

MASTERARBEIT | MASTER'S THESIS

Titel | Title

Romania's Last Primary Forests – Film-Based Science Communication in
Geography

verfasst von | submitted by

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angestrebter akademischer Grad | in partial fulfilment of the requirements for the degree of

Master of Science (MSc)

Wien | Vienna, 2024

Studienkennzahl lt. Studienblatt |
Degree programme code as it appears on the
student record sheet:

UA 066 855

Studienrichtung lt. Studienblatt | Degree
programme as it appears on the student
record sheet:

Masterstudium Geography: Global Change and
Sustainability

Betreut von | Supervisor:

Dipl.-Geogr. Dr. Simon Alexander Bunchuay-Peth

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Abstract English

An emergent expectation is that science, including Geography, should communicate knowledge and results to a broader audience and foster stakeholder discussion. While journal articles have been the primary means of communicating scientific findings for over 350 years, there is a lack of experimentation with alternative media. Recently, diverse projects and platforms have developed at the intersection between the wider public, science and film. Following this impulse, I produced a self-created Documentary Film called 'Padure Primara – The Race for Europe's last Wild Forests' on Romania's primary forests. The production process, from idea to presentation, was the core research object, and the final Documentary Film embodied the results chapter. I adopted an action research design, which is characterised by the simultaneous process of, as the name suggests, taking action and conducting research. 'Action' means, unlike the director's shout on the film set, becoming part of the debate about primary forest conservation and sustainable timber through filmmaking. By that, the Documentary Film was simultaneously part of the method and medium for communicating the results, serving the university's 'Third Mission' by promoting scientific findings on the conservation of primary forests in Europe. In total, I spent 57 Days in two regions of Romania, meeting and accompanying 16 people who all worked on the topic of primary forests. I interviewed nine of them on camera, which gave me plenty of latitude to experiment with the introduced film-based action research and participatory filmmaking. The final product is a 40-minute documentary feature produced in collaboration with a German production company. Additionally, I discuss a 'by-product' of shooting the Documentary Film: a 6-minute contribution to the television station 3sat, which aired in February 2024. Finally, I critically reflected on the challenges and opportunities of the format film for science communication in Geography. Given Geography's inherent visuality, this project's results support a shift from predominantly *discussing* film as a medium for research and publication to *producing* filmic geographies. I argue that a clear sub-field for visual culture presents a major opportunity for the Geography community to experiment with audio-visual methods.

Abstract German

Es wird zunehmend erwartet, dass die Wissenschaft, einschließlich der Geografie, ihr Wissen und ihre Ergebnisse einem breiteren Publikum vermittelt und die Diskussion mit allen 'Stakeholdern' fördert. Während wissenschaftliche Artikel seit über 350 Jahren das wichtigste Mittel zur Vermittlung wissenschaftlicher Erkenntnisse sind, fehlt es an Experimenten mit alternativen Medien. In letzter Zeit haben sich verschiedene Projekte und Plattformen an der Schnittstelle zwischen der breiten Öffentlichkeit, der Wissenschaft und dem Film entwickelt. Diesem Impuls folgend habe ich einen selbst erstellten Dokumentarfilm mit dem Titel 'Padure Primara - The Race for Europe's last Wild Forests' über die Primärwälder Rumäniens produziert. Der Produktionsprozess, von der Idee bis zur Präsentation, war der zentrale Forschungsgegenstand, und der endgültige Dokumentarfilm stellte das Ergebniskapitel dar. Die 'Action Research Methode', zeichnet sich, wie der Name schon sagt, durch gleichzeitiges Handeln und forschen aus. 'Action' bedeutet, anders als der Ruf des Regisseurs am Filmset, durch das Filmemachen Teil der Debatte über den Schutz der Primärwälder und nachhaltige Forstwirtschaft zu werden. Damit diene der Dokumentarfilm gleichzeitig als Methode und Medium zur Vermittlung der Ergebnisse und damit der 'Third Mission' der Universität, indem er wissenschaftliche Erkenntnisse zum Schutz der Primärwälder in Europa verbreitete. Insgesamt verbrachte ich 57 Tage in zwei Regionen Rumäniens und traf und begleitete 16 Personen, die sich alle mit dem Thema Primärwald beschäftigten. Neun von ihnen habe ich mit der Kamera interviewt, was mir viel Möglichkeit gab, mit der eingeführten 'Film-Based Action Research' Methode und dem partizipativen Filmemachen zu experimentieren. Das Endprodukt ist ein 40-minütiger Dokumentarfilm, der in Zusammenarbeit mit einer deutschen Produktionsfirma entstanden ist. Zusätzlich diskutiere ich ein Nebenprodukt der Dreharbeiten zum Dokumentarfilm: einen 6-minütigen Beitrag für den Fernsehsender 3sat, der im Februar 2024 ausgestrahlt wurde. Abschließend reflektiere ich kritisch die Herausforderungen und Chancen des Formats Film für die Wissenschaftskommunikation in der Geographie. Angesichts der inhärenten Visualität der Geographie unterstützen die Ergebnisse dieses Projekts eine Verlagerung von der überwiegenden Diskussion über Film als Forschungs- und Publikationsmedium hin zur Produktion filmischer Geographien. Ich argumentiere, dass ein klarer Teilbereich für 'Visual Culture' eine große Chance für die Geographiegemeinschaft darstellt, mit audiovisuellen Methoden zu experimentieren.

1 Introduction

Generating knowledge through science is not an end in itself; without communicating its findings, research is pointless. Not surprisingly, academic success is measured primarily on journal publications and citation statistics. With over 350 years of publishing history, totalling over 50 million publications, the format of a journal article holds an astonishing heritage (Jinha, 2010). Despite the text hegemony in science communication, an emergent expectation is that science, including Geography, should communicate knowledge and results to a broader audience and foster stakeholder discussion (Thieme *et al.*, 2019; Compagnucci and Spigarelli, 2020; Davies *et al.*, 2021). Alternative media and forms of communication seem imperative (Jacobs, 2013, 2016a; Angelone, 2019) and a directed non-fiction film presents a powerful tool for communication with peers and the public (Kwok, 2018; Loverd *et al.*, 2018; Angelone, 2019). Currently, diverse projects and platforms have developed at the intersection between the wider public, science and film (Thieme *et al.*, 2019). For example, online platforms ('Labocine: The Science New Wave', 2023; 'Global Science Film Festival', 2023; 'Imagine Science Films', 2023), peer-reviewed Journals and conferences ('Journal of Video Ethnography (JVE)', 2023; 'Annals of Crosscuts', 2023; JoVE, 2024), or science film festivals ('Global Science Film Festival', 2023; 'Imagine Science Films', 2023).

Following this impulse, the thesis delves into the topic of science communication through non-fiction film (or documentary film). A self-created Documentary Film constitutes the core research object and will embody the results chapter. In a subsequent reflection, the production process and film are critically reflected to reveal the challenges and opportunities of this format for science communication in Geography. This filmmaking process is embedded in the matter of Europe's primary forests in Romania. The choice for this topic is two-fold. Primary forests in Europe are undervalued in their socio-economic status and lack adequate protection (Ceccherini *et al.*, 2020; Moomaw *et al.*, 2020; Sabatini *et al.*, 2020, 2021; European Commission (EC), 2021). Rising deforestation of primary forests is widely unrecognised and rarely part of public discourse (Knorn *et al.*, 2013; Potapov *et al.*, 2017; Ceccherini *et al.*, 2020; Estonian Fund for Nature, 2020; Simon, 2022). Therefore, the topic of Europe's vanishing primary forests provides a unique opportunity to research the science communication format of film in Geography and advance conservation awareness.

The regional focus is on the Carpathian Mountains in Romania since they host among the most extensive, richest primary forests in Europe, which are exceptionally endangered by deforestation and poor protection (Knorn *et al.*, 2013; Sabatini *et al.*, 2018; Schickhofer and Schwarz, 2019). Additionally, Romania is a moderate distance from Vienna by train and allows for low-budget film production.

Research Design

How can science on primary forests in Romania be communicated through a non-fiction film?

The research question is divided into three sub-questions:

- How can science communication be applied to a non-fiction film?
- How can science on primary forests be visually portrayed?
- What are the challenges and opportunities of this format for science communication in Geography?

I adopt an action research design, which is characterised by the simultaneous process of, as the name suggests, taking action and conducting research (Lewin, 1946; Reason and Bradbury, 2001). 'Action' means, unlike the director's shout on the film set, becoming part of the debate about primary forests and sustainability through filmmaking. By that, the Documentary Film Padure Primara is simultaneously part of the research and format for communicating the results. Through techniques like the transect walk (Okoko and Prempeh, 2023), I will implement approaches for participatory filmmaking and experiment with their practicability in the field.

Relevance

I have been developing the thesis since November 2022, together with Dipl. Geogr. Dr Simon Bunchuay-Peth (University of Vienna), who also specialises in science communication in Geography. In previous semesters, I researched the topic of primary forests and science communication in my studies:

- (i) Seminar Paper on Forests as Nature-based Solutions in EU Policy (SE Inter- and Transdisciplinary Approaches to Global Change and Sustainability)
- (ii) Policy Analysis Paper of Subsidies for Biomass Energy in the EU and Semester Paper on the implications of the EU's 'Three Billion Trees Pledge' (SE Regional Innovation Policy and Governance)
- (iii) Practised interview techniques and writing (SE Wissenschaftskommunikation für die Praxis)
- (iv) Created documentary videos and expert interviews (EX Hochgebirgsexkursion)
- (v) Wrote blog and social media posts on primary forests (UE Science Communication)

The thesis expands existing research on Romanian primary forests (Knorn *et al.*, 2013; Sabatini *et al.*, 2018, 2020; Schickhofer and Schwarz, 2019). Communicating their results serves the university's 'Third Mission' by promoting the scientific findings and

conservation of primary forests in Europe. Similarly, I advance the body of work on using film for science communication in Geography (Sooryamoorthy, 2007; Jacobs, 2013, 2016a; Loverd *et al.*, 2018; Angelone, 2019; Thieme *et al.*, 2019).

The final discussion of the production process and film contributes to a better understanding of the intersection between science communication and non-fiction film. By reflecting on the film production process, I identify the format's challenges and opportunities for science communication in Geography. Moreover, its action-oriented research methodology generates immediate and actionable insights, increasing future practitioners' capacity. I also hope to raise awareness of primary forests by disseminating the final Documentary Film through social media, public screenings, and film festivals.

This thesis is structured into four main parts: background, method, results, and final reflections. In Chapters 2 and 3, I provide background on science communication through film and summarise current research on primary forest conservation in Romania. In Chapters 4 and 5, I describe the Film-Based Action Research method and the production process of the Documentary Film and TV Contribution. In Chapter 6, we lean back and literally watch the results. Finally, in Chapter 7, I reflect on the project and draw conclusions.

A remark on style: the personal pronoun *I* is used to write about the parts of my sole contribution, whereas *We* is used when others, most prominently the production company, were involved.

Throughout the thesis, the produced film 'Padure Primara' (*Padure Primara - The Race for Europe's Last Wild Forests*, 2024), is called 'the Documentary Film'. Similarly, the television contribution ('Nano - Urwaldforschung mitten in Europa', 2024) for the Broadcaster 3 Sat¹ is called 'the TV Contribution'. Online-Links to watch a pre-version of the Documentary Film and the final version of the TV Contribution are provided in Chapter 6.

¹ <https://www.3sat.de/>

2 Science Communication through Film

In 1957, a Soviet satellite orbited the Earth. An event later coined as the starting shot for the space race between the United States and the Soviet Union. The headstart of the Soviet Union, the orbiting Sputnik satellite was closely followed by millions through the then-emerging medium of television. Alongside the tensioning race to put a man on the moon, science and technology advancement received high regard (Nisbet and Scheufele, 2009), and media organisations started hiring more science reporters to cover technological advancements (Gregory and Miller, 1998). The Sputnik shock not only increased federal funding for higher education ('U.S. Senate: Sputnik Spurs Passage of the National Defense Education Act', 1957) but also the appearance of Science Formats on Television, e.g., NOVA (1974), Ascent of Man (1973) and Cosmos (1980). Today, many of the most financially successful films and television series have science at their core, including Avatar (2009, 2022), Jurassic World (2005, 2018), Black Panther (2018), NCIS (2003-), House (2005–2012) and The Big Bang Theory (2007–2019). Factual entertainment formats increased in popularity, coincidentally with online 'geek culture' (Kirby and Ockert, 2021; Knöpfler, 2024).

While the use of text is prevalent in most scientific publications (Jinha, 2010; Jamali *et al.*, 2018), science has been part of cinematic filmmaking since its inception (Gouyon, 2016). However, boundaries are still blurry between the various representations of science in film (Vidal, 2018). Besides high-budget entertainment-oriented blockbusters and TV series, e.g. Oppenheimer (2023) and Planet Earth (2006), more diverse projects and platforms have developed at the intersection between the wider public, science and film (Thieme *et al.*, 2019). For example, **science film festivals** ('Global Science Film Festival', 2023; 'Imagine Science Films', 2023), **peer-reviewed video journals and conferences** ('Journal of Video Ethnography (JVE)', 2023; 'Annals of Crosscuts', 2023), **science film platforms** ('Labocine: The Science New Wave', 2023) and **film as a method** (Garrett, 2011; Jacobs, 2013, 2016b).

The sputnik shock kickstarted an evolution of science communication into a more diverse field inside and outside academia (Kirby and Ockert, 2021). Aspirations to communicate science to a broader audience and foster stakeholder discussion are rising, which also led to various discussions on 'Visual Geography' (e.g. Garrett, 2011; Jacobs, 2013b). In this chapter, I briefly examine different formats of film dissemination in Geography (2.1) and summarise the emerging discussion on 'Visual Geographies' in the context of film (2.2). Lastly, I present a short insight into film as a method (2.3).

2.1 Dissemination of Science through Different Film Formats

Audio-visual media enjoys widespread momentum in the scientific community (León and Bourk, 2018), where researchers are constantly evolving new formats to improve the outreach of their science publications (Ferreira *et al.*, 2021). Especially visual media offer distinct benefits in science communication (Plank *et al.*, 2017; Zhang and Jenkinson, 2024). For example, scientific publications featuring visual representation generated additional impact (Larson *et al.*, 2017; Lee *et al.*, 2018; Ferreira *et al.*, 2021). In particular, the

‘dissemination of information to a much wider audience of varying levels of literacy and education’ has proven possible in the field of medicine (Zhang and Jenkinson, 2024).

Video and Film Journals

The standard format for scientific journals is text (Jinha, 2010; Jamali *et al.*, 2018). Some researchers publish additional video material or presentations. However, the following journals step even further. For example, the Journal for Video Ethnography publishes “ethnographic studies that feature video as a central methodological component and the primary form of output” (Louisiana State University, 2024). Additionally, they host a film festival every year in Paris.

The Environmental Humanities Laboratory at the Swedish Royal Institute of Technology offers a peer-reviewed publication for film-based research. The *Annals of Crosscuts* (‘Annals of Crosscuts’, 2023). They also host a recurring festival for documentary films and debates focused on environmental humanities to promote the visual experience and represent “a cutting-edge bridge between academia, the art world, and the public sphere” (‘Crosscuts Film Festival’, 2024).

