



UNSEEN ROADS, UNHEARD WARNINGS

**THE POWER OF AI AND MEDIA IN MAKING CLIMATE CHANGE VISIBLE
THROUGH CONSTRUCTION**

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1. Abstract

Abstract (English)

This thesis explores how artificial intelligence (AI), and social media can improve climate change communication, focusing on the often-overlooked environmental impact of the construction sector. Through surveys, an interview with Carlota Bruna, and the creation of a web-based CO₂ calculator, it investigates how AI tools and storytelling can simplify complex data and raise awareness among non-experts. Results show that over 90% of respondents were unaware of construction's emissions, yet reacted strongly when data was presented visually — for example, comparing emissions to the equivalent number of hamburgers. Two AI tools (ChatGPT and Gemini) were tested and revealed that while AI is powerful, it requires ethical and contextual use. The thesis argues for more inclusive, emotional, and accessible climate communication and proves that even without technical skills, anyone can use AI to make the invisible impact of construction visible and understandable.

Resum (Català)

Aquest treball de recerca explora com la intel·ligència artificial (IA) i les xarxes socials poden contribuir a la comprensió i visibilització del canvi climàtic, centrant-se especialment en el sector de la construcció, sovint ignorat en el discurs ambiental. A través d'enquestes, entrevistes i una eina pràctica —una calculadora d'emissions de CO₂— s'analitza com aquestes tecnologies poden simplificar la informació ambiental i fer-la més accessible. Els resultats mostren que més del 90% dels enquestats no eren conscients de l'impacte climàtic de la construcció, però reaccionen positivament quan la informació es presenta de manera visual i emocional (com amb l'equivalència en hamburgueses). També es comparen dues intel·ligències artificials (ChatGPT i Gemini) per demostrar que, tot i tenir resultats similars, la precisió i l'enfocament depenen de com s'utilitzen. El projecte destaca la importància d'un ús ètic i transparent de la IA, i promou una comunicació climàtica més empàtica i comprensible per a tothom.

Resumen (Castellano)

Este trabajo analiza cómo la inteligencia artificial (IA) y los medios digitales pueden contribuir a una mayor comprensión del cambio climático, poniendo el foco en un sector muy contaminante pero poco visibilizado: la construcción. A través de encuestas, una entrevista con Carlota Bruna y una herramienta digital propia (una calculadora de emisiones), se investiga cómo las redes sociales y la IA pueden simplificar datos técnicos y generar conciencia. Los resultados muestran que la mayoría de las personas desconoce el impacto ambiental de la construcción, pero que responden mejor cuando la información es clara, visual y comparativa (como en hamburguesas). Se comparan dos inteligencias artificiales (ChatGPT y Gemini) para demostrar su utilidad, pero también sus limitaciones éticas. El trabajo defiende que no hace falta ser experto para comunicar sobre el clima, y que la tecnología puede servir para acercar conocimientos complejos a la ciudadanía, siempre que se utilice con valores humanos, empatía y honestidad.

2. Introduction

It is no surprise that climate change is one of the most pressing global challenges, affecting ecosystems, economies, and societies worldwide. We must take a step back to understand where it all started. Its roots can be traced back to the Industrial Revolution when the burning of fossil fuels led to increased greenhouse gas emissions. Over time, human activities such as deforestation, urbanization, and industrial growth have intensified these effects. In Catalunya, rising temperatures, extremely shifting weather patterns, and environmental degradation are becoming more evident, impacting agriculture, water resources, and biodiversity.

It has been scientifically proven that people around the world recognize the need for action, according to the People's Climate Vote a large international survey conducted by the United Nations Development Programme (UNDP) in collaboration with the University of Oxford, most people across 77 countries believe that stronger measures are needed to protect those most affected by climate change. Additionally, a significant number of answers expressed the thought of climate change being on their minds daily. In fact, an astonishing 80% of the global population feel that their country should strengthen their commitment to address climate change. In Spain, the vast majority of

people think that there should be many changes regarding how climate change is handled.
[1]

The construction industry, despite being one of the most significant sources of greenhouse gas emissions and resource consumption, remains largely absent from public discourse—especially on digital and social media platforms. In parallel, artificial intelligence (AI) is emerging as a powerful tool to communicate climate-related data and engage broader audiences in environmental issues. However, its potential remains underutilized when it comes to highlighting lesser-known contributors to climate change, such as construction.

Before I started working at Parma Ingeniería, I had no idea how much the construction sector affected the environment. Like most people, I assumed the biggest climate issues were things like the food industry or transportation — because that’s what we always hear about. But once I got into this field and started paying attention, I realized how much construction contributes to emissions, pollution, and land degradation. What shocked me even more was that no one seemed to be talking about it.

