system**, in 2021the UK Government set up a new independent Green Technical Advisory Group to advise on standards for green investment.[18] However, regulations affect businesses in different ways, based on their size and type. Public bodies must deal with top-down requirements from Government that all their procurement activities meet certain green standards (ISO 14001/registration under EMAS). Broadcasters are private entities[19], making them exempt from these requirements.

Interventions in this sector are therefore largely voluntary. A key initiative, in this context, is the creation of **albert**[20], a UK environmental organisation funded by broadcasters whose purpose is to encourage the TV and film industry to reduce their environmental impact. The albert carbon calculator

---

17 https://www.gov.uk/environment/waste-and-recycling

18 https://www.gov.uk/government/news/new-independent-group-to-help-tackle-greenwashing

19 According to the Welsh Government, public bodies are those that are linked to or funded by Government such as the National Library, Museum, Arts Council of Wales etc.

20 https://wearealbert.org/

gathers data on emissions and albert provide core training in sustainability in AV production.

Due to reporting remaining largely voluntary in a diverse set of businesses, data gathering remains a difficult process, often requiring a non-standard approach to data collection. The need for a more robust sustainability compliance has also seen the release of a series of public policies as well as strategies and regulations that enable screen businesses to reduce their environmental impact.

On a practical level, film organisations have aligned to (or surpassed) legal requirements by attaching specific conditions to their funding. For example, the **British Academy of Film and Television Arts (BAFTA)** enables broadcasters and production companies to decide what level of compliance they want to adhere to: footprinting (e.g. UKTV, Channel 4, Netflix UK and Channel 5) or going through the entire certification process (BBC, Sky, ITV) with a requirement to offset the final footprint.

As environmental pressures on the sector increase, more broadcasters are expected to go for the full certification process. For example, as part of its Sustainability plan (Five Year Strategic plan 2021-2025), Screen Ireland has announced it will soon make the use of carbon calculators for all Screen Ireland funded projects mandatory.[21] BAFTA refers to the albert Carbon calculator/ certification toolkit as the only tool that has built behavior change into the workflow. The **British Film Institute (BFI)** requires any major production receiving funding from them to provide mandatory carbon reporting and participate in carbon literacy training.[22]

Wales

Over the last decade, the Welsh Government developed an approach to sustainability, through specific actions that put responsibility and ambition at the heart of policymaking. Concrete steps included: writing important sustainable goals into Welsh law, signing the Global Climate Leadership Memorandum, passing the **Well-being of Future Generations Act** and **the**

---

21 Announced at the Sustainability Summit, min2:34:40:
https://www.youtube.com/watch?v=zpGtNoTM7V4&t=10581s

22 https://www.bfi.org.uk/strategy-policy/policy-statements/sustainability

Environmental Act, establishing the World's first statutory independent Future Generations Commissioner, founding the Climate Groups Future Fund as well as joining the Powering Past Coal Alliance and the Well-being Economy Government Network.

The Welsh Government's approach to environmental policy cuts across the organisation through strategic documents such as **Net Zero Wales** and **Prosperity for All**.[23] The Net Zero challenge is at the heart of a new Welsh Government Innovation Strategy ensuring a coherent science and innovation system. A new carbon reporting methodology[24] was developed for public bodies which could become a reference point for broadcasters/productions. These policies aim to establish corporate responsibility as a core driver for screen businesses to develop very clear sustainable development plans and goals. In addition, they have an important regulatory effect on Wales's fast-growing creative economy.

The Welsh screen sector employed more than 9,000 people at the end of 2019 - an increase of 27% in the workforce since 2017.[25] In order to sustain such growth, the **Senedd Cymru Welsh Parliament** acknowledges the importance of the screen sector and aims to develop support by prioritizing skills and supply chain development, improving networks/partnerships, intellectual property (IP) exploitation, scalable funding models and inclusion.

This is reflected in the work of bodies like **Ffilm Cymru Wales**, the development agency for Welsh film. Ffilm Cymru's strategy for environmental sustainability comprises four strands that support the greening of the screen sector: Research (studies), Innovation and Collaboration (Screen New Deal, Greening the Screen), Funding (Green Cymru Challenge) and Training (building 'green' skills). As part of its future environmental strategy, Film Cymru aims to tap deeper into strengthening green skills funding and align to European initiatives such as the European Audio-Visual Observatory.