JoVE: Journal of Visualized Experiments is a peer-reviewed science journal that publishes video articles (JoVE, 2024). It focuses on experimental research in medicine, neuroscience, and Biology. A study found higher interaction and potentially better impact for JoVE’s video articles (Jamali *et al.*, 2018).

Abstract Videos

Biologist Ben Freeman rapped an Abstract of his work to the sound of an MC Hammer Song on X (Twitter)². The Artist re-posted and commented on the contribution swiftly, making the post go viral. The summarised creative and visual presentation of scientific work in short video format emerged around a decade ago in science communication (Spicer, 2014). However, professional video abstracts gained a significantly higher number of daily views and publications citations (Ferreira *et al.*, 2021). Many publishers accept video abstracts complementary to the published paper (Plank *et al.*, 2017), although no standardised format exists.

Science Filmfestivals

The Crosscuts and Journal for Video Ethnography film festivals, already mentioned, are examples of festivals where science publications in video format are displayed. Film festivals incorporated at conferences have gained popularity (Staaterman *et al.*, 2014). Festivals focused on a particular field of science had positive impacts on attendees and contributors (Fuchs and Knorr, 2009; Ahmed *et al.*, 2015; Schulze *et al.*, 2021).

² <https://x.com/BenGFreeman1/status/1394439844365934595>

Science in Popular Films

Cinematic scientific film blends visually appealing imagery with compelling storytelling. Science is featured in various formats of popular movies with science at their core, including documentaries as **factual entertainment** (e.g., Planet Earth 2006), films about **scientists or historical discoveries** (e.g., Oppenheimer 2024), and completely **fictional films** (e.g., The Day After Tomorrow 2004). Sales and demand for factual entertainment products have been rising for years in the prevalent 'golden era' of science in movies (Kirby and Ockert, 2021; Habersack, 2023; Knöpfler, 2024). However, impact films (e.g. Sea Spiracy (2021), The Ivory Game (2016), An Inconvenient Truth (2006), and Supersize Me (2004)), which feature a mix of investigative story and science, have not been selling well in the last two years but are expected to experience a "comeback soon" (Knöpfler, 2024).

Films's measurable impact on audiences (Flagg, 2005; Yeo *et al.*, 2018) demonstrates the potential to educate and simultaneously entertain a wide audience (Jensen *et al.*, 2022). Especially Hollywood and mainstream film influence public interest in science (Loverd *et al.*, 2018; Yeo *et al.*, 2018). Kirby and Ockert (2021) extensively discussed film's impact on science literacy. Concludingly, they argue that popular films significantly shape, cultivate, and reinforce 'people's belief structures' about science. However, they cite several studies indicating that mainstream film influences particularly the 'cultural meaning' of science instead of scientific knowledge. In other words, science in film does not educate but shapes public attitudes towards science.

Thus, scientific organisations have been pushing for decades (Gouyon, 2016) to assist filmmakers to 'facilitate scientific input on film and television' (Loverd *et al.*, 2018). Similarly, scientists have been releasing science reviews of popular movies e.g. *The Biggest Error in The Day After Tomorrow*, 2022)³, which gained wide popularity.

2.2 Visual Geographies and Film

Geography can be seen as an inherently visual discipline (Swyngedouw, 1995; Schlottmann and Miggelbrink, 2009; Jacobs, 2013) or at least considered unique in the social sciences because it relies on visual imagery to construct its knowledge (Rose, 2003). *Visual Geographies* refer explicitly to the study and representation of geographical phenomena through visual means. It explores the intersection between Geography, art, media and visual culture (Hawkins, 2013) as a subdiscipline (Mukherjee, 2016). Although alternative formats like poetry readings, visual essays, film screenings, installations, and the arts have received intense attention at scientific conferences (Hawkins, 2013), the discipline still needs to realise the full potential of the motion picture as a method (Garrett, 2011; Baptiste, 2016; Jacobs, 2016a). Others argued further that a film could indeed represent a stand-alone

³ <https://www.youtube.com/watch?v=mlhj-0iAiMQ>

academic publication as it can be optimised towards research-reporting criteria (Baptiste, 2016; Jacobs, 2016b; Thieme *et al.*, 2019) and even enrich the research process (Thieme, 2012).

“Videographic Geographies” (Garrett, 2011) or “Film Geographies” (Lukinbeal and Zimmermann, 2006) seem to emerge as a new subdiscipline that embeds filmmaking in the wider Geographic discipline.

In this regard, Jacobs added that the current Geography-Film relationship is still “uneven” and challenges the prevalent reliance on text (Jacobs, 2013), while (Aitken and Dixon, 2006) argued that the “Geography of Film” has already grown up.

The understanding of Visual Geographies at the intersection of Film is diverse. However, the active debate mirrors an emerging field in the discipline of Geography, which has yet to settle in its defined space.

2.3 Film as Method

Film, as a method in academic research, leverages the inherent visual and narrative capabilities to explore, document, and analyse phenomena. Film-based research demonstrates various applications inside Geography (Jacobs, 2016b), enhancing both qualitative research and educational practices. In this regard, Jacobs (2016b) mentioned several forms of existing film-based methods in the geographical discipline: film essays, documentaries, ethnomethodology, research reports, participatory video, digital storytelling and videography. She further argued that addressing the challenges related to media literacy is crucial for the effective use of film in academia. Similarly, Zhang and Jenkinson (2024) argue for better training of students in visual literacy because clear teaching frameworks are missing. Consequently, they propose a Visual Science Communication learning module.

I did not use Film as a method in our project. Our proposed film-based Action Research examines film itself as a tool for communication instead of exploring phenomena through film. Nonetheless, I highlight some examples of “film as a method” that also influenced the creation of our approach.

(Anderson, 2013) explored Student-generated films to capture experiences of “drifting” across urban environments, a method rooted in Psychogeography. Jacobs (2016b) used film to document and communicate the rapidly changing practices of heritage tourism, which proved to be effective for “exploring, representing and interacting with emotional geographies” (Jacobs, 2016b). Duru (2019) employed a visual research-creation process to examine how violence appeared in everyday life and places, highlighting the physical and contextual aspects of these experiences through the development of a film narrative. Parr (2007) explored participatory filmmaking, which reduced the social distance between the researcher and the researched subject, promoting a more impartial and collaborative research environment. Parr's (2007) and Garrett's (2011) experiments with Audio-Visual Media

allowed for geographical research in ways that traditional methods could not. Moreover, Garrett (2011) used film for a more immersive and reflective exploration of geographical spaces, fostering a deeper connection between the researcher and the subject matter. Thieme (2012) documented the lived experiences of labour migration in Kyrgyzstan, capturing the geographical and social dynamics. Film allowed her to do so more vividly than traditional academic writing. Visual storytelling significantly enhanced the impact and accessibility of the findings.

3 Europe's Primary Forests

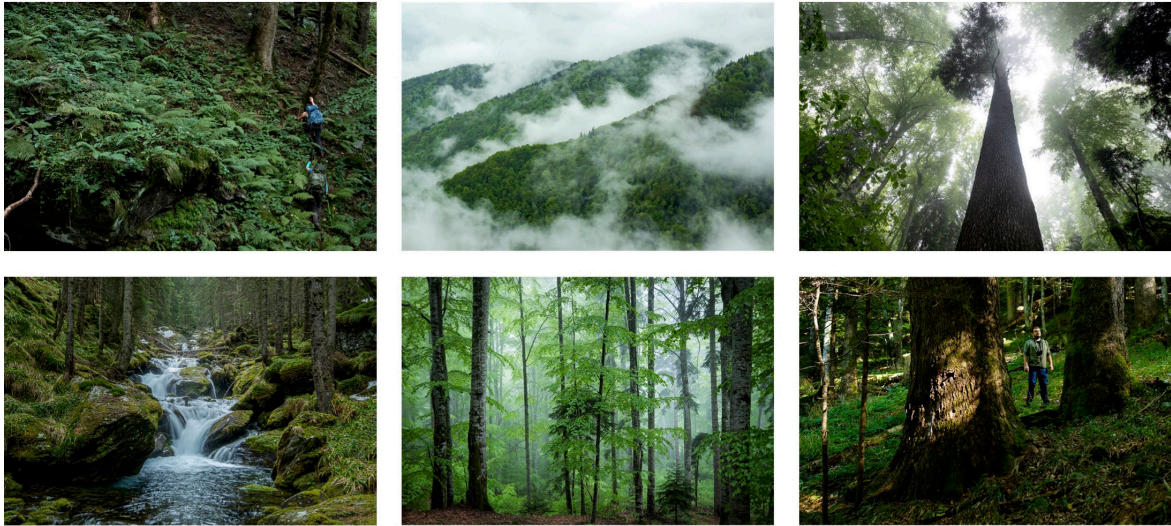


Figure 1 Pictures of the photo story 'Not the Amazon!'.

'Not the Amazon!' The title of my photo story on primary forests in Europe. Most associate primary forests ('Urwälder') with the Amazon rainforest or other rainforests in South America, Southeast Asia, or Sub-Sahara Africa. As the title suggests, European primary forests receive little media attention but share the same fate. They are vanishing quickly (Knorn *et al.*, 2013; Ceccherini *et al.*, 2020; Sabatini *et al.*, 2021; Mikoláš *et al.*, 2023).

Deforestation in Europe started with the establishment of the first agricultural societies in the mid-Holocene (Kaplan *et al.*, 2009). Since then, pristine forests have been cleared for economic expansion and growth of populations. Until today, nations profit extensively from deforestation, which is mostly driven by its transformation to agriculture and grazing land (Shvidenko, 2008; Kaplan *et al.*, 2009; DeFries *et al.*, 2010). Today, only 0.7 percent of Europe's forest area is estimated to remain primary (Sabatini *et al.*, 2018). Historically, Europeans managed their forests rather arbitrarily until 300 years ago, when the first notion of sustainability was documented. Some decades before the start of Europe's industrialisation, Hans Carl von Carlowitz introduced a scientific approach to forestry (Schmithüsen, 2013). His idea of sustainable forest management eventually expanded to the rest of the world, entailing that forests need human intervention to be of any value.

Given today's planetary crisis, primary forests are of extraordinary conservation value as they feature rich biodiversity and vulnerable species (Chirici *et al.*, 2012; Sabatini *et al.*, 2020). However, they face several challenges in Europe. They are underresearched (Gloor, 2023; Majdanová *et al.*, 2023), timber is of high economic interest, especially recently (O'Brien and Bringezu, 2017; Ceccherini *et al.*, 2020; Nepal *et al.*, 2021; Baumgarte, 2023), and forest policy has poor international institutionalisation (Berner and Ihlenburg, 2022). The European Union is still struggling to establish a clear and common definition for primary forests, leaving the specific management of these ecosystems in member states' hands.

Thus, this thesis is embedded in the overarching debate on sustainable development, in particular, the management and protection of primary forests in Romania. I further elaborate on the detailed connections in the final Reflections in Chapter 7. In this chapter, I provide a short overview of existing research on primary forests in Europe and Romania. I focus on the geographical aspect, i.e., where these forests are located and what protection they receive. Subsequently, I discuss the European policy perspective and analyse some existing documentary work on the topic.

3.1 Current Research on European Primary Forests

European primary forests are understudied, as researchers from the REMOTE (REsearch on MOuntain TEMperate)⁴ Research project at the University of Prague have indicated (Ferenčík, 2023; Gloor, 2023; Majdanová *et al.*, 2023). Europe is missing an official inventory. Primary forests are differently mapped throughout the states on the continent, providing only incomplete or sometimes missing data that hinders conservation efforts (Veen *et al.*, 2010; Barredo *et al.*, 2021). Gloor and others stated that in Romania, most primary forests are lost before they can be accurately mapped (Ferenčík, 2023; Gloor, 2023; Mikoláš *et al.*, 2023).

A lack of meta-studies that identify and locate primary forests accurately, motivated Sabatini *et al.*, (2018, 2021) to generate a comprehensive database called EPFD v2.0. The map in Figure 2 gives an estimate of primary forest locations and density.

Most primary forests are located in northern Europe, particularly in Finland and Russia. Otherwise, the Carpathians, especially in the Ukrainian part, host extensive areas of primary forests. In the south of the Carpathians, Romania hosts some of Central Europe's largest swaths of primary forest. In Romania, the EuroNatur Foundation commissioned an inventory of potential old-growth and primary forests based on freely available satellite data. The report (Schickhofer and Schwarz, 2019) identified around 500.000 hectares of potential primary and old-growth forest, whereas the Romanian Forestry Agency only recognises 70.000 hectares (Ministerul Mediului, 2023), with a maximum potential of up to 80.000 hectares (Nicolescu, 2023).

According to several experts, official efforts to assess and map this gap of potential primary forests seem unrealistic (Agent Green, 2023; Ciprian, 2023; Schickhofer, 2023; Moldovan, 2024). Another study found that Romania harbours over 700,000 ha of high-conservation-value forests, though they face excessive anthropogenic pressure (Munteanu *et al.*, 2022). This circumstance mirrors a fundamental problem in Romanian forestry. Nature protection often collides with regional economic interests, a strong traditional forestry lobby and

⁴ <https://www.remoteforests.org/>

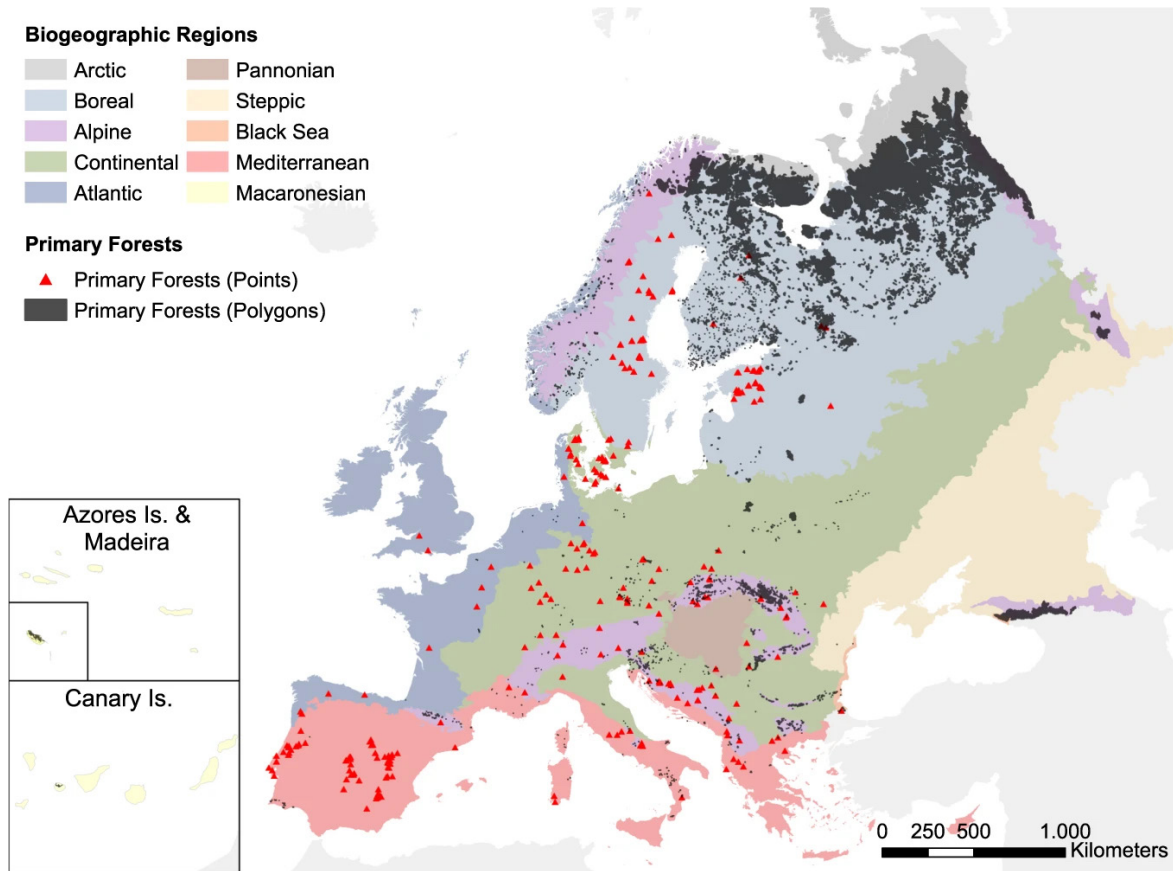


Figure 2 Overview of the primary forest patches contained in the EPFD v2.0. Both points and polygons were magnified to improve visibility (Sabatini *et al.*, 2021).

corruption (Bouriaud and Marzano, 2014; Gísladóttir *et al.*, 2020; Committee on Petitions European Parliament, 2022).