When I began this thesis, I asked my Instagram followers: *“On a scale of 1 to 5, how familiar are you with the environmental impact of road construction?”* Out of 80 responses, 23.8% said they had absolutely no idea, 30% had a vague sense of it, and 27.5% had maybe heard about it once. Only 7.5% said they were familiar with the issue. And honestly, that didn’t surprise me — because I used to be one of them.

I think part of the problem is how social media works. These platforms boost content that’s dramatic or emotional — floods, fires, and disasters — but they leave out slower, less visible issues like construction. Even when we talk about climate change online, it’s often the same simplified narratives. But if we want real awareness, we must start including everything that contributes to the problem — especially the parts we don’t see.

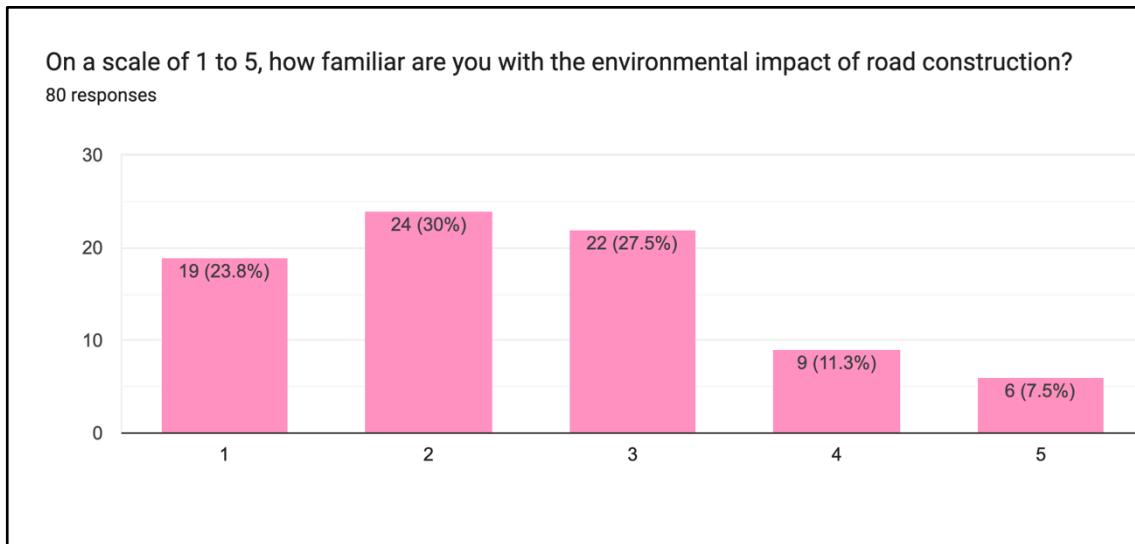


Figure 1

2. Importance of the study

The reason I decided to focus on this topic is because I realized just how little we talk about the environmental impact of the construction industry — even though it’s one of the biggest contributors to climate change. Most of the attention goes to things like transport, agriculture, or food. And while those are important, construction is often left out of the conversation, even though it involves heavy energy use, tons of raw materials, and high CO₂ emissions.

According to Climate Trade, construction comes right after other major sectors like fossil fuels and agriculture. It’s responsible for around 40% of total global emissions when you include materials, transportation, construction processes, and building operation [2]. And yet, when we go on social media or even watch the news, we rarely see this mentioned. That silence is exactly why this thesis matters — because it shines a light on something we’re not paying enough attention to.

What I’ve tried to do with this research is to connect the dots between construction, climate change, and the way we communicate online. We live in a world where Instagram, TikTok, and AI tools shape how people learn and care about things. So, I asked: why not use those same tools to talk about something as important as construction’s environmental footprint?

That's why I created a tool that compares how different AIs calculate the CO₂ emissions of road building. The goal is simple: make data easier to understand for people who aren't engineers or scientists. Because if I was able to learn all this with no practical experience in the construction industry, then anyone can — if the information is presented the right way.

At the end of the day, this thesis is not just about AI or construction — it's about making climate knowledge more visible, more accessible, and more human. It's a small step toward using tech in ways that serve the planet — and help more people understand the role they play in all of this.

One of the most important survey questions I asked was whether people believed it was possible to raise public awareness about climate change using AI — even if the person doing it had no technical background. Out of 80 responses, 61.3% said yes, 26.3% said maybe, and only a small percentage said no or weren't sure. This result was meaningful to me because it validated the entire foundation of my project. I wanted to prove that tools like AI can be powerful for climate education — not just in the hands of experts, but in the hands of everyday people. The fact that most respondents believed it was possible shows that there's an openness and willingness to explore new ways of communicating complex issues like climate change. It also reinforces the idea that we don't need to wait for institutions or scientists to lead the way — people are ready to learn, share, and act, as long as they're given the right tools.