---

23 https://gov.wales/working-together-reach-net-zero-all-wales-plan; https://gov.wales/prosperity-all-climate-conscious-wales

24 https://gov.wales/public-sector-net-zero-reporting-guide

25 See Fodor, M. M., Komorowski, M. & Lewis, J. (2021). Clwstwr creative industries report no 3 – An updated glance at the size and composition of the creative industries in Wales. Clwstwr publication series, Cardiff, Clwstwr. Via https://clwstwr.org.uk/sites/default/files/2022-02/Creative%20Industries%20Report%20No%201.2_Final_compressed.pdf

An overview of current policies and organisational approaches in Wales, the UK and beyond

WALES AND THE UK	EU
POLICY	
The **UK Government** ensures through legislation like the Climate Change Act and a series of policies around waste and recycling (as well as a Green Taxonomy system) that businesses can better monitor their impact on the environment. The **Welsh Government** initiated the Net zero challenge for its Innovation Strategy ensuring coherent science and innovation. Green Policy operates across the organisation (e.g. Net Zero Wales, Prosperity for All). A new carbon reporting methodology was developed for public bodies but can become a reference point also for broadcasters/productions.	The **European Commission** aims to make the EU climate neutral by 2050. In 2020 it has approved the Green Deal, which includes a set of measures that review existing laws on climate merits, and introduce new legislation. This enforces already existing EU regulations that impact the screen sector such as the Energy Performance of Buildings Directive (EPBD) and the Ecodesign Directive that production sets/cinemas need to comply with, as well as The New Directive on Single-Use Plastic Products.
ORGANIZATIONS, INITIATIVES AND PROGRAMMES	
albert: an environmental organisation in the UK aiming to encourage the TV and film production industry to reduce the environmental impact. Through the albert carbon calculator productions can earn a certification and can use the Sustainable Production logo on their credits. Other activities include research and other projects. The recent Climate Content Pledge stressed the importance of events such as Film Festivals (Climate Future Festival, UK Green Festival, WOW Wales One World Film Festival), new tools helping UK broadcasters to consider climate storytelling, new genres and formats (eco-horror: The Feast/Gwledd, animation and gaming) in tackling environmental awareness. **British Academy of Film and Television Arts (BAFTA):** requires broadcasters and production companies to decide what level of compliance they want to adhere to – either Footprinting (e.g. UKTV, Channel 4, Netflix UK and Channel 5) or full Certification (BBC, Sky, ITV). Through certification it recommends using the albert Carbon calculator/certification as the tool that has built behavior change into the workflow. **British Film Institute (BFI):** Requires any major production receiving funding from BFI to provide mandatory carbon reporting and participation in carbon literacy training. **Film Cymru Wales:** adopts a four-level approach to supporting the greening of the screen sector: Research (studies), innovation and collaboration (Screen New Deal, Greening the Screen), Funding (Green Cymru Challenge), training (building 'green' skills). Future strategy focusing on strengthening green/skills funding, and aligning to European initiatives (European Audio-visual observatory).	**Cine Regio and sub-group Green Regio:** a network of 43 regional film funds across 12 EU member states, which focuses on raising awareness about the sector's environmental impact. **Creative Europe MEDIA**: encourages competitiveness, innovation, and sustainability of the audiovisual sector in Europe. One of the four strands of the MEDIA programme for 2022-2026 is Policy Support, which aims to create a holistic European audiovisual policy in this regard. **European Film Commissions Network (EUFCN):** is a non-profit association committed to foster and promote a more sustainable and efficient film industry in Europe by sharing all green protocols, best practices, and tools. **European Film Agency Directors association (EFAD):** through its Sustainability working group, exchanges best practices and information on sustainable initiatives launched by national film funds and other partners. **Film.eu Alliance:** has set environmental sustainability as the core challenge for 2023, through a series of joint measures that put green practices at the core of education: micro-credential courses to certify green consultancy for film/media industries following creative Europe, EU and national laws; explicitly embedding sustainability in under-and postgraduate programs across allied universities.

Table 1: Mapping of policies, organisations, and initiatives for greening the screen sector in the UK, Wales and Europe.

Green innovation as sustainable tool for systemic change

Understanding green innovation in the screen sector: A new framework

As our mapping of institutional strategies shows, innovation has been part of the strategic tools to strengthen the environmental compliance of the screen sector. Although current policies and initiatives point towards a collective approach to creating a greener screen sector, we need to ask whether current policies and initiatives are enough, or do we need a more holistic approach to environmental sustainability in the screen sector? Although the screen sector is known for its creativity and imagination, it has struggled to use this as an asset to re-think environmental sustainability, or to build net zero into its creative processes.

Core industrial, structural and policy obstacles have rendered the adoption of sustainable operations difficult.[26] At industry level, productions depend on other highly polluting industries such as fashion, energy, transport, and technology. Tight pre-production timeframes, frequently changing production teams, spontaneous decision-making processes, as well as higher demand for streaming services pose important challenges to the sustainable management of productions. From a policy perspective, the isolation of green policies from other screen or innovation policies (e.g. training, employment, co-production) as well as the lack of shared reporting and auditing systems, have generated a fragmented understanding to tackling environmental sustainability in the screen sector.