Official efforts to properly assess and protect these forests are of minor priority (Knorn *et al.*, 2013; Schickhofer and Schwarz, 2019; Mikoláš *et al.*, 2023). In practice, it seems to be mainly a conflict between old-school forestry, based on strong human intervention and more recently emerging close-to-nature forestry with significantly less intervention (Žmihorski *et al.*, 2018). While the latter is significantly less profitable in the short term.

3.2 Efforts from the European Union

The European Union has several laws and regulations intended to protect primary forests. Most significantly regarding primary forests are:

- (i) **Biodiversity Strategy 2030** aims to protect 30% of EU land and sea areas, with 10% under strict protection, including primary and old-growth forests (European Commission, 2024a).

- (ii) **Habitat Directive** and the establishment of the Natura 2000 network to protect the most valuable and threatened species and habitats, including primary forests (European Commission, 2024b).
- (iii) Proposal of comprehensive **Forest Monitoring Law** to create a database for all forests in Europe (EU Directorate-General for Environment, 2023b).

Although the European Union clearly states that it will protect all primary forests by 2030, several challenges render this goal impractical.

- (i) **No legally binding definition** of primary forests exists for all member states; each crafts its own primary forest definition.
- (ii) An estimated **mapping deficit** of approximately 4.4 million hectares for old-growth and primary forests exists—the size of the Netherlands (Barredo *et al.*, 2021).
- (iii) Most primary forests are under protection. However, **legal frameworks differ** in every member state and can still allow forms of logging.
- (iv) The interests of the EU and many **member states regarding forestry are not aligned**. In Romania, the majority of logging activities in old-growth forests are legal (Knorn *et al.*, 2013) despite reported breaches of EU law (Client Earth, 2020).
- (v) Illegal logging and breaches of EU Directives are **not sufficiently prosecuted** (Knorn *et al.*, 2013; Estonian Fund for Nature, 2020; Heubl, 2020; Client Earth, 2022; Committee on Petitions European Parliament, 2022).
- (vi) New guidelines on monitoring all primary and old-growth forests by 2029 are **neither binding nor prescriptive** (EU Directorate-General for Environment, 2023a; Mikoláš *et al.*, 2023).

Other factors like rising demand for Biomass Energy are additionally pressurising primary forests (Partnership for Policy Integrity, 2022). The first Renewable Energy Directive in 2009 pushed for Biomass Energy to become a major renewable resource (European Union, 2009). Today, it's the primary source of renewable energy in the EU (Bioenergy Europe, 2021). In particular, burning wood has been declared a zero-emissions energy source (European Union, 2018), stimulating logging activities in Estonia and Eastern European states (Ceccherini *et al.*, 2020) to satisfy the rising demand for wood. This surge for “energy wood” also expanded in protected areas (Knorn *et al.*, 2013). Investigations on supply chains linked subsidies for energy producers to primary forest and old-growth forest logging in Estonia and Romania (Heubl, 2020; Hurtes and Cai, 2022). The policy decisions of the EU and subsidies for Biomass Energy remain questionable as they prioritise European energy security and emission targets over biodiversity and primary forest protection (Ihlenburg, 2023).

3.3 Existing Documentary Work on Primary Forests in Europe

Several documentaries and stories exist on this particular topic. I highlight the most significant:

New York Times (Hurtes and Cai, 2022) conducted research on the burning of wood from protected areas. They published an interactive online article ⁵, which was cited various times, as it visually highlights the supply chain from the forest to the sawmill. They also caught a company on camera, which ground large old-grown trunks into wood chips. This sparked a widespread debate.

‘ARTE’ on IKEA “Ikea processes 20 million cubic meters of wood every year. Despite the immense consumption, the large corporation advertises with environmental awareness. The documentary uncovers the global links between the furniture multinational and uncontrolled timber production” (ARTE, 2023)⁶. The documentary contributed to the public debate that criticises the international company and its forestry practices (GEO, 2024).

‘37 Grad’ on the Wood Mafia and Illegal Logging Umweltschutz: Waldgold⁷ (Karremann, 2021) covers attempts of journalists and activists to shed light on illicit practices of the forest industry.

‘ARTE’ and ‘3 Sat’ on Primary Forest Research The Research team ‘REMOTE Forest’ around Martin Mikolas explores primary forests in Romania (‘Europas letzte Urwälder’, 2020; ‘360 Grad Reportage - Europas Urwälder, ein Schatz der Natur’, 2022)⁸.

Documentaries of NGO Agent Green The NGO has published many videos on the topic. Most prominently, the YouTube series ‘Out of Control’ (Agent Green Romania, 2017)⁹.

⁵ <https://www.nytimes.com/interactive/2022/09/07/world/europe/eu-logging-wood-pellets.html>

⁶ <https://www.arte.tv/de/videos/112297-000-A/wie-ikea-den-planeten-pluendert/>

⁷ <https://www.ardmediathek.de/video/37-grad/umweltschutz-waldgold/zdf/>

⁸ <https://www.3sat.de/wissen/nano/200113-urwald-102.html> (ARTE Contribution is not available anymore)

⁹ <https://www.youtube.com/watch?v=BrKNWcTD54U&list=PLD5D5t0S8X6hynqjsPML6QB01D9ks2GNe>

4 Methodology

The maxim for this thesis was, in the words of Erick Kästner: ‘Nichts gutes außer man tut es’¹⁰ (Kästner and Niemann, 2015). I wanted to produce something that contributes to research on science communication in Geography but also tangibly persists outside my written thesis. Consequently, I proposed a **Film-Based Action Research Methodology**, which is situated in action research and inspired by Lewin’s (1946) research method in educational science. The plan was that I, the researcher, would be actively involved in the debate of Europe’s primary forest conservation and produce a science communication product in the form of a documentary film.

This chapter starts with a short background of action research, followed by the proposed Film-Based Action Research methodology in 4.1., participatory methods in filmmaking in 4.2, and finally, audiovisual methods tested during production in 4.3. Nonetheless, the actual production process is partially also a method. It is an intermediate step, i.e., the practical hands-on part between the theoretical framework of Film-Based Action Research and the final Film and TV products. Hence, I describe the production process of the Documentary Film Padure Primara and the TV Contribution in the ‘second’ Methodology Chapter (5).

4.1 Film-based Action Research

Action research is a highly interactive method mostly used in social sciences. It aims to bridge the gap between theory and practice. However, I propose a film-based form of action research to investigate and solve our research question simultaneously. This approach differs from traditional research, for it does not seek to advance knowledge by generating generalisable results but experiments in the practical field. The advantages are immediate and actionable insights, increasing future practitioners' capacity.

Background of Action Research

Kurt Lewin is often referred to as the originator of action research (Carson and Sumara, 1997; Dickens and Watkins, 1999; Bargal, 2006; Reason and Bradbury, 2013; Smith, 2013). His approach included a spiral of planning, acting, observing, and reflecting (Lewin, 1946) as illustrated by (Dickens and Watkins, 1999).

The ‘spiral’, represented in Fig 3, starts with an overall plan, which is followed by phases of planning, executing, observing, and evaluating the results. The outcomes may lead to modifying the overall plan again and restarting the spiral.

¹⁰ Nothing good happens unless you make it happen.

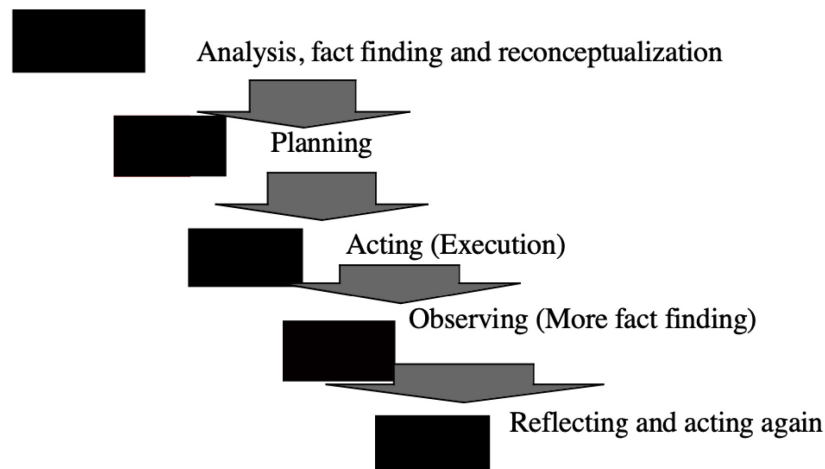


Figure 3 The original action research model of continuous inquiry in theory and practice from Lewin (1946), illustrated in Dickens and Watkins (1999).

While different approaches exist in action research, they all imply some form of direct problem-solving through the research activity (Baskerville and Wood-Harper, 1996; Dickens and Watkins, 1999; Cohen *et al.*, 2011; Hammad *et al.*, 2019).

Lewin's model was oriented to social and organisational settings (Lewin, 1946; Dickens and Watkins, 1999). Others see action research as the collecting of data to expose unjust practices or environmental dangers (Bogdan and Biklen, 1998). This strongly relates to our goal of communicating the topic of vanishing primary forests. Simultaneously, Dickens and Watkins (1999) further argue that the results of action research lead to change – exactly what I aimed for.

Concludingly, action research aims to foster the learning process to improve action and practice. Film production falls outside my main expertise. Thus, it provides an opportunity to learn across disciplines and integrate the knowledge into science communication in Geography.

Limitations of Action Research

I already discussed the advantages of an action research approach:

- (i) It is highly adaptable. Changes are part of the process and offer flexibility.
- (ii) It creates an immediate and actionable path, e.g. how to produce a film on a conservation topic.
- (iii) It empowers practitioners, e.g. other students, to advance science communication products.

Table 1 Action Research versus Experimental Research (Cohen et al., 2011). Table inspired by George (2023).

	Action Research	Experimental Research
Goal	• Diagnose, investigate and solve a problem • Improve a system • Increase future practitioners' capacity	• Quantify outcomes resulting from treatments • Advance existing knowledge • Generate generalisable findings
Context	• The own work is object of investigation • Reactive use of data in ongoing cyclical process	• Researcher is not involved in the experiments • Analytical use of data to derive causal relationships
Significance	• Practical	• Statistical

However, action research has its limitations:

- (i) Very limited generalisability, i.e. difficult to replicate.
- (ii) The process is highly subjective to the researcher. Therefore, it is also prone to research bias.
- (iii) Experiments are complicated to plan and execute. The high flexibility of the method can make travel or interviews difficult.

As presented in Table 1, it is also important to confine action research to experimental research. Action research differs in its goals, context, and significance. Limitations are further discussed in the Final Reflections Chapter 7.

The Cinematic Action Cycle

The core of our Film-based Actions Research Methodology is an action cycle consisting of three *Actions*: **Planning. Executing. Evaluating.** It differs from Lewin's original model but also from other action research 'cycles', as it is geared particularly towards film production. Thus, I call it the **Cinematic Action Cycle**. Its characteristic is constant iteration during all tasks necessary in film production, from idea to final edit. Its characteristic is constant iteration during all tasks necessary in film production, from idea to final edit.

Planning.

The goal of this *Action* is to generate a **Plan**.

Following the maxim: make plans, break plans, but never go without a plan, I expected that plans need to be adapted in the field. However, how much a plan has to be adapted varies. Anything can change, from the simple timing of the departure



Figure 4 The Cinematic Action Cycle consists of planning, executing and evaluating.

in the morning to a completely different interview partner, location, or shooting day. The connection between planning and executing is, therefore, **adaptation**.

Executing.

Action! Like the Hollywood Klischee of a director shouting on-set, execution of the Plan means being in the field producing raw content. The goal here is to **generate Video and Photo footage**. Sometimes hectic and stressful, sometimes hours of waiting. Timing mainly dictates the **execution**. Everything happens on the go, and while there is little time to 'zoom out' and put single scenes or shots into the bigger context, **execution** happens mostly **unreflected**.

The **documentation** of impressions in the field or more extensive logs at the end of the day close the gap to the third *Action* of Evaluation.

Evaluating.

After the documentation comes the evaluation to generate insights. This is a key step in the learning process. Reflecting on actions and their results builds the practitioner's capacity.

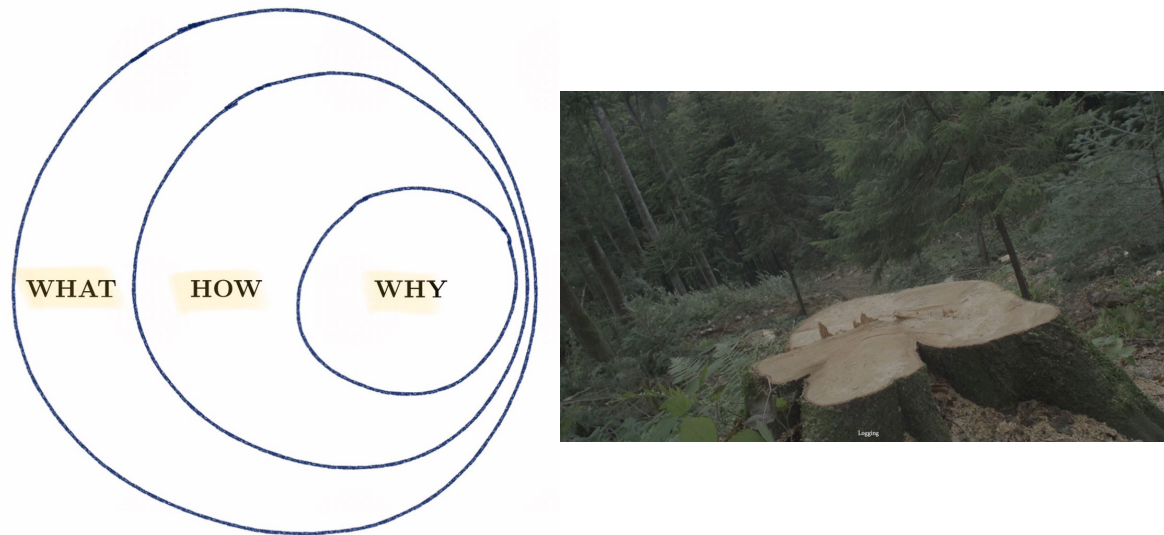


Figure 5 The Golden Circle from Sinek's 'First start with Why' (2009) next to a screengrab from the Documentary Film.