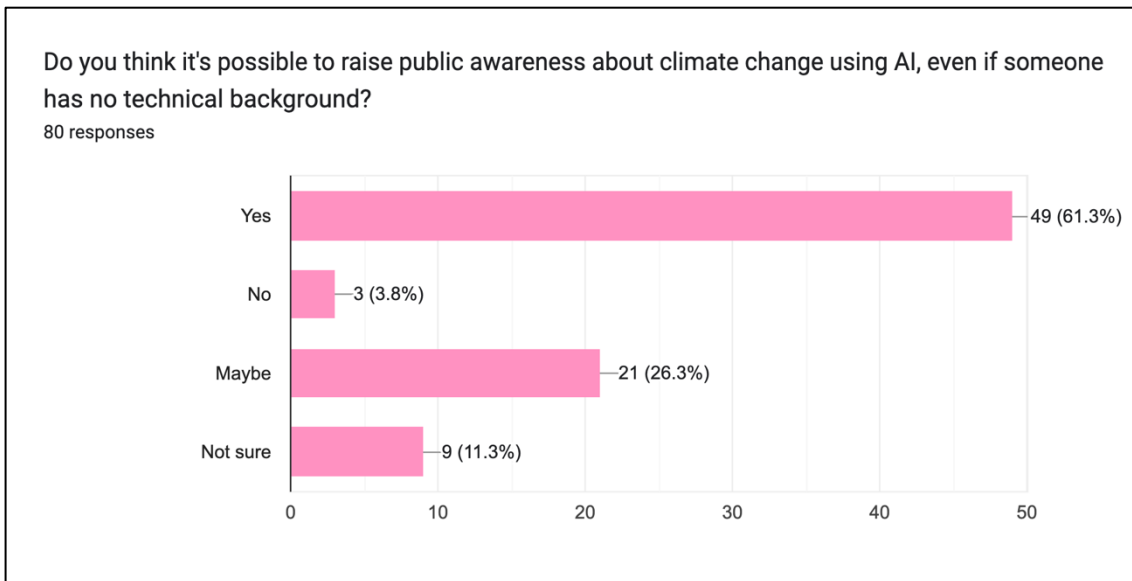


Figure 2

Social media has become one of the main platforms where people get their information about the environment. Influencers and content creators have helped spread awareness about plastic pollution, fast fashion, or veganism — but when it comes to construction, it's still mostly a blind spot. It's not that people don't care, but the topic itself isn't "viral" — it's technical, less emotional, and rarely shown in a visual way. That's what makes it both a challenge and an opportunity: with tools like AI and a bit of creativity, we can turn those hidden issues into something people can see and understand.

In my survey, I asked people if they had ever seen a post or video on social media talking about how construction — especially roads or buildings — affects the environment. Most people answered "no." But the few that said yes described things like forests being destroyed to build roads, or how roads can break ecosystems, pollute water, or heat up cities. Some even mentioned ads from Greenpeace about factories being built in protected areas. These answers showed me that people are aware when the message reaches them — but that message isn't reaching most of us.

That's where this thesis comes in. It explores how AI and media can work together to make complex environmental issues — like construction emissions — easier to explain, especially to people without a technical background. It also builds on the research I did back in high school about food sustainability, where I focused on how meat consumption affects the climate. That experience helped me realize that even when the science is clear,

what matters most is how we talk about it. Now, I'm doing the same thing — but with construction instead of food — and using AI and social media to make it accessible.

Finally, I wanted to connect this work to my own region. Catalunya faces specific climate challenges, like extreme heat and water shortages. At the same time, it's a place with intense industrial and construction activity. That's why it's so important to bring these conversations to a local level. Understanding how AI and media can help raise awareness here — and not just globally — is key to creating real change, both in policy and in public mindset.

Research objectives and questions

Objectives:

- To understand the creative and impactful ways media shapes the public perception and view of climate change through storytelling and digital innovation.
- To investigate how AI-powered tools transform climate journalism, from data visualization to personalized content delivery.
- To explore the intersection of technology, ethics, and media in driving climate action and inspiring collective responsibility.

Research Questions:

1. How has the media contributed to raising public awareness of climate change?
2. In what ways has artificial intelligence (AI) helped improve communication of climate change issues?
3. What could be the potential issues or risks of integrating AI into climate change discourse?

3. Literature Review

3.1 Media's Role in Climate Change Awareness

Social media has played a huge role in how people like me have come to understand climate change. Unlike traditional news, where you usually get the same kind of formal coverage, social media makes things feel more personal and closer to real life. Through platforms like Instagram, TikTok, or YouTube, I've learned about climate issues in ways

that are easier to connect with emotionally. Visual content, short videos, and personal stories make the topic feel more urgent and less abstract.

A big influence in my case was Carlota Bruna, a well-known climate activist and my cousin. Her work made me curious at a young age, and thanks to her, I started exploring content from other activists, watching documentaries, and changing habits—like becoming vegan. In her book *Somos la última generación que puede salvar el planeta*, she talks about the importance of making sustainability relatable and empowering people instead of overwhelming them. That’s something I’ve seen work well on social media, especially when creators share simple actions or personal routines.