We propose a framework for understanding environmental sustainability in the screen sector, through green innovation practices, resting on three pillars:

⇒ reducing consumed resources (green solutions);[27]
⇒ raising awareness through content creation (green content);
⇒ changing our behaviour (green mindset), which takes a more inclusive and holistic approach to audio-visual production.

Innovation falling into this area weaves social and cultural responsibility into environmental concerns, as it tries to create more systemic change within the industry. As such, it often deals with changing practices towards a more responsible screen sector. This framework allows companies and policy makers to better approach green innovation in the screen sector and guides our analysis in the following parts of this Policy Brief.

---

26 Sørensen, Inge Ejbye, and Caitriona Noonan. "Production, policy and power: the screen industry's response to the environmental crisis." Media, Culture & Society 44.1 (2022): 172-184; Brereton, Pat. "Eco-cinema, sustainability and Africa: A reading of Out of Africa (1985), The Constant Gardener (2005) and District 9 (2010)." Journal of African Cinemas 5.2 (2013): 219-235.

27 Chen, X., & Valdmanis, V. (2019). The content analysis of Chinese media report on the issue of waste incineration power plants. Management of Environmental Quality: An International Journal, 30(2), 456–466. https://doi.org/10.1108/MEQ-05-2018-0091

Environmental
sustainability framework
for the screen sector

GREEN SOLUTIONS

Innovative technologies/ services which reduce CO2 emissions/waste. Examples: power sets working on renewable energy (LED/ solar generator supplies), the use of drones for filming, the transition to technologies working on sustainable biofuel or platforms for remote work.

GREEN CONTENT

New formats of audio-visual content raising awareness about environmental problems. Examples: animation, interactive art, immersive solutions and installations, ecological horror film. Green education based on content and format innovation offers new opportunities to have a positive impact on environmental sustainability also beyond the screen sector.

GREEN MINDSET

The search for new ways of reducing environmental impact which starts with the behavior of individuals on the production set and is more wide-reaching as it often has broader social and cultural implications that lead to a systemic shift. Examples: collaborative models across the production value chain, new film production systems, sustainable infrastructure

GREEN INNOVATION

Figure 1: Framework for understanding environmental sustainability in the screen sector. Source: Clwstwr

Data from the creative industries and screen sector in Wales

We surveyed 388 creative businesses from March 2019 to December 2021 (including companies and sole traders) from the creative industries in Wales about their innovation activities. We asked them whether they were innovating in ways that have a **positive environmental impact.**

Businesses active in the film, TV, radio and photography sector (112 of the 388 surveyed businesses) are less likely to embrace green innovation than other creative sub-sectors – only 17% of respondents in film, TV, radio and photography stated that their innovations always or often have a green impact, with most other sectors reporting over 30%. This raises questions about potential barriers specific to the screen sector.
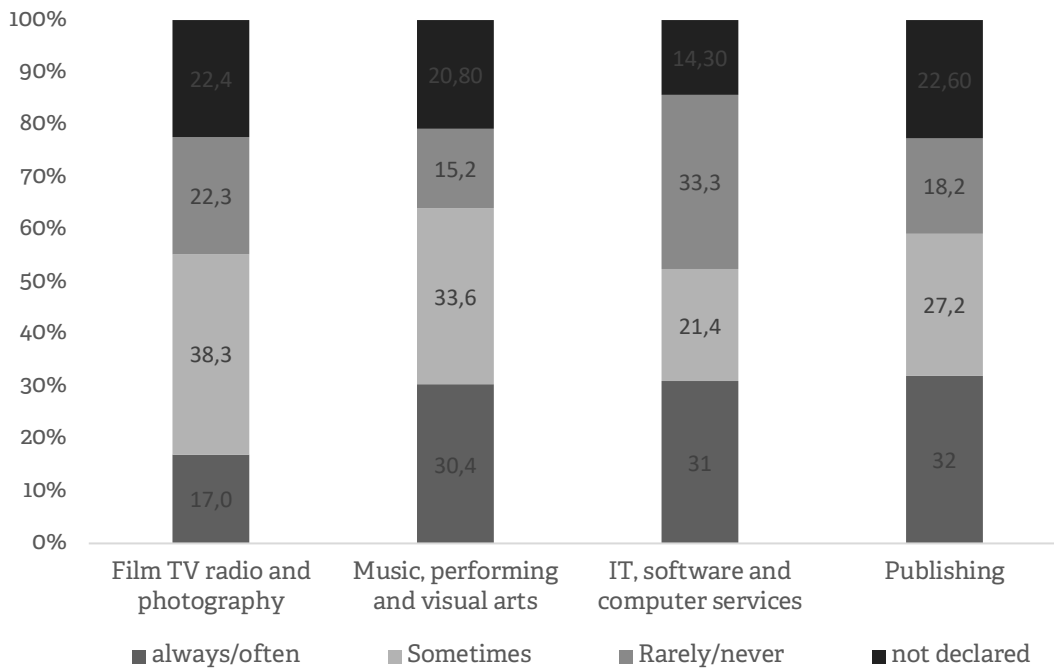
Figure 2: % of creative businesses creating innovation with environmental impact by sub-sector.