This generated knowledge will then be disseminated into the planning phase of the following iteration of the cycle.

Inspired by (Sinek, 2009) 'First Start with Why'¹¹, I asked **What**, **How** and **Why** for the evaluation. Figure 5 represents this scheme in a circle where What and How lead to the core – the Why.

I start with **the descriptive**, **What** do I see and feel?'. This is represented mainly by the first impression. What does the scene convey? What is the takeaway? This is followed by an examination of **technique**, **How** is it done?'. To explain how the message was transported, I investigated, for example, the scene's composition, technical aspects or timing. Lastly, this brings us to **contextualise**, **'Why** does the shot work?'.

In Figure 5, I use a visual example to demonstrate how I used this scheme to evaluate our actions and results. A tree stump is surrounded by a partly intact forest. It seems recently cut, while the surrounding fresh green branches and leaves cover the forest soil (Ihlenburg and El Flamingo, 2024, 11:08). That is **what** I saw.

How was it done? This is more technical. In our example, it is a still shot on a wide 19-mm lens. Although it is video, there is less camera movement and, in this case, barely any movement in the scene. The camera is close, about 2 meters above the

tree stamp, offering a top-down view of the steep forest parcel against the opposing tree-covered valley. What follows is the **'why'**.

¹¹ <https://www.youtube.com/watch?v=qp0HIF3Sfl4>

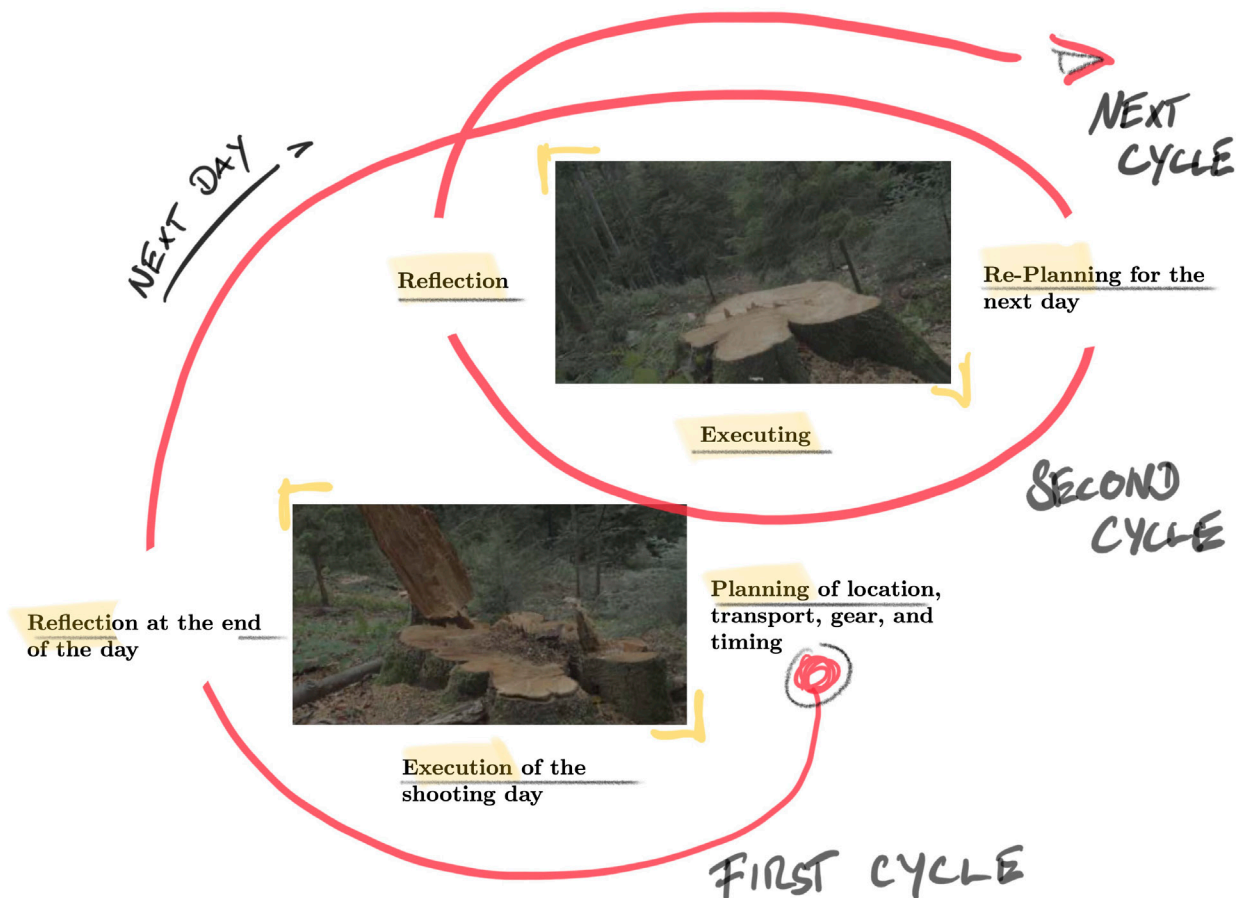


Figure 6 Example of two Cinematic Action Cycle iterations.

Why does it work or not work is much more subjective than the other ‘what’ and ‘how’ outer circles. This inner circle asks for the perceived meaning. **Why** do I feel like the other trees will be cut next? **Why** does it feel like the destruction of nature? **Why** is the main feeling sad?

Many components influence the message. A wide angle close to the subject exaggerates the perspectives, which generates the feeling of immediacy and of being ‘in the scene’. The fresh sawdust conveys the recent event of cutting down the tree. Treetops and green surroundings offer plenty of contrast. The fallen tree is missing, suggesting that it was harvested. The sharp cut of the tree stamp makes the impression of human intervention rather than natural disturbance. Simultaneously, its bright surface emphasises the contrast to the untouched surroundings. These are possible answers to why the shot works as intended.

This framework is a simple way to evaluate single scenes. It is embedded in the Cinematic Action Cycle’s evaluation part. In the following, I demonstrate an example shot to explain how I applied the Cinematic Action Cycle.



Figure 7 Topographic map of Romania with main Areas of reserach in red and travel routes in yellow. Map by Mapsland (2024).

In Figure 6, a complete iteration of the action cycle is started by **planning the location, transport, particular gear, and timing**. I wanted to shoot a freshly cut tree in a primary forest in the Fagaras Mountains in Romania as a wide-angle still shot with sufficient available light represented in the bottom-left picture in Figure 6 (Ihlenburg and El Flamingo, 2024, 11:02). While **executing the plan** in the field, I **adapted** exact framing, the top-down angle and timing to evening/darker light. Skimming through the footage at the end of that day, I **noted that this shot worked** out sufficiently for the reasons already mentioned above (exaggerated perspective, immediacy, and contrast). I also tried out a slightly off-angle alternative to emphasise that the tree stamp was actually „off“ in this shot. Reflecting on both versions, I **recalibrated the shot list for the following days** to play more with this off-angle composition, nonetheless definitely continuing with the wide-angle shots (top-right in Figure 6, (Ihlenburg and El Flamingo, 2024, 11:08). While this is a highly subjective result, the example demonstrates that the Cinematic Action Cycle serves as a tool for iterating through a project in a structured way and simultaneously offering actionable solutions.

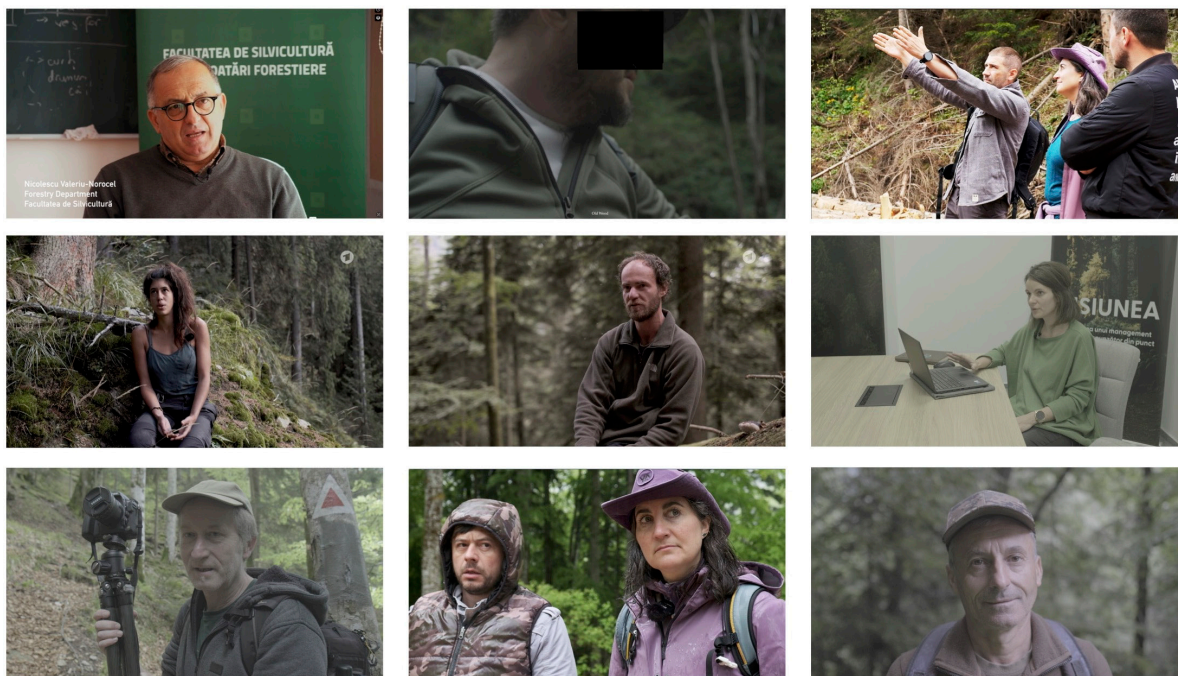


Figure 8 Interviewed Protagonists from top-left to bottom-right: Prof. Norolescu, Silviu Moldovan, Garbiel Paun, Rhiannon Gloor, Matej Ferenčik, Alexandra Popa, Matthias Schickhofer, Anna Deparnay-Gruneberg, Nicu Ghircoias. Screengrabs from the interviews without color or exposure corection.

The experimental environment for the cycle

While the Action Cycle is the method, explaining the project's overall structure is important to render a complete picture.

I set the scene to experiment with the Action Cycle in Romania around the topic of primary forests. Originally planned to be a one-time trip of three weeks, I ended up travelling to Romania six times, spending a total of 57 Days in mainly two regions of the country, namely Domogled National Park and Fargaras Mountains in the southern Carpathians (See Map in Figure 7). I met and accompanied 16 Persons in Romania who all worked on the topic of primary forests. I also interviewed eleven of them on camera. Figure 8 represents nine of them:

- (i) Prof. Dr. MSc. Norocel Nicolescu, Transilvania University of Brasov, Faculty of Silviculture and Forest Engineering
- (ii) Silviu Moldovan, Forest Ecologist, Investigator for NGOs and Universities
- (iii) Gabriel Paun, President NGO Agent Green, Activist
- (iv) Rhiannon Gloor, Researcher and PhD Candidate at Prague Unvierstiy of Life Sciences, Department for Forest Ecology
- (v) Matej Ferenčík, Researcher and PhD Candidate at Prague Unvierstiy of Life Sciences, Department for Forest Ecology
- (vi) Alexandra Popa, FSC Romania, Market Development Coordinator

- (vii) Matthias Schickhofer, Activist, Journalist, Photographer, Book Author, and Researcher.
- (viii) Anna Deparnay-Gruneberg, Member of the European Parliament, Greens/EFA
- (ix) Nicu Ghircoias, Forest Ranger in Șinca, Brasov.

This 'environment' gave me plenty of latitude to experiment with the Cinematic Action Cycle in Romania. I mainly used audio memos to document my impressions, ideas, and progression on primary forests and film-based action research. Later, transcription software helped significantly to structure these notes in text form.

4.2 Participatory Methods in Documentary Filmmaking

Documentary Filmmaking mostly involves interaction with other stakeholders, i.e. any party or person involved around a certain issue or topic. In our case, the ecosystem forest and, more specifically, the conflict over primary forests in Romania. This could be for example, an expert, concerned community representative, or researcher. Documenting a topic without stakeholder interaction is possible, e.g., using only archive or stock footage and creating the narrative without interviews. Though, interviews are the usual form to include the voices of stakeholders and shape the narrative.

Interacting with stakeholders can take many forms. One variable that defines the relationship is participation. I experimented with different participatory methods.

- (i) The transect interview, originating from the transect walk, is often used in ethnography (Okoko and Prempeh, 2023).
- (ii) Feedback loops on draft edits with stakeholders.
- (iii) Participatory filmmaking, i.e. shooting in a collaborative style.

Transect Interview

Derived from the Transect Walk, I used a more flexible and mobile interview form. (Okoko and Prempeh, 2023) and (Rojas *et al.*, 2021) describe the transect walk as a community-based mapping tool. Additionally, (Dongre *et al.*, 2009) see it as a 'qualitative tool and technique which uses participatory research and action'. For the context of interviews for a documentary film, I adapted the transect walk into a 'transect interview'. This means that instead of participants reporting on their walks through an area of interest, I conduct an immediate walking interview with stakeholders. The main defining points of the transect interview are

- (i) the recording on the way – no set up of the interview
- (ii) the interviewee chooses where to go and what to highlight without a prior arrangement
- (iii) the interviewee expresses the bigger picture or issue by observing and explaining the surroundings.

I used it primarily in planted, and clear-cut forests. For example, I interviewed a forest ecologist about the specialities in primary forests. He chose where to go and explained what he observed. Not knowing the outcome, I filmed him and only asked follow-up questions to clarify his statements for laypeople. On his own terms, he also expressed his concerns about current forestry practices while we passed a forest parcel that had been managed in the past.

Feedback Loops with Interviewees

Three interviewees received a draft cut of their interview, which they could comment on. Especially with Moldovan and Gloor, I practised several feedback loops. In most cases, they noted some statements to remove and others to include as they were more important visually or for accuracy. They also commented on the general accuracy of their statements' summarisation, which helped to represent them as authentically as possible.

Participatory Filmmaking

To create a participatory environment, when filming, I asked several questions while or before filming. For example:

- (i) What should be in the background?
- (ii) What is important for you to convey regarding the topic of primary forests?
- (iii) What question would you ask in my position?

- (iv) What is visually important to represent the primary forest authentically?
- (v) What do you think should be included visually?
- (vi) What should be excluded?

When filming with researcher Matej Ferenčík (2023), I asked him about bears in primary forests. I perceived that bears are mostly dependent on primary forests. However, Ferenčík explained that bear populations thrive also in managed forests. There is no consensus that they are dependent on primary forests. He requested to exclude this topic from his interview and parts associated with him. This was valuable information during our filmmaking process.

Other examples of participatory filmmaking included requests to film interviewees in front of specific species or including the species in the B-Roll. All valued the chance to articulate their personal key points on the topic.

4.3 Experimenting with Audio-Visual Methods

Cinematography is the storytelling element most intrinsically linked to filmmaking. We experimented with different methods to create a visual style for the cinematography in the Documentary Film. When I started filming the first interviews, I was not really focused on style. We¹² shifted our focus in cinematography to consistent styles only in a later stage (see Fig 9).