Even though social media has brought climate change closer to many people, some areas are still rarely talked about. The construction industry, for example, has a huge impact on the planet, but it’s almost invisible online.

Researchers like Boykoff have pointed out how media tends to focus on dramatic, short-term events like fires or floods, while ignoring longer-term, technical issues like infrastructure or emissions from buildings and roads. [3] That’s one of the gaps that motivated me to do this thesis.

Schäfer explains that social media allows users and organizations to bypass traditional gatekeepers and reach massive audiences directly. Influencers like Greta Thunberg or eco-TikTokers are now more powerful than legacy media in shaping public opinion. However, algorithms also create echo chambers and misinformation, which complicates how people understand climate change. [4]

A clear example of the differing impacts of traditional and social media can be seen during the DANA floods in Valencia in October 2024. Traditional outlets like *La Vanguardia* reported on the disaster, providing statistics and official statements. For instance, they noted that the DANA caused 226 deaths in the province of Valencia and left several areas isolated due to flooding. [5]

However, it was through platforms like TikTok and Instagram that the emotional gravity and immediate needs of the situation were vividly portrayed. Videos showing streets submerged in mud and residents in distress quickly went viral, prompting widespread

attention and action. One notable TikTok video captured the rapid transformation of a street into a deadly flood zone, highlighting the urgency and human impact of the disaster.

These firsthand accounts and visuals shared on social media platforms galvanized a massive volunteer response. Young people, often labeled as disengaged, organized cleanup efforts, distributed supplies, and provided support to affected communities. This grassroots mobilization was largely coordinated through social media channels, demonstrating the platform's power to not only inform but also to inspire collective action.

Reflecting on this, I realize that without the immediacy and emotional resonance provided by social media, I might not have been compelled to participate in the relief efforts. The personal stories and calls for help that flooded my feed made the crisis feel personal and urgent, spurring me and many others into action.

3.2 Artificial Intelligence in Environmental Communication

AI isn't just about writing texts or making chatbots — it's already being used in real climate action. The World Economic Forum lists nine different ways that AI is helping the planet. [6]

The first way is by knowing where and how fast icebergs are melting. This helps scientists understand how much meltwater icebergs release into the ocean and how that affects rising sea levels. Another way is by mapping deforestation using AI, satellite images, and ecological knowledge. An interesting one is how they're using AI to recycle more waste — since waste is a big source of methane, which is responsible for 16% of global greenhouse emissions.

A huge tool that directly connects with my thesis is how AI can help industries decarbonize. For example, Eugie.ai developed a platform that uses satellite images and real-time data from machines to track emissions in sectors like oil, gas, and mining. Then it uses AI to suggest how to cut those emissions by 20–30%. That's a real solution — not just for scientists, but for industries that need to take responsibility. These tools also include things like predicting extreme weather, optimizing energy in buildings, and managing traffic to reduce emissions. But one of the most powerful uses of AI that often gets ignored is its role in climate adaptation. According to another article from the World Economic Forum (2022) [7], AI is now being used to help communities prepare for climate risks — like identifying areas that are vulnerable to floods or droughts,

helping cities manage water better, and planning where to build future infrastructure. It's not just about tracking damage, but about using technology to adapt smarter and faster. And to me, that shows AI's real potential: not only can it predict the future, but it can help change it — especially when we use it to bring invisible problems, like the emissions of construction, into the spotlight. This is one of the reasons why I believe AI should also be used to explain hidden climate problems, like the ones in the construction industry. If we're using it to track glaciers, we can also use it to tell people how much carbon is released by building a road — and make that data understandable and emotional through media.

Cristina Aranda, in her book *Vidas futuras*, talks about how AI can be a powerful tool, but only if used responsibly. She explains the risks of depending too much on technology or forgetting the ethical and social side of it. I agree with her idea that AI should be combined with human values, empathy, and education. This thesis follows that mindset— using AI in a way that helps people understand something that's usually ignored, like the carbon footprint of road construction. Cristina Aranda describes AI as our “*copilota de futuro*” — not a tool to fear, but one to guide us through the decisions we face in society. She stresses the importance of making AI transparent, responsible, and inclusive, especially when it's applied in areas that affect everyday life (Aranda, 2023, pp. 184–186). Aranda argues that AI should not only serve businesses and governments but should also be shaped by diverse teams that understand real-world needs. This idea directly connects with my thesis, where I use AI tools not as something distant or technical, but as accessible platforms that allow people (even without coding skills) to understand the environmental impact of road construction. Aranda points out that AI can help us work more efficiently, reduce repetitive tasks, and give us time to focus on what really matters — human creativity, ethics, and strategy (p. 188). In the case of climate change communication, AI doesn't just generate data; it can personalize information, increase public engagement, and make invisible issues — like the carbon footprint of building roads — easier to visualize and understand. That's why her vision of AI, where it's developed for public good and sustainability, is so important to bring into this conversation.