Similarly, we found that only 21% of film, TV, radio and photography businesses attribute a high business value to green innovation, compared to other sub-sectors, such as publishing, where 43% of respondents perceive a high business value for green innovation.

The low percentage of green innovators in the film, TV, radio and photography sector reflects a degree of reluctance of business to go down the research path leading to the development of green solutions. Research requires times and resources and can be perceived as an unrealised investment until the resulting innovations are diffused/adopted by the market. In addition, the uncertainty connected to research and development outcomes represents an important factor hampering green innovation. Therefore, businesses can often associate new (green) technology development with higher costs/investment and uncertainty, compared to its productivity generated throughout its lifetime (actual added value). On the other hand, there is a fairly good correlation between green impact and business value for creative industries businesses, which shows that on the long-term businesses tend to see green innovation as paying out. We can conclude that although there is a certain level of value seen in green innovation, this could be encouraged more for specific sub-sectors such as screen (see Figure below).
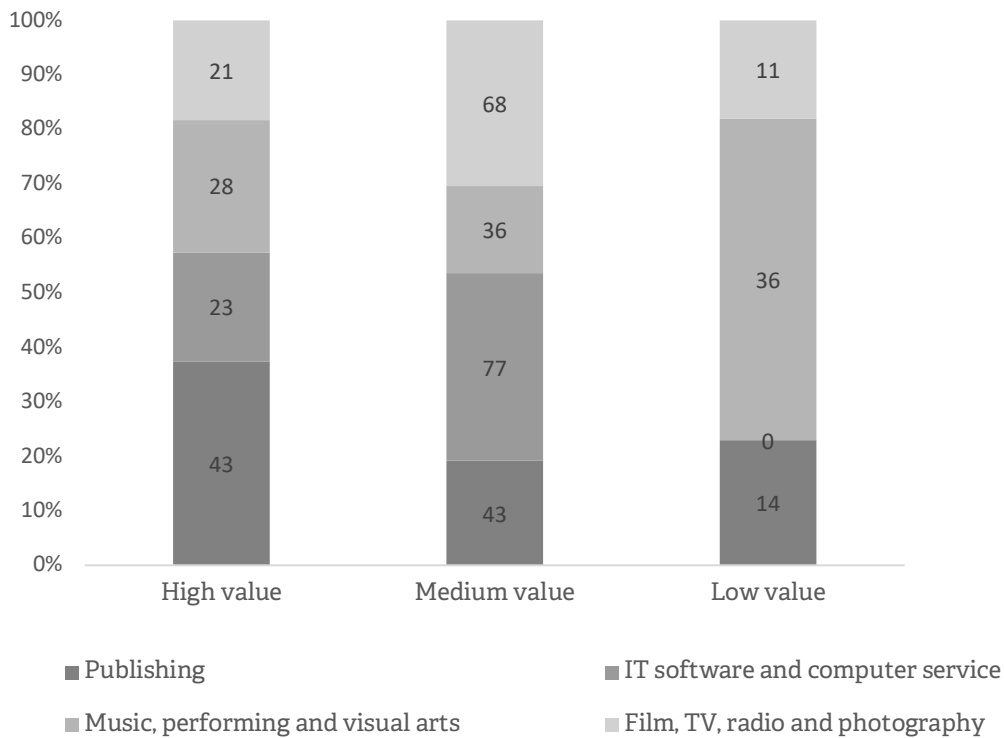
Figure 3: Perceived business value of high-frequency environmental innovations by sub-sector.

Our data shows that green innovation is generally perceived as having a fairly good business value in the Welsh creative industries, but is still not a predominant practice in the screen sector (only 17% of companies have a strong focus on green innovation), which means that more opportunities need to be created to enable more businesses to put green innovation at the heart of their thinking.

Towards green innovation in Wales: A new approach through R&D in the Clwstwr program

Over a period of five years Clwstwr has funded over 100 research and development (R&D) projects in the screen and media sector. Having a positive environmental impact by creating innovative products, services and experiences has been at the heart of our approach. This has led to a systematic approach of funding and enabling projects that addressed specifically carbon footprint reduction and a lower negative environmental impact in the screen sector and beyond. In addition to supporting R&D of innovative solutions that lower environmental impact, Clwstwr has been:

⇒ encouraging and supporting an innovative ecosystem of sustainability within the media sector in Wales through the participation in and organisation of dedicated events/talks/conferences.