¹² Chapters 4.3 and 5 are predominantly ,We' since I created the Documentary Film together with the production company.

Interviews

The interviews were the most experimental since the settings varied. However, we also played with different techniques and styles of filming.

Different settings included

- (i) One person conducted the interview vs. two people, the interviewer and cameraman, conducting the interview. This was a significant difference since in a 'one-person show,' it is much more difficult to focus on the interviewees.
- (ii) A fixed setting vs. on the go. Fixed offered more control but was less interesting, and interviewees were more uncomfortable. On the go offered more flexibility but less control. Interviewees were mostly more comfortable.
- (iii) Preparation for an Interview vs. no preparation. Sometimes, no preparation was even better since questions were asked, similarly to the viewers, without prior specific knowledge.

Other factors were the Timing of the interview, length, and the style of questions.

Visual Storytelling and Technique

We experimented with different directing styles, including:

- (i) Static shots vs handheld shots
- (ii) Playful movements vs calm movements
- (iii) Different Angles of the camera
- (iv) Staged vs unstaged B-Roll (i.e. staged walking through the forest)
- (v) Hiding Silviu's face through various techniques¹³
- (vi) Flying the drone inside and outside the forest
- (vii) Filming displays vs screen recordings

Otherwise, we experimented with music, sound effects and graphics in the editing process to achieve consistency and unique style.

Equipment

We used three different cameras and different sets of lenses to create specific looks. For example, we intentionally used the consumer camera for more investigative-styled footage, while the cinema camera was used for large parts of the movie. Additionally, we used several drones. The most significant difference was the focal length. For some shots, a long focal length on a special drone created a unique look of a zoomed image, which is rather unusual

¹³ We decided to hide Moldovan's face in the Documentary Film for security reasons and to avoid obstructing his future investigations in Romania.

for drone shots. We used this look in several scenes that showed wood harvesting or timber industry.

For Audio, we used a shotgun mic, a Lavalier mic, or a Rode Go Clip mic. This offered different possibilities. A shotgun mic, for example, is limited to a certain distance, while the Rode GO offers wireless transmission. This way, sound quality is consistent when people are walking at some distance from the camera or not facing the camera. For example, in some shots, Moldovan was 15-20 meters away from the camera inside the forest, but his voice sounded like he was standing in front of the camera. A special effect we used frequently.

5. Producing a Non-Fiction Film

The Documentary Film is about the forest ecologist Rhiannon Gloor, and forest investigator Silviu Moldovan. Both share the same concern about the missing recognition and poor protection of primary forests in Romania. They frequently visit and research several forest regions in the Fagaras Mountains, where they encounter breaches of European Law, Illegal Logging or dubious practices in protected sites. However, they also show the viewer pristine primary forests never touched by man and explain their relevance to society. Both argue for better and faster protection.

In this chapter, I explore the actual production of the Documentary Film in three parts. 5.1 sets the scene, i.e. the pre-production. I explain the collaboration with El Flamingo, a professional production company, and how we planned the shooting days. 5.2 describes the experiences from the field, where hurdles and deviations from the original plan were part of everyday life. Finally, 5.3 is about the post-production process for the Documentary Film and a television feature.

5.1 Setting the Scene

At the beginning of the thesis project, I had no relevant experience with a 30-minute plus documentary video project. Not only in a technical sense but also for storytelling in video and organising shootings. My relevant experience was freelance work as a photographer and assistant at film productions. I gained additional experience throughout the thesis project by working on a YouTube series for the Greens/EFA in the European Parliament. In the following, I provide a detailed explanation of the project's timeline, the collaborations, and the pre-production process.

Working with a professional Production Company and for Television

During the project, a production company¹⁴ from Düsseldorf, Germany, became interested in the topic of primary forests in Europe and offered to produce the Documentary Film I was working on. The idea was to combine their filmmaking skills with my knowledge and network in Romania. They would take the producer role, and I would shift into the director role, responsible for the content, dramatic aspects, and organisation of all stakeholders. Table 2 outlines the responsibilities and limitations of contributions in the collaboration with the production company.

¹⁴ <https://www.el-flamingo.de/>

Table 2 Responsibilities and contributions to the Documentary Film Padure Primara

Responsibility	Production Company	My Contribution
Checking on the science behind the movie		X
Content lead on the environmental issues and questions		X
Research on location, stakeholder and content		X
Stakeholder Management		X
Organising Cast and trips to Romania		X
Filming	X	X
Directing	X	X
Defining Look and Cinematography	X	
Defining the main Narrative (Storytelling)	X	X
Organising Equipment	X	X
Conducting Interviews		X
Data Handling	X	
Editing (on professional Workstation)	X	
Overseeing Edit (remote and in-person)		X
Color-Grading	X	
Audio Mixdown	X	
Final Distribution	X	
Application to Film Festivals	X	X
Marketing for Screenings and Release	X	X

Table 3 Responsibilities and contributions to 3 Sat TV Contribution

Responsibility	SWR	My Contribution
Filming in Romania		X
Author		X
Editor	X	
Master Cut		X
Color Grading		X
Audio Mixdown	X	
Voice Over	X	
Distribution	X	

It is important to note that they had no direct financial benefit from the production. No sponsor was involved. This was a personal project for one of the owners. They will benefit only through exposure to film festivals and potential awards.

On the one hand, this offered several possibilities:

- (i) Increase in quality through their experience, skill and equipment
- (ii) More budget for production, especially in the post-production
- (iii) Learning from over 10 years of filmmaking experience
- (iv) Significant increase in exposure for the Documentary Film
- (v) I could focus more on the content of the Documentary Film

On the other hand, this posed some risks:

- (i) Less control over the overall product
- (ii) More work and longer project time because of higher standards
- (iii) Conflict on story and style
- (iv) Team differences and other team-related conflicts

After careful consideration and discussion, I decided to pursue production with the company. Figure 9 describes the project's timeline from the initial idea to the hand-in of this thesis. Not shown in the figure is the collaboration with 3 Sat. In December 2023, I sold them a short television contribution. This feature was produced at SWR in Germany. The final 6-minute contribution was aired in February 2024 as part of the Science Magazine 'Nano'. The collaboration is defined in Table 3.

It was about Rhiannon Gloor and Matej Ferenczik from the University of Life Sciences in Prague, who researched a primaeval forest in Romania. Gloor is part of the REMOTE Forest Team, mapping primaeval forests and studying their changes, while Ferenczik examines forestry's impact on biodiversity by comparing primaeval forests with managed forests and clear-cut areas. We explored what drove them and how they used Europe's wilderness to understand ecosystems better.

The TV Contribution is part of the results in Chapter 6 and complements the longer Documentary Film as a 'side product'.

Pre-Discussions and Expert Interviews

To prepare for the challenges, I interviewed several professionals or otherwise experienced people (see list below). My preliminary findings are divided into technical issues, storytelling, and organisation.

- (i) Schickhofer (Photographer, Campaigner, and Researcher on Romanian Forest Protection (2019))
- (ii) Dr Dorn (Photographer, Producer of a Documentary Film, University Vienna)
- (iii) Neugebauer (Geographer, Photographer and Filmmaker, University Vienna)
- (iv) Dr Habersack (Award Winning Documentary Director for ORF)
- (v) Boris Emhardt (Chiefeditor SWR News (ARD Germany))
- (vi) Dr Klingler (Researcher focused on Visual Geographies, BOKU)
- (vii) Iwaniewicz (Journalist Falter, Focus on Science Communication, Lecturer University Vienna)
- (viii) Martin Mikolas (Czech University of Life Sciences Prague, specialised in Romanian primary forest)
- (ix) Charles Ottley (BBC Director, produced over ten documentaries on the natural heritage of Romania)
- (x) Univ-Prof. Dr Valeriu-Norocel Nicolescu (Forestry Departement at the Transilvania University Brasov, cooperates with BOKU)

Technical Issues and Equipment

I focused on a budget camera body with a brand I already knew about and prioritised audio equipment and lenses. Managing audio and video simultaneously would be challenging, so I opted for the practicality of the microphones and lenses.

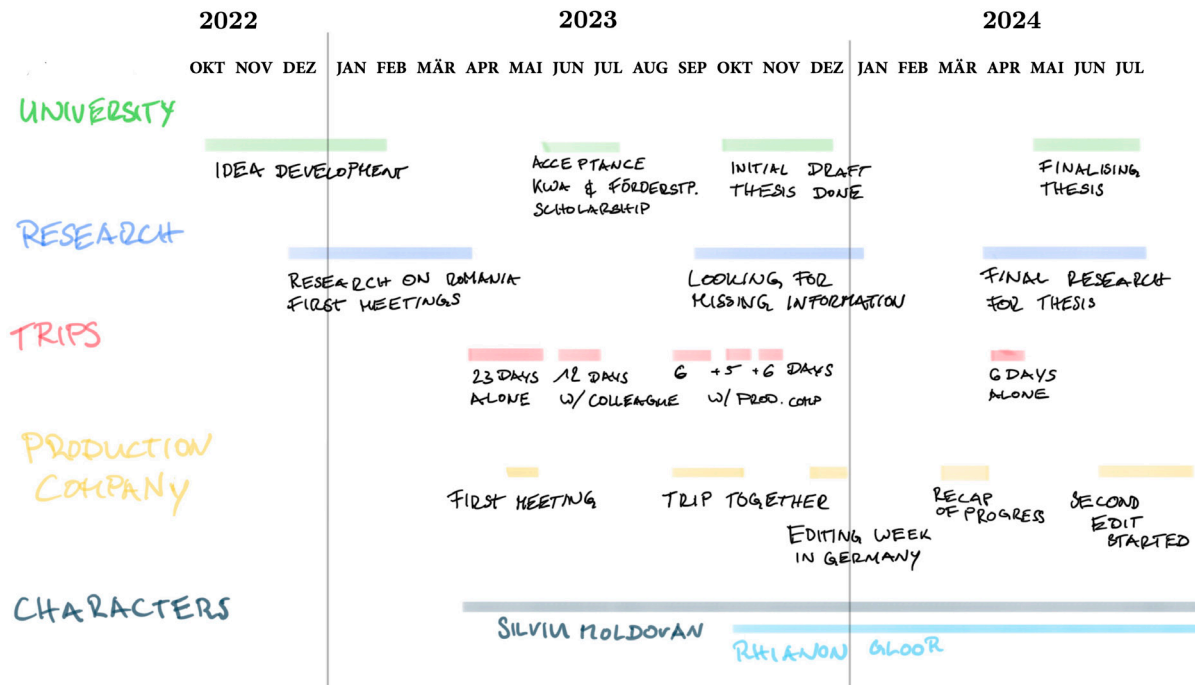


Figure 9 Timetable of the production of the Documentary Film Padure Primara.

Simple clip-on wireless microphones proved to be very valuable, as they are quickly set up and deliver solid audio quality. I was recommended to use prime lenses for better image quality and simplicity. Initially, the plan was to rely solely on a modern smartphone for filming. It would have been the most simple approach for filmmaking, also guaranteeing a low barrier for other practitioners. However, after several discussions, it became clear, that a smartphone is too limited in options. Moreover, most people are confused when you show up for a documentary shoot only with a smartphone in hand.

The most recommended a drone since forests are hard to portray without a bird's eye perspective. One stressed that drones are overused for modern media productions and would leave the camera on the ground, i.e., stick to the human's eye perspective.

Also important was a tripod since interviews are much more comfortable without simultaneously holding the camera. Additionally, I needed long battery life and small file sizes to shoot for a full day or two without recharging and backup.

Storytelling

Telling an engaging non-fiction story for 40 minutes is complex. There is no definite guide to follow. However, I received many helpful recommendations and summarise them in three categories: the plot (what), the characters (who), and the style (how).

The most common advice for the plot was to keep it as simple as possible. This meant explaining the topics in less words and complexity. Breaking down the issues into easy-to-understand bits and explaining every term, that might be unfamiliar.

“The opposite of science of scientific writing is not unscientific writing, but boring writing” (Iwaniewicz, 2022). This expressed the importance of writing a story, not just listing facts. The work to understand a complex topic is either by the author or the reader. Thus, the story should follow an arch. Former ORF director Habersack (2023) explained that films longer than 15 to 20 mins need to have a dramatical arch to keep viewers engaged. Only shorter films could work without a clear story.

The question for the narrator's perspective was often mentioned – Who is telling the story? This followed the question of whether there would be a narrator and if he would be in front or only behind the camera. Through the narrator, information can be easily scripted and directly communicated to the viewer, either in voice-over style or as a reporter in front of the camera. In the contrary, without a narrator, characters and imagery would need to tell the story. The latter makes it more complex but creates a cinematic style of film, whereas voiceover is typical for a TV reportage or nature film.

Organisation

Most argued for a minimum of two or three trips to Romania. In classic documentary films before internet communication, the first trip was to scout locations and characters, the second was to arrange shooting days, and the third was to actually shoot. However, nowadays, two trips have become the norm in modern communication (Habersack, 2023). In any way, all recommended taking enough time to build a network at the location.

Postponed interviews, weather changes or spontaneous opportunities with new protagonists would most certainly arise along the trip and flexibility would be important. Direct and personal contact, also on the phone would be easier than e-mail. Reaching people could be difficult. Convincing them to be part of a documentary film is even tougher. However, it certainly would help to explain the connection to the University. Especially for interviews, an initial conversation could help to clarify the first questions and the scope.

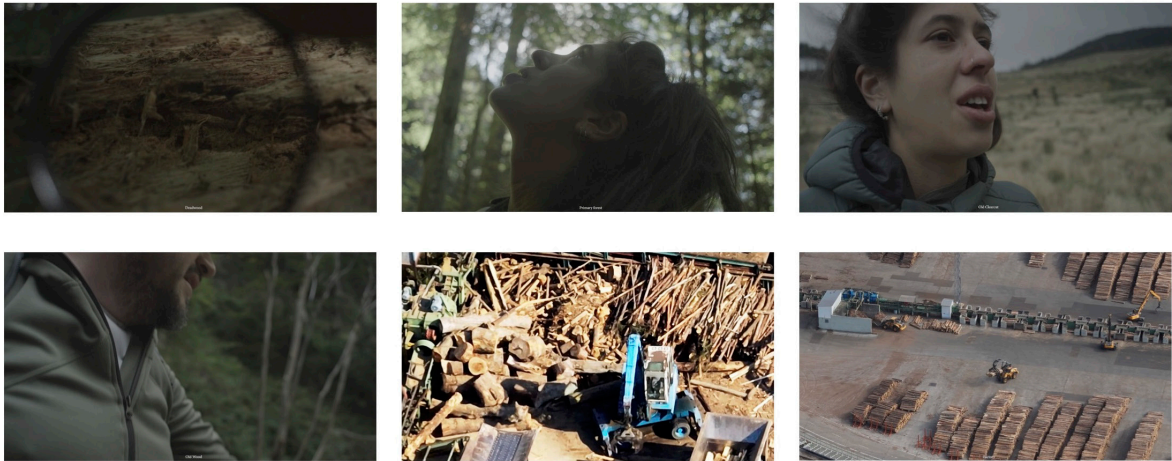


Figure 10. Screengrabs from the documentary film. From top-left to bottom-right: magnifying glass effect (v), special look of lenses against the light (i), distortion effect of wide-angle lens interviews (ii), hiding Moldovan's face through framing (vii), zoomed drone footage (vi), drone footage with long lens (vi).