AI isn't just helping us track what's going wrong — it's helping us adapt. The WEF explains how AI helps cities plan flood protection, manage water, and build more resilient

infrastructure. This shows that AI isn't only reactive — it's a tool for building a better future. [8]

3.3 TikTok, Attention Spans, and Digital Learning

Why TikTok Works: Attention Spans, Algorithms, and the New Way of Learning

One of the reasons I believe TikTok has become so important in climate communication is because of how young people consume information today. Our attention spans are not what they used to be. I've noticed this in myself too — it's way easier to focus on a 15-second video than on a long article or newspaper piece. And it's not just a feeling: according to *ProfileTree*, the average attention span for Gen Z is now around 8 seconds. That's shorter than it was for millennials and way shorter than previous generations. [9]

This change isn't random — it's a direct result of how platforms like TikTok are designed. The fast, engaging, and constantly refreshing content keeps our brains stimulated. It rewards speed and emotion, not depth or nuance. That's why people scroll so fast. If a video doesn't grab your attention in the first few seconds, you move on. So, when it comes to climate awareness, TikTok is the perfect format — especially for sharing shocking images, personal experiences, or short, relatable facts.

But this also comes with a problem. When everything is fast, there's no time for depth. Complex topics like the environmental impact of construction, for example, don't get the same visibility as dramatic weather events or “aesthetic” sustainability routines. TikTok can help us learn fast, but sometimes, it can make us forget to look deeper.

That's one of the reasons I developed this thesis: to bring underrepresented issues like construction into the same conversation, and to explore how we can use AI and short-form content to make them more visible and easier to understand — without losing the depth they deserve.

3.4 Social Media Algorithms and Climate Communication

Algorithms amplify what's emotional or divisive. Construction, being technical and less dramatic, doesn't usually make it to the top of people's feeds. That explains why in my survey, the vast majority of people had never seen anything about the environmental impact of road construction.

Schäfer (2024) also points out that while algorithms help climate content spread, they can create bubbles that reinforce what we already believe. That's why we need more deliberate and educational content strategies — especially using tools like AI that can personalize and contextualize data.

3.5 Misinformation and the Risks of AI

One of the biggest challenges with AI and digital media is that it's getting harder to know what's real and what's not. With AI now able to write news articles, generate fake images, and even imitate voices, the line between fact and fiction is becoming blurry. If we aren't careful, AI could be used to spread climate misinformation — or worse, greenwashing campaigns that make harmful companies look eco-friendly.

In 2025, I came across an image that had gone viral on X (formerly Twitter) showing the city of Manaus, in Brazil, perfectly blending into the Amazon rainforest. At first glance, it looked like a hopeful example of what sustainable urban development could look like. But later, it turned out the image wasn't real — it had been created using AI. The original post didn't say anything about it being artificial, and that's where the problem starts. Even though the goal might've been positive — to inspire people — sharing AI-generated content without saying it's fake can be misleading.

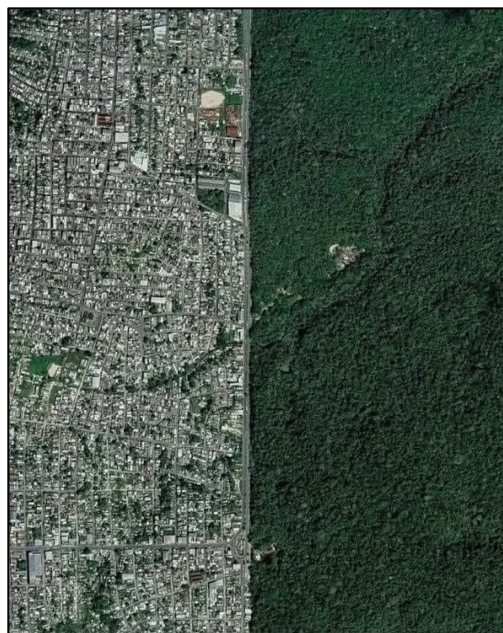


Figure 3 - Aerial satellite view showing the contrast between urban development and preserved forest in Manaus, Brazil

In this case, it showed a peaceful coexistence between a city and nature, when the reality in that region is one of deforestation and environmental tension. What looks like awareness can sometimes actually confuse people, or worse, distract from real issues. That's why I think it's so important that we always ask where content comes from, especially when it's about the environment.

As AI tools become more common, it's going to get harder to tell what's real and what's made up. And when this happens in the context of climate change — a topic that already suffers from misinformation — it can seriously harm public understanding. For me, this is another reason why AI needs to be used with care: not just to inform, but to inform truthfully.