⇒ collaborating with others to create a cross-sector 'green' focused screen community through initiatives such as the Screen New Deal[28] and the Green Cymru Challenge Fund (see more below).[29]

⇒ sharing new knowledge and signposting the media sector to sustainable solutions through a targeted communication strategy that showcases success stories/case studies from the Clwstwr programme.

The successful delivery of green innovation projects was supported by: a member of the Producer team and the delivery team, an academic Co-Investigator from Clwstwr's university partners, time with PDR (leading design consultancy partner) and access to expertise within the Management Team.

The support offered by Clwstwr ensured that innovative ideas can be followed all the way through to commercialisation. This engagement structure has also provided a more holistic model for greening the screen sector through innovation, that addresses environmental awareness at different scales (from individual to business and the community), as well as across different production chains (pre-production/production/post-production). The series of green innovations generated through this model adopt a wide range of approaches, covering all three areas of the extended framework for green innovation proposed previously (green solutions/green content/green mindset).

---

28 https://clwstwr.org.uk/bfi-and-albert-announce-wales-develop-screen-new-deal-production-sustainability-plan

29 https://clwstwr.org.uk/clwstwr-and-ffilm-cymru-launch-new-green-cymru-challenge-fund-sustainable-screen-sector-wales

GREEN SOLUTIONS THROUGH GREEN INNOVATION: BEST PRACTICE EXAMPLES

Clwstwr approach: Clwstwr supports the research and development of new technologies and services for the screen and media sector, paying specific attention to their contribution to reducing the environmental impact across all stages of production (pre-production/production/post-production). Clwstwr has funded different innovative ideas which aim to reduce environmental impact and which operate across different stages of the production cycle. Contributing to some of the green best practices across all three production stages, we selected three Clwstwr case studies that stand out as green innovation solutions for the screen sector.

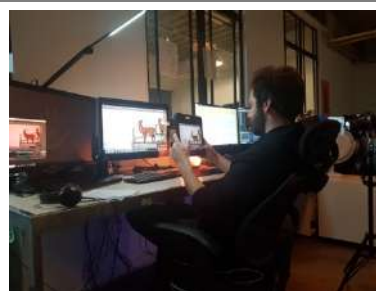| Pre-production best practices	Production best practices	Post-production best practices
Script: paperless scripts/cloud documents; video meetings. **Casting:** characters as models of ecology/social justice. **Workflow:** education toward ecological values/ideas **Location:** territorial planning incorporating measures of material (eco-design practices) and non-material respect (mitigate impact of touristification/gentrification) for the environment. **Transportation:** environmentally friendly travel plans.	**Production:** streamlining time and resources for shootings; eco-friendly backup technologies. **Catering:** mindful catering choices. **Equipment:** using environmentally friendly equipment/ resources (LED for lighting, reusable set supplies etc.), reuse, recycle and upcycle sets, props, hair and makeup and try to use eco-friendly products, sustainable travel to sets etc.	Early adoption of a model of environmental impact of the broadcast chain (technology sourcing). **Editing:** energy-saving approach and efficient/ certified equipment. **Special effects:** digital special effects (drone) **Distribution/exhibition:** virtual broadcasting, avoid plastic in merchandising. **Preservation:** green-friendly preservation and training.

Clwstwr case studies

Salt White Studio/ Set the Story	Painting Practice/Plan V	Gorilla/Remote Editing Toolkit
 © Set the Story 2022	 © Painting Practice, PlanV	 © Gorilla
Salt White Studio developed a cloud-based digital product that provides production design and drawing management to the film and television Art Department. The solution contributes mainly to reducing impact in two areas defined by the Screen New Deal (pag.15): **production materials** (paperless and remote working practices reduce the generation of waste) and **production planning** (shared tools for collaboration that maximize the focus of the procurement process and streamlines production processes).	Painting Practice developed Plan V, a **plugin** that lets users **visualize virtually-created sets**, scenes and worlds by using VR to provide a realistic sense of scale/detail. The solution provides new ways of working by enabling users in remote locations to work on and share project files in a 3D space, which reduces impact across two areas defined by the Screen New Deal (pag.15): **production materials** (waste connected to physical sets) and **production planning** (collaboration tools for the delivery of productions and virtual planning that minimise resource use).	The project developed by Gorilla resulted in a **post-production editing toolkit for remote work** that enables teams operating from different locations to work on the same material without the need of physical travel. In doing so, the solution contributes mainly to reducing impact across 1 area defined by the Screen New Deal (pag.15): **studio and location** (reduces transport/travel demand and associated emissions).