Developing a Visual Narrative

I developed a visual narrative with El Flamingo, the German production company. This included framing, composition, distance to subject, focal length, gear, and other creative choices to visualise the story. Generally, much inspiration came from the area of modern sports commercial shoots¹⁵ – El Flamingo's main expertise. In contrast to standard television features, this style is defined by the following 'techniques'. Visual examples are given in Figure 10.

- (i) Vintage Lenses on modern Camera, i.e. Leica Lense from the 90's on a RED cinema Camera. This produces imperfect but characteristic imagery.
- (ii) Use of wide prime lenses. This requires a close distance to subjects while filming to generate a typical portrait shot. It also distorts more than longer lenses.
- (iii) No stabilisation, e.g., tripod, in-body-stabiliser or gimbal. This produces a shaky but also imperfect look matching the vintage lenses (i).
- (iv) Fluent camera movements around the subjects. This provides a rough and intimate feeling of being in the scene.
- (v) We used a magnifying glass holt up against the lens when filming details.
- (vi) Drone Footage from high above and a long lens (7x optical zoom) created a 'surveillance-style' picture
- (vii) Hide Moldovan's face mainly by 'smart' framing

Additionally, we decided to hide the main protagonist's face, mostly due to security concerns and to not obstruct his work. Moldovoan's face will be only visible from different angles,

¹⁵ E.g. <https://www.el-flamingo.de/mammut-together-for-glaciers> or <https://www.el-flamingo.de/arcteryx-closeup-series>

not showing his eyes, or he will be blurred in the final release ¹⁶. The weather during some shoots was, to some extent, a style choice since we filmed the primary forest shots in good weather and the clear-cuts in bad weather. We figured this created a better contrast. The scenes I filmed on my own are different, not only because I used a much smaller consumer camera, but also because we intentionally wanted to create an investigative look for some parts.

Location and Logistics

I consulted several people who had local knowledge of the area. It was clear that I would need a car to move between locations and interviews, so I mainly focused on two locations to reduce the travel times – Domogled and Fagaras Mountains (See Map in Figure 7). The most useful advice was about the locations of primary forests that were accessible and visually interesting to portray, since they are not easy to find, as no official guides or maps exist. Moreover, most forests are too steep to shoot in sufficiently, so planning the location had to be precise.

I expected many scouting trips to get a picture of the area. Moreover, tourism is scarcely developed, so most areas are only connected by forest roads, which are not mapped and sometimes inaccessible for normal cars. One comforting fact about Romania was the train connection to Vienna, which allowed for budget and environmentally-friendly travel.

Arranging Days of Shooting was challenging, mostly due to the changing weather and availability of protagonists. Generally, we made only rough plans and decided on most scenes on the go.

Characters

Following Ken Burns (2022), conflict is the driving engine of story. In writing fiction, storytellers can create conflict and drive each character's journey forward. However, documentary filmmakers face the additional challenge of being bound to factual accuracy when shaping non-fiction characters.

A central consideration was on how much scripting for these characters is justifiable. Certain scenes can only be filmed when staged, while others emerge organically. I discussed this with most experts and concluded that less staging the better; however, it should be decided for every scene.

The viewer needs to identify with a person in Documentary Film, somebody who guides them through the topic. As a backup plan, I should have been the central character—the student who explores a topic. Nonetheless, we preferred to find one or two main (expert) characters who explained the topic and local circumstances. Both were not easy to find. A character is very defining for a film. Thus, our decision was carefully made. Moldovan

¹⁶ In the current edit, this hasn't been done yet. His face is still visible.

proved to be a good communicator and fully invested in the topic, so we stuck with him. Similarly, when we met Gloor for the first time, it became clear that she was a fitting counterpart from the scientific community to Moldovan. In approximately the middle of the process (see Figure 9), we agreed to feature both as the main characters that guide through the Documentary Film.

Although they had never met before the shooting days, they worked in great synergy. Both were interested in each other's work and comfortable in front of the camera.

Finding the Central Message

Our initial central message looked like this:

“Primary forests exist in Romania, but we don’t know where they are exactly. This makes them hard to protect, but they are relevant to society. We should better protect them, but efforts have had little success in the past.”

This perhaps changed most during our filming process. However, I discuss the evolution of the central message in the Final Reflections Chapter 7.

The advice from peers for the central message differed vastly, perhaps because this matter is highly subjective. How do we portray the primary forest? Old-growth Forests can look similar to young forests for laypeople. The defining differences should be carved out and visually represented. We discussed many ideas, including how to find the balance between the explanation of primary forests and conservation issues. Who will be mainly represented in the interviews? What is the overall narrative? How do we represent characters? What do we leave unanswered? How do we end?

All considerations always led to the final question: How will this shape the central message?

5.2 In the Field

After the pre-production, the shooting in the field followed. All shootings took place in Romania, mostly in the Region of Fagaras and Domgled (see Figure 7). In this section, I describe how interviews were conducted and discuss the teamwork experiences throughout different settings.

Shooting while moving

Most filming happened on the go, which meant very short set-up times, no artificial lighting, and almost no scripting. See Figure 11 for some ‘behind the scenes’ photos, demonstrating our lightweight setup. Additionally, we mostly accompanied experts on their missions, i.e., they took us with them. This complicated the precise planning of shooting days. Moreover, we were very dependent on weather and road conditions. Table 4 describes a standard day of shooting to provide an example.

The example shooting day in Table 4 demonstrates that most situations come up on the go. This also fitted our participatory approaches, as described in Chapter 4, because both characters, Gloor and Moldovan, are highly engaged in the topic. The shooting days are part of their actual work, and both had valuable exchanges during these days on their work and knowledge. We followed their guidance through the area and paid attention to what they felt in different places. This flexible approach with interviews directly on the spot without a script or long preparation created a participatory environment.

We generally used a shot list for every shooting day. Figure 12 represents an extracted version of the production documents. It is divided into three chapters: the beauty (primary forest), the problem (conservation issues), and the solutions. Each chapter consists of a logline, visual shot ideas, the goal of the chapter, and the mood.

Shooting in controlled settings

Three interviews were carried out stationary and indoors, with a two-camera setup. This helped with short time frames and interview partners working mostly in an office. The advantage is that the interview can be done in 1-2 hours, in a very dense dialogue. The most significant differences were whether a fixed questionnaire was used and if there was a dedicated cameraman. With a questionnaire, the dialogue in the interview was more static; however, the interview partner was better prepared and answered questions concisely. In contrast, the interview without a questionnaire offered more room for follow-up and situative questions. However, it was more difficult to edit in post-production since it was much more dense in different topics, and the interviewee answered questions in more depth.

I conducted the interviews alone with the camera mounted on a tripod. Later, we also used a two-camera setup operated by a cameraman, and I could fully focus on the interview. This division of work offered much more control over it. However, this means more effort to organise, a more intimidating environment for the interviewee and more expenses.

Audio matters

Most interviewees of the pre-discussions already mentioned the importance of audio quality. Missing or broken audio is hard to fix. In imagery, there are more opportunities to coat scenes. For example, we had a situation where there was interference from an electric source in a room. The microphone picked it up during the interview. It would have been hard to fix. Fortunately, the backup Lavalier mic was fine. A blurred image or camera shake may also disturb the viewing experience. However, in our experience, it is not to the same extent. Lost audio is worse than lost imagery. Most imagery can be replaced with stock footage or other B-Roll. Missing audio statements can't be replaced or regenerated.



Figure 11 Behind-the-scenes pictures demonstrating the light equipment setup.

Interviews

For two interviews, questionnaires were sent up-front. All others were conducted on the go without precise planning. We always carried out a list of important questions that helped with structuring. Most Interviews were quickly planned and executed in collaboration with the interviewees. As described in Chapter 4, we strongly relied on the transect interview. In praxis, a mixture of accompanying someone on his own mission, asking questions and filming simultaneously. It also ensured the participation of experts in defining the place, background and even direction of the interview. This was the most comfortable way of interviewing for us and the interviewees.

Working in a team

Most scenes were filmed in a team, with at least two people. This meant constant feedback and consulting on detailed and major questions. During interviews, a second person could significantly help to ask missing questions or clarify ambiguities. Otherwise, we discussed most scenes immediately and decided whether we needed more or if it was a wrap. Nonetheless, working in small teams makes communication simple and direct. There were no major disagreements during the shooting days

Table 4 Example of a typical shooting day in the Fagaras Mountains.

0800	Driving towards the primary forest area in Fagaras Mountains with Silviu Moldovan, a forest ecologist.
0900	Continuing on the forest road, as far as the conditions allow with the 4x4. Filming first questions on the local forest conditions in the car.
1000	Starting to walk towards a GPS location, Moldovan wants to inspect for one of his reports. First traces of recent logging become visible along the muddy road.
1200	Arriving in a new forestry parcel, where recent logging took place in an old-growth forest, potentially primary. Short interview with Moldovan on the situation. Is it officially declared? How was it logged? Did they follow the Natura 2000 Protection Guidelines? Where does the timber go? Starting the drone for Orientation and top-down perspective. Filming B-Roll of the logged forest (stamps, heavy duty machine, surroundings).
1300	Ascending to an 15 year old clear-cut, that turned into grassland. Interview with PhD and researcher Gloor on the situation. Shortly after, we find several habitat trees of high-conservation value that are marked for logging. Shooting of Gloor around the habitat trees, explaining their value. Filming B-Roll of her exploring the clear-cut.
1500	Descending towards an ancient forest part not far away. Moldovan identifies it as primary but outside official protection. Filming habitat trees (large, old trees covered by moss and smaller plants) and other specific species in the area. Drone shot: transition from inside the forest to outside the canopy layer. B-Roll shots of Gloor walking inside the primary forest.
1600	Heavy rainfalls. Hiking back to the car.
1700	Back at the car.

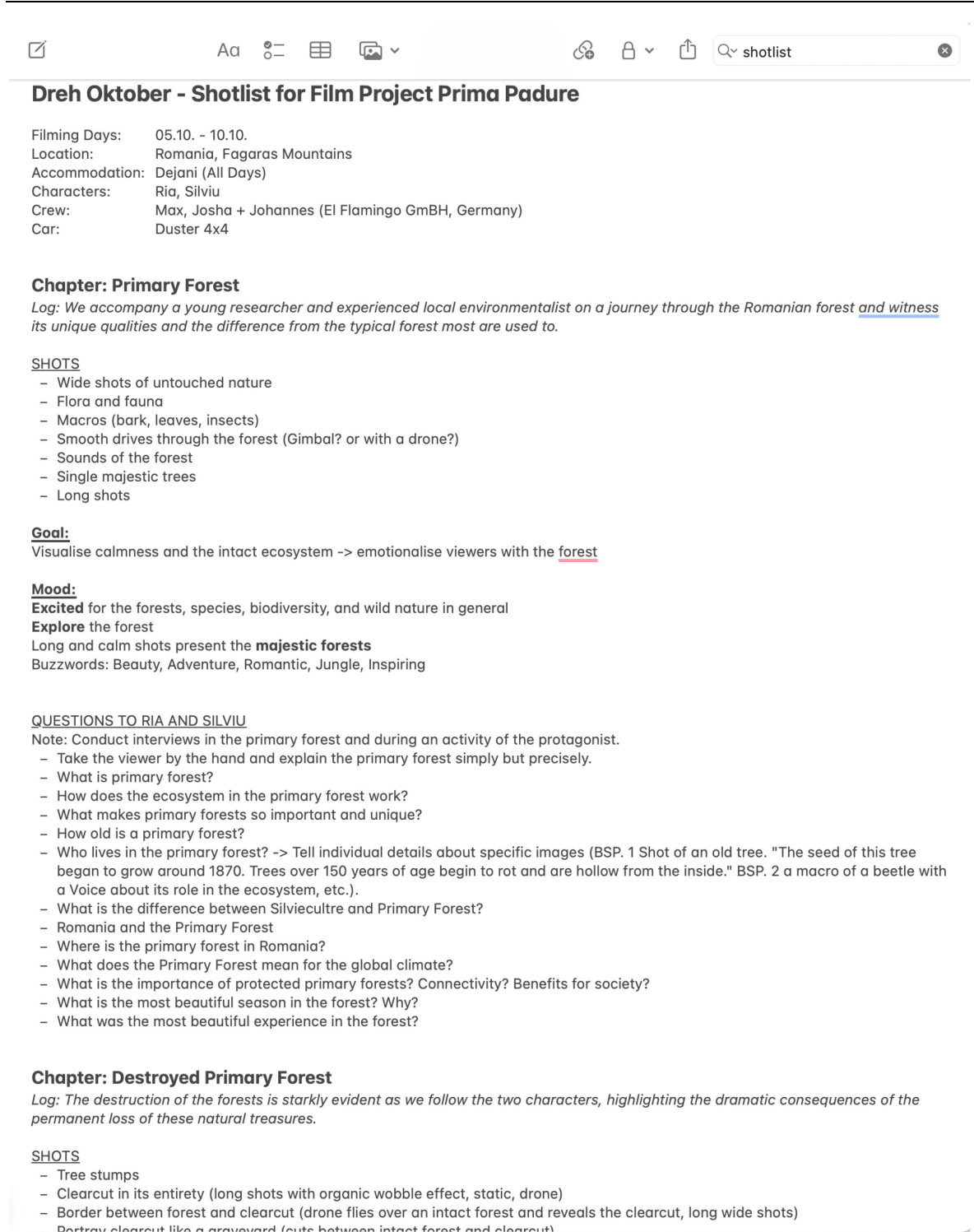


Figure 12 Shotlist extraction from production documents

5.3 Post-Production

Good documentary storytelling takes time. There is no way around the essential process of editing. I have already described the research, visits, scripts, methods, characters, interviews, and camera work. In the edit, these pieces are arranged, coordinated, and shaped into the final form – this is where the actual film is created. All the micro-decisions took more time than expected, though time is perhaps the defining component of a qualitative edit.

Our process was not all straightforward. The first edit started later in the project (see Figure 9). The resulting first edits were rough and experimental. However, they focused on the interviews and the structure of the narration. The key is understanding the overall structure and receiving feedback from the first screenings.

The first assembly is mostly too long and complicated or, as (Burns, 2022) described, painful to watch. However, this is as it should be. It is crucial to lay out all your options as a first step in refining the core story. The next step involves an iterative process of trimming, restructuring, compressing, and rewriting, focusing on refining the most important narrative elements.

During the revision process, it is crucial to maintain enthusiasm and view the Documentary Film from a fresh perspective, similar to that of a first-time viewer. We conducted informal screenings for each successive cut, inviting individuals whose opinions are trusted or who can provide valuable insights, mostly peers, colleagues, and subjects featured in the Documentary Film. The point is to find out where viewers are confused or losing interest and estimate how well the story works at different points in the edit.

Sighting the Material

A lot of work is dedicated to sighting the raw material after the production days. We accumulated over fifty hours of material, which were skimmed through approximately three times in total. Normally, the cameraman who shot the material makes the first edit, i.e., selects the most relevant snippets. As documentary filmmaking primarily does not follow a script, most shots are irrelevant for the final edit. Thus, only one-fifth or less was selected into a new refined sequence. The refined material was also separated into interview material and visually interesting material. The so-called A-Roll and B-Roll. This process allows the rest of the team to go over the selected material very efficiently. Sighting and listening to the selected A-Roll carefully, then proceeding with just skimming the B-Roll. An example would be the scene, where Gloor, one of our main characters, states on the ecological consequences of a clear-cut (Ihlenburg and El Flamingo, 2024, 16:15). This is

A-Roll, while the scene of the grassland that used to be a forest is B-Roll (Ihlenburg and El Flamingo, 2024, 15:35).