This is a question I kept coming back to while working on my thesis: *Is there a way to know if something was made by AI?* Right now, it's getting harder and harder to tell. Sometimes even I can't distinguish if a photo, article, or video I see online was created by a real person or a machine. And that's worrying, especially when it comes to serious topics like climate change. We've reached a point where AI-generated images can look just as real as photographs, and texts written by AI can sound just as convincing as news reports.

There are some tools being developed to detect AI content, but they're not perfect. Some experts are working on digital watermarks or invisible tags that could be added to AI content, kind of like a fingerprint, so platforms or people can recognize it instantly. According to an article from the Wharton School of Business at the University of Pennsylvania, researchers are exploring tools that embed invisible patterns or metadata into AI-generated content to flag it. But even these methods face problems — because as models get smarter, their output becomes harder to distinguish from human writing. The article also explains how current detection models, like GPT detectors, are struggling to keep up with newer AI systems that are constantly being trained to sound more natural.

[10]

The bigger issue, as they mention, is that AI evolves faster than our ability to detect it. That means even though there are systems trying to track and flag AI-generated content, those systems are always playing catch-up. It's a digital arms race between the creators and the detectors.

I think what's important is that we start building a culture where content is labeled properly. If something was made by AI, just say it. Being transparent helps people understand what they're looking at and protects public trust. Because if we lose the ability to tell what's real and what isn't, how are we supposed to make good decisions — especially about something as big as the climate crisis?

3.6 Gaps and Blind Spots in Climate Coverage

Even with all the progress in media and AI, some sectors remain left out of the conversation. The construction industry, for example, is responsible for around 39% of global CO₂ emissions related to energy (UNEP, 2020), yet it's rarely mentioned in climate campaigns or media posts [11]. Most people I talk to don't realize that something like building a road or pouring concrete has such a big impact on the planet.

This gap in communication is one of the reasons I decided to create a carbon calculator using different AI tools, focused on pavement construction. My goal is to make this kind of impact more visible and relatable—especially by comparing it to things we all understand, like the footprint of food. If someone can see that building a sidewalk release as much CO₂ as eating 50 hamburgers, that might make them stop and think.

In the end, social media, AI, and environmental education need to work together—not just to talk about what's already trending, but to shine a light on what we tend to ignore. This literature review has helped me understand the importance of making knowledge accessible, emotional, and practical. That's what I hope to achieve with this project.

Based on the academic article *“Social media in climate change communication: State of the field, new developments and the emergence of generative AI”* by Mike Schäfer social media has completely changed the way people talk about climate change. Platforms like TikTok, Instagram, or YouTube aren't just for entertainment anymore — they've become tools for activism, learning, and connecting over global problems. Schäfer (2024) explains that social media allows users and organizations to bypass traditional gatekeepers like journalists and reach massive audiences directly. This means that even small voices can be heard — and in climate change conversations, that matters a lot. Campaigns like Fridays for Future show how online platforms can drive real-world mobilization and help people connect with climate activism emotionally and practically (Schäfer, 2024, p. 49). [12],

But the article also points out challenges. Algorithms can create echo chambers, showing users content that confirms their beliefs while hiding other perspectives. That's a problem, especially when it comes to climate misinformation, which can spread quickly on social media (p. 50). The rise of short-form video content, like TikToks and Reels, has made it easier to share climate messages in creative, emotional, and even humorous ways — which is great for awareness. However, the downside is that sometimes these videos oversimplify complex topics (p. 50–51).

The part that stood out to me most was about influencers. Schäfer describes how influencers like Greta Thunberg or even eco-TikTokers are becoming more influential than traditional media in shaping public opinion. This really connects to my experience — it was through social media, and especially my cousin Carlota Bruna, that I learned about climate issues and made changes in my own life. Influencers can inspire action, but the article also reminds us that not all of them are experts, so it's important to think critically about the information we consume (p. 52).

Finally, the article explores how generative AI — like the tools I'm using for this project — is starting to shape climate communication. AI can make content faster, more personalized, and even more engaging. But it also brings risks: fake news, deepfakes, and the energy costs of AI tools themselves (p. 53). That's why this project matters — it uses AI in a positive way, to make something practical and understandable for the public, especially about topics that aren't usually visible, like the environmental cost of building roads.

4. Environmental Impact of the Construction Industry

In one of the most eye-opening studies I came across while working on this thesis, Haque et al. (2021) explains that when we talk about emissions from construction, we often only think about the obvious things: trucks on-site, cement being poured, or machines running on diesel. But the reality goes much deeper. [13]

This paper shows that construction emissions come from two big categories: direct and indirect. Direct emissions are the ones that happen right there on the site — fuel used by machinery, energy to run operations, and so on. But indirect emissions are less visible and often ignored. These include the emissions from producing materials like cement and steel, transporting them, and even the energy used to manufacture construction

equipment. When you add everything up, the true carbon footprint of a construction project is much higher than most people realize.