Table 2: Green Solutions through green innovations. Source: Clwstwr

GREEN CONTENT THROUGH GREEN INNOVATION: BEST PRACTICE EXAMPLES

Clwstwr approach: Clwstwr recognises audio-visual content as a powerful medium for raising awareness about environmental challenges and aims to provide further support to create more innovative content about environmental topics, as well as contribute to the generation of new audio-visual formats that can engage audiences in novel ways with sustainability. To tackle this area, Clwstwr funds projects which generate new formats (e.g. Lewnah - news programme for children deploying animation). It also organises events promoting new ways of engaging with climate change e.g. co-organisation of Animation and the Climate Emergency (RIFACAF). Below, we highlight three RIFACAF case studies which promote positive models for engaging with sustainability issues in different ways.

Animation and the Climate Emergency

RIFACAF is part of the Arts and Humanities Research Council's wider Research in Film Awards (RIFA) Climate Screenings 2022 programme that took place on 8 April 2022. It was delivered by Clwstwr and Cardiff Animation Festival. The event was preceded in the morning by Cardiff Animation Festival's Green Cymru project workshop 'A Net Zero Workspace'. In the afternoon, attendees and speakers watched and discussed screenings of: A Stork's Journey (Commissioned by the Max Planck Institute of Animal Behaviour, Germany) and The Promise (directed by Chi Thai). Both films are Nominees for the Arts and Humanities Research Council's (AHRC) Research in Film Awards. Following this, clips were screened from Sky's Obki, Lewnah's Clwstwr project, Picture Zero's So Hot Right now (animation for Waterbear- Kristina Fugerres), and content from the BBC's The Regenerator programme as well as other BBC content.

RIFACAF case studies

The Promise (7min)	A Stork's Journey (5min)	Obki (Sky series)
© Simon Ratliff	© PositiveNegatives: Karrie Fransman	© Skykids
Set as an urban fairy tale, The Promise plays out in the mean streets of a mean city, where a young thief tries to snatch an old woman's bag but she cannot have it without giving something in return: The Promise. The film follows the thief (a young girl) who introduces nature to her city and discovers how, to rewild the world, she must first rewild herself. The Promise is an animated climate film about how one person can make the world greener and fairer. It is based on the New York Times Best Illustrated Book of the same name, written by Nicola Davies and illustrated by Laura Carlin.	Following the migration of white storks as they navigate man-made perils, this film invites viewers to fly with storks as they migrate from Germany to Sudan, navigating perils including pollution and pesticides. In addition to its narrative structure, the animation uses a distinctive 'zoom' feature to draw viewers along the stork's journey. Moreover, the animation was informed by research papers, GPS maps, photographs and interviews from the Max Planck Institute of Animal Behavior, offering a solid research foundation for the story.	The animated series features the original character Obki, a loveable alien, on his journey to be a positive force for good on Earth. It explores issues around climate change in an informative and entertaining way for 5–9 year old children through Obki's adventures with his friend, the Orb. The series is a collaboration with Sky Zero – Sky's campaign to be net zero carbon by 2030 and commitment to encourage its customers to #GoZero, by using its content and channels to raise awareness of the climate crisis and inspire viewers with actions they can take to protect the planet.

Table 3: Green content through green innovation. Source: Clwstwr

GREEN MINDSET THROUGH GREEN INNOVATION: BEST PRACTICE EXAMPLES

Clwstwr approach: In addition to funding new solutions that target specific environmental aspects in the screen sector, Clwstwr aims to foster a more holistic approach to green innovation, which considers the system as a whole and not only one portion of it. In doing so, it funds projects which try to find clever ideas that can trigger a systemic change within the industry. This means that although such projects focus on concrete actions, their aim is more wide-reaching, trying to create an ecosystem of sustainability, through a more responsible approach to innovation.

Green Cymru Challenge Fund partnership

In June 2020, The Green Cymru Challenge Fund - a partnership from Clwstwr and Ffilm Cymru Wales - made available £75,000 in funding for individuals, organisations and collaborations across sectors – including media, academia, technology, transportation, energy, water and waste management - to research and develop new sustainable ways of working in film and TV. Three innovative environmental projects have been selected to be developed with support from their Green Cymru Challenge Fund, each of them taking a different approach to environmental sustainability by driving systemic change to exemplify the green innovation practices.