However, this process is not linear. After the first edit, several more cycles of re-choosing the relevant snippets can happen. Moreover, the beginnings and ends of the snippets are

flexible. This means that when only one sentence of a shot seemed relevant in the original sighting, it can still be extended in the later edit.

Sound and Music

Using different music can drastically change a documentary's atmosphere and audience reaction. It is a powerful component applied in the post-production phase. When the underlying music varies, the same scene can transport different emotions to the viewer. For example, we initially used inspiring, uplifting music when Gloor explored the primary forest (Ihlenburg and El Flamingo, 2024, from 01:42). In the fly-over scene of the fabrique, we opted for more dramatic and disharmonic music to emphasise the industrial scene and machinery (Ihlenburg and El Flamingo, 2024, 24:10). If we were to swap the music, both scenes would be confusing.

We used stock music¹⁷ as a cost-effective tool. Different platforms offer flat rates for a variety of pre-composed tracks that can be easily integrated, making the search for music convenient. The database can be filtered for different styles, instruments, emotions, speed, and more.

Without a dedicated audio technician, documentaries often face sound quality and feasibility challenges since the cameraman has to handle the sound. This can either be done by a shotgun microphone on the camera, or a wireless Lavalier microphone somehow clipped to a person's chest. While this is a cheap and very flexible approach, it has some limitations. For this reason, we also used stock ambient sounds and effects. For example, if a person is interviewed, the audio is focused on a clear voice recording. Nonetheless, when this person was simultaneously walking, we enhanced the audio with a sound effect of footsteps on the forest ground, which was otherwise lost in the background noise. This provided a better viewing experience and authenticity of the scene.

Visual Effects

We intentionally used several visual effects in post-production. Most significantly, the visual effect of a frame distinguishes the documentary footage filmed with a consumer camera from the other scenes. Figure 13 demonstrates an example. This was an intentional decision for two reasons: The footage from the consumer camera looks very different from the cinema camera, and it provides a more immediate feeling of the investigations. Another effect we used was digitally zooming in and out of the drone footage.

This creates the look of a surveillance or even a satellite camera, amplifying the situation of a dubious situation on the ground. Lastly, we used screen recordings (e.g. Ihlenburg and El Flamingo, 2024, 06:30), and in at 22:56 (ibid.), we also used product pictures of cutting boards as special effects to connect the final product to the timber.

¹⁷ <https://artlist.io/>



Figure 13 Example for intentional use of consumer camera (right) for stylistic reasons.

Sharing a First Version for Feedback with Peers and Friends

After the initial rough cut was ready for viewing, it was uploaded to Vimeo and shared with some friends. Vimeo offered a convenient commentary function, so all viewers could comment directly on the video. This helped significantly in understanding story ambiguities. When the version was shown to friends, we always asked for a summarisation at the end. The answers revealed which key messages were easily understandable and which were not.

In a second step, we shared a version with peers and professionals from related fields. This helped us find visual and filmmaking flaws. We often missed details. Furthermore, a refined version, the first master version, was screened inside the production company, among most colleges. This helped to discuss feedback immediately, and we received valuable input.

Working with national Television (3 Sat)

The collaboration with 3 Sat and the created TV contribution (see Chapter 5.1) only happened after I went filming in Romania. I used material that was originally intended for the Documentary Film. Hence, in pre-production and during shooting days, I had no collaboration with 3 Sat in mind.

In September 2023, I spent four days with the research team from the University of Prague. They conducted field research on primary forests in several valleys in Romania. During post-production, we realised that this particular material wouldn't make it into the final Documentary Film. I contacted the documentary department at SWR Broadcasting in Germany and pitched the concept for a 6-minute contribution. 3 Sat bought it, and I started

editing. A person at SWR was the editor and finally approved the contribution. Sound production and the final mixdown also happened at SWR Studios (See Figure 14).

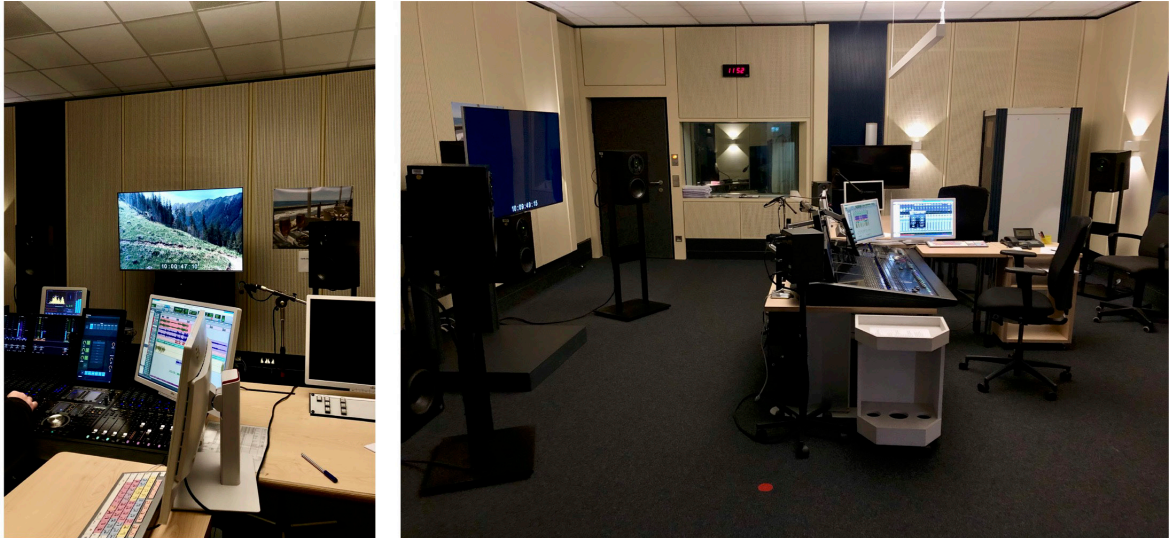


Figure 14 SWR Studios in Germany, where audio mixdown, voice-over and final approval took place.

6. Film ab!

This is perhaps one of the shortest results chapters – it's a film.

The initial question was: How can science on primary forests in Romania be communicated through a non-fiction film?

While it is an uncommon way to present results, the production and, thus, its final products embody the result of this research. Both sub-questions ...

- How can science communication be applied to a non-fiction film?
- How can science on primary forests be visually portrayed?

... are also answered through both the Documentary Film and the shorter TV Contribution. This connects to the production process described in Chapter 5, which is a partial result of the Film-based Action Research.

However, the current status of the main Film at hand-in is, unfortunately, rough and incomplete.

Time was and is our greatest enemy. The production company and I focused the last three months on a short documentary film in Romania about an isolated mountain village¹⁸. Film festival deadlines were approaching, and post-production demanded its time. Additionally, we had to delay the post-production since they had to prioritise commercial commissions.

As explained in Chapter 5.1., the Masteredit linked to 6 terabytes of files is located at the company editing machine in Germany. Remote access is not possible. Thus, I was not able to cut a specific Version for this thesis. The presented Version is the last 'rough cut' from the beginning of this year. It is common to arrange story blocks and fix the narrative before extensive post-production happens. Hence, this version is missing exposure correction, colour-grading, graphics and titles, fine-cut and precise transitions, audio correction, audio mixdown, and some B-Roll. However, it should convey the story and overall style we want to achieve.

At the moment, it features mainly the two main characters Moldovan and Gloor. Currently, we plan to focus more on their 'Journey' of research and conservation activities on primary forests in Romania.

Additional scenes already shot but not included in the edit yet:

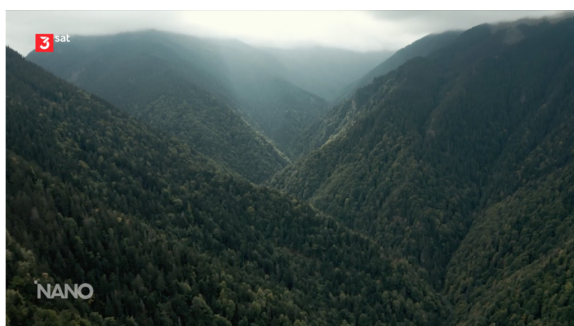
Moldovan found several forest areas protected by European Law, owned by IKEA and certified by FSC. However, these parcels were basically clear-cutted and demonstrate severe

¹⁸ <https://maxihlenburg.com/the-flowers-remain/>

breaches of sustainability standards. This highlights the lack of accountability in the international system. We follow him on the quest to file complaints and escalate the problem on a European level. Finally, we interviewed a spokesperson of FSC in Romania about these controversial forest areas. However, they do recognise the illicit practices that have been reported.

Similarly, we follow Gloor, who repeatedly finds her research plots destroyed inside primary forests. Although they qualify as primary forests, her complaints and appeals to the authorities are ignored.

Lastly, I filmed an initiative in Romania that educates and promotes 'Primary Forest Guides' to foster eco-tourism. The initiative achieved minor wins in engaging local communities to prioritise tourism and nature protection instead of conventional logging. I conducted several interviews and documented a weekend workshop. With these scenes about eco-tourism, we want to present an economic solution, other than regulation and prosecution, towards the end of the film.



TV Contribution – Urwaldforschung mitten in Europa

<https://maxihlenburg.com/urwaldforschung-mitten-in-europa/>



Padure Primara – The Race For Europe's Last Wild Forests

<https://maxihlenburg.com/padure-primara/>



7. Final Reflections

It was pouring rain. I grabbed my camera from the passenger seat and hoped it would survive the heavy amounts of water. We had driven ten cars along a forest road to a river delta. The mission: the local NGO Agent Green showed members of the European Parliament (MEP) several protected forest parcels. Spoiler: there was no protection. Eleven foresters attempted to convince the Members of the European Parliament (MEPs) that there was nothing to see, but the MEPs persisted in examining forestry practices in the area, which later revealed breaches of several EU laws. Initially, the entire team had to cross a river. Just picture two MEPs and their team wading knee-deep in a torrential river while being shouted at by the foresters. A special scene¹⁹. Although it was an exciting day, the footage was unusable. The image was technically poor, the audio horrible because of the river, and my lenses had steamed up from the inside. Moreover, it didn't fit the overall story, so we cancelled it, like hundreds of other hours of raw material. Producing both the Documentary Film and the TV contribution pilled an incredible amount of spare material. However, I gained a lot of valuable experience from shooting those unused scenes. On top of that, I built a network and expertise on the ground. During almost 60 days on 6 trips, I met 16 people, from activists to government officials, conducting 11 interviews. We continued to shoot a spin-off short film in an isolated mountain village last September²⁰, I produced videos for one of the MEPs on Primary Forests in Sweden²¹, and recently received a 30.000 USD scholarship to pursue documentary practices and visual journalism studies – what a journey!

Reflecting on the last year and this project, I answer the final research question about the opportunities and challenges of film in Geography. I also discuss some major learnings and limitations of this work and reflect on how it is embedded in current debates.

But let's start from the beginning when a friend wanted to know what my Master's Thesis was actually about. It was one of those moments where, in my head, I had figured it all out, but the answer came in fragments as I asked myself, for every word, what I was actually doing.

¹⁹Reportage from Agent Green on the trip: <https://www.youtube.com/watch?v=UMvRtU2uDv4>

²⁰ <https://maxihlenburg.com/the-flowers-remain/>

²¹ <https://maxihlenburg.com/bring-back-nature-in-sweden/>



Figure 15 The 'Double Onion' represents the intersection of two circles with onion-like layers representing the fields of Primary Forests in Romania and Filmic Geography.

It is about Science Communication in Geography ...

- ... using a film-based action research method
- ... to explore the production of a non-fiction film
- ... on the Topic of Nature Protection and Sustainability
- ... in particular, Primary Forests
- ... in Romania

‘Aha, sounds interesting’ was the scant answer. Well, I tried.

This thesis intersects two fields in Geography. Mainly **the subfield of Visual Geographies**, in particular, **Filmic Geographies** (Jacobs, 2016b), also called Video Geographies (Garrett, 2011). Secondly, the topic of **Primary Forests in Romania**.

Figure 15 shows the ‘**Double Onion**’, where the two circles with onion-like layers intersect at the core: (Primary Forests) in Romania and Filmic Geography. On one side, primary forests in Romania are embedded in the fields of nature protection, the EU Green Deal, and sustainable development in general (SDGs). On the other side, Filmic Geographies are embedded in Visual Geographies, Geography as a Discipline and the overarching field of Science Communication.

Hollywood has a wide audience

Film-making is a multi-sensorial medium which can visually document experiences (Garrett, 2011). Other than text, a film can be viewed and visually understood by a wide audience, potentially unrelated to literacy or educational level (Jacobs, 2013). Imagine a non-academic person from Bucharest who is concerned about primary forests in her country. She could interact with the Documentary Film. All she needs is basic knowledge of English, a screen and an internet connection. This makes this medium very appealing for science communication, since normally scientific publications lie behind a paywall or otherwise

restricted platforms in certain formats of text, difficult to understand for the concerned citizen in Bucharest. Al Gores's film 'Inconvenient Truth'²² (2006) brought the discussion on climate change to the public's attention, pushing politicians to address the topic in campaigns like probably no science publication has ever done.

Accordingly, the Documentary Film and TV Contribution **aimed to advance the dissemination of scientific findings beyond academia, i.e., contribute to the Third Mission** (Compagnucci and Spigarelli, 2020). In this regard, I call for **more creative communication with the public in Geography**. Like (Loverd et al., 2018) coined it: "If we want people to be more informed about science, we have to introduce it into the public forum, at the heart of which lie movies and TV."

Embracing a subfield for visual experimentation in Geography

Humans are visual creatures. Large parts of our brain are wired to visual stimuli (Mayeli, 2019). While we have been drawing in caves for a long time, text as mainstream media emerged with mass printing just some hundred years ago. The point is that visual creation and communication can also be an exciting and, perhaps, more natural medium for many to play with. This holds true for both sides, the creator and the consumer. Video content and film consumption tremendously changed with the advent of streaming and social media. Simultaneously, the barriers to creating content fell remarkably with the rise of powerful and affordable consumer electronics and software. Nowadays, it is possible to shoot high-quality films on a phone, edit on a tablet, and share them with a wide audience online.

This rising global demand in audio visual content calls a shift towards a more filmic geography (Jacobs, 2013), that also uses **film as a method and medium of scientific communication** (Garrett, 2011; Baptiste, 2016). Two decades ago, at the beginning of this exponential growth in **digital visualisation of information**, Rose argued that we just don't know *how* Geography is visual (Rose, 2003). This project might present an Answer by demonstrating how filmic Geography practice could look like.

I explored many possibilities of *producing* by starting with just an idea and almost no experience. Thus, I argue that today's major remaining barriers towards a more filmic Geography are missing institutions and access to networks (see Limitations below). Our goal with this work is **to promote the development of Visual Geography. Embracing a clear sub-field for visual culture—including film—presents a major opportunity** for the Geography community to experiment with audiovisual methods and forms of publication in learning, teaching, researching, and communicating.