The article emphasizes that material production, especially cement and steel, are two of the biggest contributors. For example, cement alone accounts for nearly 8% of global CO₂ emissions. That's more than the entire aviation industry. And yet, people talk about flying less way more than they talk about building smarter.

Another thing that stood out to me is that even in developed countries, there is very little regulation or awareness around these indirect emissions. Most construction companies don't calculate or report them. That means we're missing a huge part of the puzzle when it comes to climate accountability. Here in Catalunya, however, there's been an important step forward with OC 3/2024, a circular that sets out new criteria for sustainability in public construction projects. This regulation requires emissions to be considered during both the planning and execution phases, and it encourages the use of materials with lower environmental impact.

During my internship at Parma Ingeniería, I saw how these kinds of policies can shape real projects. The company bases much of its work on OC 3/2024 and uses it as a framework for designing and executing infrastructure that meets environmental standards. It was through working there that I first realized how important indirect emissions are — from transporting materials to the long-term energy use of the infrastructure we build.

Even though this is a great example of how policy can guide sustainable construction, we still have a long way to go. Most private companies aren't yet required to follow these guidelines, and the public has no idea how much a single road or structure pollutes. That's why policies like OC 3/2024 are necessary — but they're not enough. We also need awareness, transparency, and tools that make this information easier to understand and share. That's what I've tried to do with this thesis.

What this article helped me understand is that to reduce the environmental impact of construction, we need to look at the whole life cycle — not just the final structure. That includes how the materials were made, how they were delivered, how long they last, and how often they need to be replaced. This life-cycle view is exactly what inspired me to

create a carbon calculator that makes all this information easier to understand for everyone — not just engineers.

Another article that really helped me understand the complexity of construction's environmental footprint was published by the Cámara Mexicana de la Industria de la Construcción (CMIC). They break down the entire construction process and explain how every stage — from the first shovel of earth to the last coat of paint — has an impact on the planet. [13]

According to their analysis, there are three main areas where construction causes environmental harm:

1. **Land use and soil degradation**

Every time we build, we alter natural ecosystems. Trees are cut, topsoil is removed, and entire landscapes are transformed. This doesn't just affect plants and animals — it also increases erosion and reduces the land's ability to absorb water, which can lead to floods.

2. **Air and water pollution**

Construction sites generate a lot of **dust and emissions**, especially from heavy machinery. Plus, the use of chemical products like paints, solvents, and sealants can contaminate water sources if they're not handled properly.

3. **Noise and visual pollution**

This is something people don't always include when they talk about "pollution," but it's real. Construction sites are noisy, disruptive, and often located in areas where people live and work. This affects mental health, wildlife behavior, and the overall quality of life in surrounding areas.

The CMIC also highlights that many of these impacts happen before the building even exists — during planning, design, and material selection. That's why sustainable construction isn't just about adding solar panels after the fact — it's about making better choices from the beginning.

This article made me realize that reducing the footprint of construction isn't just about emissions. It's about thinking holistically: where we build, how we build, what materials we use, and how we manage waste. This is exactly the mindset I'm applying with the

carbon calculator — helping people see that even one square meter of asphalt has a story behind it, and that story starts long before it's laid down.