Clwstwr case studies

Cardiff Animation Festival	Hybrid Narrative	Severn Screen
© CardiffAnimationFestival	© ChrisBuxton	© SevernScreen
Solution: Routemap to reaching net zero through the development of a new economically sustainable service *Characteristics*: Dedicated to the animation, games and post-production industry, the routemap was prototyped using in-depth interviews, carbon footprint analysis, co-creation workshops and public/private consultation surveys. It provides a new collaboration model to reach net zero by 2030. *Impact*: Although seeking tangible solutions in different areas of sustainability–energy and water; studio buildings and facilities; Production planning – the routemap goes from the creation of a single solution to offering a new economically sustainable service.	*Solution*: Hybrid Narrative explores a new method combining low-cost tools and techniques for film production that replaces location filmmaking with a sustainable alternative. *Characteristics*: Aimed at creating a new film production system, the method combines different methods: discussions with subcontractors/ motion graphics experts, production/ post-production tests and business model development. *Impact*: Although it experiments with different existing technologies, the system takes a new approach to making production greener, which involves a wholesale re-imagining of how we tell stories on screen.	*Solution*: Severn Screen develops a sustainable and collaborative infrastructure model to support the future of film and TV production *Characteristics*: The model is being developed by combining carbon footprint analysis with reporting on sustainability success stories and concept development for new apps/platforms *Impact*: The project provides a production model that leverages on new learning and systems in order to go towards a greener sector.

Table 4: Green Mindset through green innovation. Source: Clwstwr

Recommendations for overcoming innovation obstacles

Both the findings of the Clwstwr survey, and the green innovation examples highlighted in the case studies, point to ways that R&D can provide tangible benefits in terms of greening the screen sector. But the survey also indicates a level of reluctance of the sector to go down the green R&D path. This is connected to specific challenges, which we explored by conducting targeted interviews/workshops with Clwstwr-funded projects and industry representatives with expertise around greening the screen. These fed into the following recommendations for the future:

⇒ POLICIES/STRATEGIES NEED TO BETTER ALIGN WITH SECTOR NEEDS IN ORDER PROVIDE THE BEST SUPPORT FOR GREEN INNOVATION.

Chris Hill, Green Manager at Film Cymru explains: "The Welsh sector is built on freelancers and micro-enterprises which may not have the capacity to do R&D as much as larger companies and studios. The challenge is to encourage these small players to make time and space for R&D. What I see key is also working with other sectors and again finding that time to share that knowledge and cross-collaboration. I think this is key to any policy."

⇒ MORE INVESTMENT IN CREATIVE APPROACHES TO GREEN INNOVATION AND SKILLS DEVELOPMENT IS NEEDED.

Green Innovation is costly and time consuming, and the skills gap remains an important factor driving green innovation. As Chris Hill underlines: "The only sector specific sustainability training offered in the UK is via BAFTA albert courses. I think there is a need for improved understanding, which starts with skills, about the sustainable approaches in film and embed that in creativity as well."

⇒ R&D SHOULD BE BETTER SUPPORTED, THROUGH MORE TAILORED FUNDING PROGRAMMES THAT CATER FOR A WIDE RANGE OF INSTITUTIONAL NEEDS.

There is no 'one-size fits all' strategy regarding R&D approaches, demonstrated by the variety of Clwstwr-funded projects. In addition, there are few funding opportunities like Clwstwr, which renders innovation difficult especially for small-scale players. As Michelle Whitehead - until recently Special Projects Manager at albert - recognises, R&D requires dedicated investment and development time and funding bodies need to address this through their programs: "If you are involved in research and innovation, what are the things that you're looking at, what are the ideas that you have that you might not have the time and the money to research, but you think it's a good idea? That is something that we can help with."

⇒ A BETTER MAPPING OF THE STAKEHOLDER CHAIN IN TV AND FILM AND THEIR NEEDS THROUGHOUT THE INNOVATION PROCESS IS REQUIRED.

A sector that is as project-driven and diverse as film and TV involves many stakeholders with different and specific needs. This requires more systematic and detailed forms of data collection. As Michelle Whitehead (until recently Special Projects Manager at albert) underlines: "How do you put systems in place when you've got this quite mixed funding

structure? It is helpful to look at the entire ecosystem in film and television and see where different stakeholders can take action."

⇒ MORE CLARITY IS NEEDED ON HOW INVESTMENT IN R&D BY SCREEN COMPANIES CAN ALLOW PRODUCTIONS TO WORK IN AN INCREASINGLY RESOURCE-FRIENDLY AND COST-EFFECTIVE WAY.

For the screen sector greenwashing remains a problem. Concrete measurements that compare the impact of green innovations against more traditional approaches can create real impact. So, for example, sustainability related to practices such as conscious choices for travel can in fact be more cost-effective than technical innovation.[30] Technological innovations such as Virtual Production have the potential to cut down on emissions, but only if developed in ways that take account of the ways in which virtual production technologies impact on energy use.[31] Yassmine Najime from Painting Practice[32] makes this point: "I recall a few years ago everyone was saying 'this is a new world, we are going to reduce carbon footprint so much', but we all started to wake up little by little, to realise how much it actually costs and how much pollution we are producing by having these massive computers, LED screens and data storage that need electricity. I think that now we are coming to a point in which people are starting to figure this out and make more studies on what is more sustainable."