Visual Literacy in Geography

²² <https://www.imdb.com/title/tt0497116/>

Personally, this project was a thrilling, playful experience. It enabled me to experiment with documentary film, which has always excited me (and been on my bucket list). However, since it was somehow a pioneer work in the subfield of visual geographies, it took huge efforts to make it fly finally. Crafting a compelling film is not just reading a summary of scientific publications over beautiful footage. It's also not just profound knowledge of the covered topic. A film of 40 minutes needs a narrative and characters to work. The gap between scientific writing and a good story is what makes the difference in compelling science communication. As a journalist in one of my science communication classes once stated, 'The opposite of scientific writing is not unscientific writing but exciting writing' (Iwaniewicz, 2022). A skill I had to acquire by myself outside the standard curriculum. This **lack of film, more broadly, visual storytelling literacy, represents a major challenge for other novice practitioners**. The current extra effort of a film-based approach is not to be underestimated, especially when 'blueprints' and resources are scarce. Adding basic training to curricula could have a significant impact. I highlighted several researchers in Chapter 2.3 that experienced higher engagement and better dissemination of their work. Still, film and video play only a niche role in Geography.

(Nisbet and Scheufele, 2009) argued that the representation of science in popular films mainly shapes the meaning of science, not scientific knowledge. Thus, the emerging interest in science-centred entertainment could influence the public image of science and scientists. All the more so, **literacy in film and active engagement in a visual sub-discipline could be beneficial for Geographers**. On the one hand, to keep up with a global visualisation trend of information and popular media. On the other hand, to actively define and communicate the 'meaning' of Geography as a scientific discipline through film. I am not talking about the justification of research but rather to engage and inspire the public. **Film, in all its variety, provides a visual storytelling tool for geographers to reach new audiences and engage critically with a global trend of digital visualisation.**

When Geographers become Directors

Promisingly, video abstracts have found their way into the mainstream recently (Spicer, 2014; Ferreira *et al.*, 2021). Storytelling is probably the most powerful tool in communicating science. Humans are just wired to it (Hasson *et al.*, 2012; Le Hunte and Golembiewski, 2014). The good news is that **every geographer with a phone can become a director** for his, however small, project. Thinking like a director means always thinking in a story—how to connect scenes, present characters, and convey a subtle central message. The process of creating a film **required me to think differently about the topic of Primary Forests in Romania since it was clear that the addressed audience lies foremost beyond academia**. No Blue-Print, standard procedure or similar approach existed. **I had to create audio-visually and conceptually, which forced me to explore the topic 'outside the box'**. Similarly to existing research, producing the Documentary Film allowed for an **immersive exploration** of geographical spaces in Romania (Garrett, 2011), a more **collaborative research environment** (Parr, 2007), and the **exploration of emotional geographies** with Gloor and Moldovan (Jacobs, 2016b). Lastly, we could capture **more vivid audio-visual impressions** of characters, places, activities, and other data (Thieme, 2012). In every interview or

exchange, I was constantly thinking about the central message and understandability for outsiders. Thieme argued that incorporating film into her research made her think 'much harder' about her research (Thieme, 2012). I can definitely attest that it sharpens the sense of information flow, i.e., how I thought about every little detail of information and how it might be received. Putting on the director's hat requires understanding a topic thoroughly to explain it to a ten-year-old while discussing it with students, professionals, and experts. As a scientist, it is important to build these communication skills to 'sell' your work for recognition or impact diverse networks in and outside academia.

The transect walk through the Forest

I described the different approaches for Transect Walk, Participatory Filmmethods, and Feedback loops in Chapter 4.2. Interestingly, the Transect Walk matured into our predominant form of conducting interviews. 'Sitting' interviews produced solid material, but most interviewees, especially researchers, were observably uncomfortable and stuck to complex answers. When we filmed in a less intrusive style, e.g., the camera held at chest level and not at eye level, participants were already more relaxed. However, the most significant was the 'walking'. We let them follow their research, investigation or task and filmed them in an accompanying style, asking them questions about what they do or think. This tremendously altered how we could portray characters. The overall mood from a stiff interview shifted towards an engaging persona. We observed that people spoke much more freely in this way. This is also recognised by the viewer, making it easier for her to empathise with the protagonists on screen.

Shift from discussion to production

Science films are still recognised as entertainment rather than a scientific publication medium inside academia (Jacobs, 2016b). Arguably, the field of film geographies is rather new and emerging (Aitken and Dixon, 2006; Jacobs, 2016a). Still, few journals accept video-only contributions and no formal standards exist. Jacobs (2013b) argues rightly that film still enjoys an 'uneven relationship' with Geography. Even for this Master Thesis, it would not have been possible to hand in a video as complete work. While I do not question the importance of a structured text document to transfer scientific knowledge, I find it somehow bizarre that the final printed and digital versions are inaccessible, intellectually or physically, to almost everyone outside academia. Given the inherent visuality of Geography, **a shift from *discussing* film as a medium for research and publication to *producing* filmic Geographies is overdue.**

Through the final Documentary Film and TV products, the thesis promotes the scientific findings and conservation of primary forests in Europe, which is an overlooked and understudied topic (see Chapter 3). It also connects to the existing research on Romanian primary forests (Knorn *et al.*, 2013; Sabatini *et al.*, 2018, 2020, 2021; Schickhofer and Schwarz, 2019; Barredo *et al.*, 2021). Simultaneously, this work represents an experiment to explore the production process and enhance the capacity of future practitioners to create

similar work. The **action-oriented research methodology generated immediate and actionable insights.**

Lastly, the thesis builds on and expands **the body of work on using film for science communication in Geography** (Sooryamoorthy, 2007; Jacobs, 2013, 2016a; Loverd *et al.*, 2018; Angelone, 2019; Thieme *et al.*, 2019), contributing to a better understanding of the intersection between science communication and non-fiction film.

Evolution of the central message

This project has been running for over a year. Naturally, I started with different ideas and views. In the beginning, I focused on the Primary Forest, highlighting their existence and relevance. However, my initial conviction, not to mention the elephant in the room – the destruction of Romanian primary forests – quickly changed. After almost 4 months of desk research, I was finally on the ground, driving around the country for three weeks (see Figure 9). I talked to various people, accompanied them, sometimes for days, experienced the ancient forests, and even camped in a remote primary forest for some days. **My perspective changed.** Not in a complete twist, but I realised the nuances, the emotions, the intangible. The overall direction of the story changed. I wanted to convey the frustration I experienced of researchers, activists, NGOs, and former foresters. They tried to change the national system and fought for genuine nature protection. I also started critiquing and including the international players and the European Union in the story. **Every piece of additional knowledge followed an increase in the project's complexity.** While we collected several terabytes of footage, the question of what we wanted to say with this film grew big and blocked our process.

“Primary forests exist in Romania, but we don’t know where they are exactly. This makes them hard to protect, but they are relevant to society. We should better protect them, but efforts have had little success in the past.”

Evolved into:

“The national landscape is characterised by corruption and official ignorance of nature protection laws for primary and old-growth forests, but the EU Commission is unable to prosecute breaches of the law, so international players benefit from high profits and poor regulation.”

We realised the latter was completely different from where I started at the very beginning. Finally, we tried to merge both perspectives, focusing on the two main characters and their personal stories to explain the situation in a more subtle way. For me, this evolution of the central message is a key takeaway since it is probably the decisive difference to most commercial documentary movies, where you have to deliver what you originally promised, i.e., **crafting a story versus letting it evolve.**

Knowing your central message relates to knowing the receiver—the audience. In our case, the audience consists of people who visit film festivals for outdoor sports or adventure and

are interested in environmental problems and nature protection. Additionally, people with the same interests, who watch high-quality cinematography on the video platform Vimeo.

This is a pretty defined space; any additional viewer is welcome, **but targeting your work for a specific group of viewers is crucial**. This might sound common sense. However, finding the central message of our film and defining who it is for **was fundamentally difficult**. This applies to almost all science communication: **know your audience first**.

This brings us to a challenge I want to comment on shortly: **the entertainment trap**. Since the target was a public audience, we had to entertain them somehow and fixate them on the screen for 40 minutes. Unfortunately, the real world is less exciting than a Hollywood script, and often, we filmed just boring stuff. It was tempting to embrace **every little conflict as they drive the story, but their overamplification also might distort validity**. It was often hard to balance replicating a complex discussion precisely and building a compelling narrative. During the process, I became increasingly aware of this challenge, and we attempted to navigate it, which often ended in long discussions as it was rarely clear how to portray debates and characters.

Different Format, different Audience: TV Contribution vs Film

The Documentary Film runs over the standard feature length of around 40 minutes, whereas 3 Sat ordered a contribution of 6-7 minutes about doing science *in* and *on* primary forests. Otherwise, the **style and narrative are very different** for several reasons.

- (i) Voice-over *tells* the narrative. In the Documentary Film, we *show* the narrative and let the protagonists speak.
- (ii) Translation of the Interviews to German.
- (iii) The narrative is fairly simple without a dramatic arc, but for the short format, it works.
- (iv) Banners introduce the characters with their title and name
- (v) Both researchers speak in an Interview setting
- (vi) TV-Reportage videography without original visual style

As mentioned in Chapter 5, the production was the same for both formats. However, post-production really differed, but details would exceed the scope of this thesis. My point is that both formats target a different audience, the intentionally watching 'cinematic film festival audience' and 'science interested TV-reportage audience' (which probably just watched the ve program on television). **The difference in contributions demonstrates how film formats need to be adapted to an audience**, for which knowledge of that targeted group is vital (e.g. SWR's expertise for the TV audience or the production companies' expertise for cinema audiences at film festivals and online). Is it a video abstract for academics, a long feature for the public or a short film for decision-makers? Is it played on TV, Cinema, Social Media, or Websites? A good story for the wrong audience won't work. For further analyses, it would be interesting to see which format receives more views and has a better impact. For the

Documentary Film, we do not know at the time of writing. For the TV contribution, the estimate was 300-500 Thousand per Episode ²³, which is an impressive view count.

Limitations of the work

Other than the inherent limitations of the Film-Based Action Research Method discussed in Chapter 4, I found some additional impracticalities regarding the method, this work's contribution to future practitioners and the measurability of the Documentary Film's impact after publication.

The **Cinematic Action Cycle helped structure** the initial half of the project. From there on, I followed it more intuitively, and **towards the end, I mostly shifted towards freestyling** without its structure. It simply cost time and effort to document every mistake, success and learning. Moreover, it seemed unnecessary to document the 10th interview repeatedly, as they became fairly similar. The structured way of producing film **generates overhead** that accompanies the workflow. For example, note-taking via audio transcription piled huge amounts of data. Transcribing and organising many different audio recordings is time-consuming. While this might be **suitable for starters and shorter projects**, it may need **adaptation for longer projects**.

We probably generate less views with the Documentary Film than with the short TV contribution. The **significant difference is the platform**. Public TV has high watch rates, while film festivals are niche. On the contrary, modern online platforms, i.e. Social media, are somewhat democratised, though their algorithms are a black box. It is hard to estimate upfront how much content a product receives. In this work, I **assumed that good content will disseminate well, although success is also highly dependent on the platform**. This links to **the importance of networks**. I was only able to interview and access so many people because of my university network, my filmmaking network (e.g. production company and SWR), and my personal network. This **subjectivity and special circumstances make it barely reproducible for peers**. While reproducibility was never the aim of this research, I see barriers for future practitioners through the dependency on the mentioned networks, as well as budget and time restrictions and missing support for film-based work from the Geography community.

A short mention should also be made of the research question's answerability. Without measuring its impact it cannot be answered in *right* or *wrong*. Thus, the **filmic result is highly subjective**. To give a clear empirical answer, I would need to question viewers or compare engagement, view rates, or other statistics between, for example, different films on the same topic.

Lastly, it's all about time. Burns (Burns, 2022), one of the most successful documentary filmmakers, argues that 'the editing process cannot be rushed, and no amount of planning,

²³ Editorial SWR, personal communication, Feb 05, 2023

determination, or money can replace the simple fact that the more time you have, the better your film can become’.

Well, we are more than a year into the project, and the **edit is still far from cinema-ready**. Time is perhaps the most constraining resource for filmmaking. I am not sure whether this is really a limitation, but it should be considered by practitioners that **the ‘fast film project’ does not exist**. It is a slow process, especially when aimed at the creation of good-quality content.

What's next?

More research is necessary at the intersection between science communication and non-fiction film to build upon the emerging field of ‘Filmic Geography’. Since I argued for more ‘producing’ than ‘discussing’, it would be interesting to see more Geographers playing with different formats of film in and around their research. Simultaneously, research exploring reasons for a potential lack of film literacy in Geography would be highly interesting.

Similar to the message of the documentary film, I call for research that helps to better map and/or understand European primary forests.

Personally, I am already in contact with Forest Biologists in Sweden and working on the conception for a similar format of a film about Sweden’s shrinking Primary Forests.

8. Conclusion

This thesis intersects two fields in Geography. Filmic Geographies and Primary Forest Conservation in Romania. Driven by the idea to produce something that contributes to research on science communication in Geography but also tangibly persists outside my written thesis, I tested a Film-based Action Research methodology. This produced several outcomes. Most importantly, a 40-minute Documentary Film and a 6-minute TV contribution that has already aired on 3 Sat.

Secondly, the combination of producing a film and discussing its process enhances the understanding of the intersection between science communication and non-fiction film, building upon the field of 'Film Geography'. Embracing a clear sub-field for visual culture presents a major opportunity for the Geography community to experiment with audiovisual methods. Film, in all its variety, provides a visual storytelling tool to reach new audiences and engage critically with a global trend of digital visualisation.

Thirdly, the production process, findings and resulting communication contribute to the Third Mission of the University. I not only researched the topic of primary forest conservation but simultaneously disseminated the findings to the public. The SWR estimated 300-500 thousand views for the already aired TV contribution, and the Production Company estimates 50 thousand potential views for the documentary film through the online platform Vimeo and film festivals.

Given Geography's inherent visuality, this thesis's results support a shift from predominantly *discussing* film as a medium for research and publication to *producing* filmic Geographies. In this regard, the project helps to fill the gap of knowledge on practical projects. Creating audio-visually and conceptually forced me to explore and research 'outside the box', thereby enhancing the overall research process. Nowadays, every geographer with a phone can become a director, no matter how small the project is. I hope to inspire and support other practitioners to create their science communication projects.

Acknowledgements

The project would not have been possible without the help and energy of many other people. I want to thank anyone who contributed to this project. Special Acknowledgements go to:

Matthias Schickhofer, who set me up with contacts and locations in Romania.

The Transylvanian University in Brasov and Prof. Nicolescu provided me with knowledge, contacts and advice in Romania.

The production company El Flamingo for their trust and support in this project.

Dr Siomon Bunchuay-Peth, who supported my unconventional approach from the very beginning and helped me significantly with the scholarships for this project.

Silviu Moldovan, who became one of the main protagonists and helped me in the overall process with local knowledge.

Rhianon Gloor and Matej Ferenčík, who were outstandingly passionate protagonists and took us into their research areas.

Conflict of Interest

The production company El Flamingo paid me only the costs for most trips to Romania. I received no remuneration. The company has no priority obligations in the film's financial success, and we do not have a sponsor. The film is self-funded.

I was paid industry-standard remuneration for the TV Contribution on 3 Sat. However, the shooting took place before a collaboration was foreseeable.

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