---

30 Riet de Prins (producer at VRT, Belgium public broadcaster) proved this effect through calculations done for the Buck film series which showed that reducing crew travel has cut CO_2 emissions by 15%, while reducing the travel of equipment (limited film locations) has led to cutting 94% of CO_2 emissions.

31 In fact, experts taking part at Cannes festival 2021 discussed the need to measure the real green impact of virtual production, which requires all kinds of equipment and consumes huge amounts of energy due to the data that needs to be processed and stored: https://cineuropa.org/en/newsdetail/408044/

32 https://clwstwr.org.uk/painting-practice-creating-plan-v-revolutionary-plugin-virtually-visualises-sets

CONCLUSION

OUR FINDINGS CONFIRM THAT GREEN INNOVATION HAS BECOME A VIABLE APPROACH TO FINDING HOLISTIC SOLUTIONS FOR GREENING THE SCREEN SECTOR. THROUGH THE CLWSTWR PROGRAM, WE HAVE SHOWN THAT GREEN INNOVATION CAN CREATE EFFECTIVE COMPETITIVE ADVANTAGES FOR THE WELSH SCREEN SECTOR. NEVERTHELESS THE CONDITIONS FOR THIS TO HAPPEN ARE CONNECTED TO THE NEEDS OF A PREDOMINANTLY PROJECT-DRIVEN AND DIVERSE SECTOR, AS WELL AS TO FUNDING THAT MATCHES THE COMPLEXITY THAT R&D PROCESSES IN THIS CONTEXT INVOLVE.

R&D funding provides an effective approach to creating a more environmentally sustainable screen sector by adopting a holistic approach (mindset-content-solutions) aimed at generating systemic change. Green innovation is effective when it works through organic storytelling that at the level of content proposes good/positive models and at the level of methodology and technology is truly sustainable.

Greening the screen sector is not always about adopting the latest solutions, but about having a systemic approach across all aspects of media production and its supply chains ('even the smallest gesture counts'), developing comprehensive knowledge/skills ('know what works best') and making green choices practical and cost effective. R&D needs to become 'easier', allowing a systemic change through dedicating time and funding for R&D, especially for small/micro businesses which do not have the capacity to lead on organic innovation (e.g. strengthen incentives for innovators, improve R&D tax claim process).

What does the future hold?

Although that Clwstwr has contributed to the recognition and uptake of R&D practices by screen businesses, there are intrinsic challenges around overly technocratic definitions of R&D and its specificity inside the screen sector. One of the most recent initiatives that aims to address this, is the transformation plan being put in place by the *Screen New Deal*. This initiative brings together the BFI, BAFTA albert, Arup, Creative Wales, Ffilm Cymru Wales and Clwstwr to conduct localised data collection and mapping to support the creation of a location-based transformation plan for reaching a zero-carbon, zero-waste future for the screen industry. The Screen New Deal promises to catalyse collective efforts enacted through initiatives such as The Green Cymru initiative (Ffilm Cymru), BAFTA's albert carbon calculator and training programme, BFI research reports (Green matters report) and the R&D programme implemented by Cardiff University through the Clwstwr programme.

More information can be found here: https://gov.wales/written-statement-screen-new-deal-production-sustainability-plan.

What R&D means in the screen sector, how green and more inclusive innovation can be fostered through research and how this can lead to a stronger and more competitive sector, is also the task of the follow-up programme of Clwstwr, media.cymru (2022-2026), to be launched in October 2022. As part of media.cymru and led by Ffilm Cymru Wales, the *Greening the Screen* initiative is a three-year R&D grant scheme that will distribute £600,000 in funding for individuals and organisations to scale-up products and services that will make the screen industry in the Cardiff Capital Region and Wales greener. Greening the Screen will also create awareness of the impacts of climate change and environmental issues through storytelling and filmmaking, promoting and sharing best practice for sustainable screen working through creative media, events, and other resources.

In addition, media.cymru will work with BAFTA albert to implement *the Screen New Deal: Transformation Plan* that is currently being piloted in Wales, establishing common goals and consensus for long term zero-carbon, zero-waste solutions across the Welsh screen sector. The main aim is further consolidation of R&D practices in the screen sector and to move from lessons learned to practical movement towards net zero. At the same time, such programmes manage to bridge current gaps in research and knowledge about the industry, by collecting and providing important information on the state-of-the-art of the sector and publishing the findings as part of tailored studies and reports.

Please consult our website on ongoing and finished projects that Clwstwr (https://clwstwr.org.uk/projects) has supported to date and to get in contact with us to engage with us on the upcoming media.cymru programme starting in October 2022.