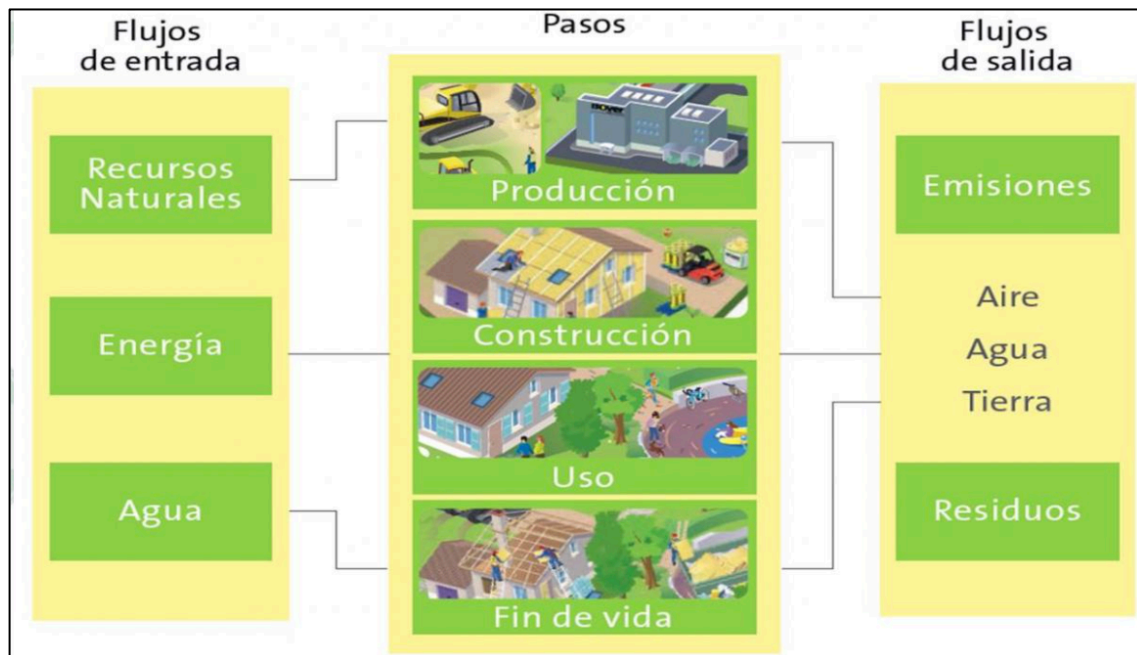


Figure 4 - Life cycle of construction process

The construction sector contributes significantly to global CO₂ emissions, especially through materials like cement, steel, and asphalt. Cement alone emits approximately 900 kg of CO₂ per ton produced. A single square meter of asphalt can emit between 50 and 100 kg of CO₂, depending on thickness and mix. These numbers multiply rapidly on infrastructure projects.

My experience at Parma Ingeniería made this real. Seeing project budgets full of diesel-powered machinery, cement trucks, and heavy-duty operations opened my eyes to how normalized — and invisible — these emissions are.

According to Haque et al., emissions from construction are both direct (fuel, machinery) and indirect (production and transport of materials). CMIC adds that construction also harms soil, air, and water quality. [14] Yet no one talks about this because it isn't emotionally or visually impactful.

By comparing emissions from construction to more relatable things, like food, we can start to bridge that gap. For instance, 1m² of road is equivalent to the emissions of dozens of burgers. That makes it easier to understand — and harder to ignore.

5. Methodology

5.1 Research Design

I used a mixed-methods approach that included quantitative surveys, qualitative interviews, and content analysis. This helped me explore both personal perceptions and media patterns around climate change and construction.

5.2 Data Collection Methods

To better understand how people relate to the topic of construction and climate change, I conducted a survey using Google Forms. I shared the link mainly through Instagram and sent it to friends and family. I ended up collecting more than 80 responses. The questions focused on how familiar people were with the environmental impact of road construction, whether they had seen content about it on social media, and if they believed AI could help explain these kinds of topics in a simpler way.

Alongside the survey, I also carried out a personal interview with Carlota Bruna, a climate communicator and influencer whose work has always inspired me. Her answers gave me a deeper understanding of how climate messages spread (or don't spread) online, and how important it is to communicate with honesty and hope — not just fear. Carlota pointed out that topics like construction barely show up on social media because they aren't "visually emotional." She also talked about the need for AI to be used responsibly — not as a replacement for human sensitivity, but as a support for better storytelling.

5.3 Data Analysis Techniques

- **Thematic Analysis:** Categorized responses from surveys and interviews.
- **Comparative Table:** Compared human and AI-generated news articles.
- **Graphs:** Created pie charts and bar graphs from survey results using Google Forms.

6. Practical Project

6.1 Description of the Tool

The CO₂ calculator estimates emissions from pavement construction based on material used (e.g., cement, asphalt), surface area, and thickness. It provides results in kg of CO₂ and compares them to food equivalents.

6.2 Comparison of AI Tools

I used ChatGPT and Gemini to generate responses to the same question: “How much CO₂ is released by building 1m² of road?” Each gave different answers. I compared their clarity, technical accuracy, and accessibility.

6.3 Calculator in Context

As part of the practical part of my thesis, I wanted to test how different AI tools would handle the same task: creating a simple CO₂ calculator for road construction. I gave both Ais the exact same prompt — a tool where the user can input how many square meters of road they want to build, select a material (like asphalt or concrete), and then see the total CO₂ emissions plus how many hamburgers that equals. I chose to compare it to hamburgers because it’s something visual and relatable that helps people understand numbers they normally wouldn’t think about.

Model 1 was built with the help of **ChatGPT (OpenAI)** and published online via Glitch: leather-cheddar-biplane.glitch.me

Model 2 was created using **Gemini (by Google)** using the exact same instructions: glossy-dawn-monkey.glitch.me

At first glance, both calculators look almost the same. They both ask you to enter the surface area and choose the material, and both instantly give you the result in kg of CO₂ and hamburgers. But when you look closer, there are a few differences worth mentioning.

In **Model 1**, ChatGPT used more detailed emission factors — for example, it calculates that 1 m² of standard asphalt equals 90 kg of CO₂, and concrete is even higher. These values are more aligned with the real numbers I found in academic reports from UNEP and CMIC. The logic is very solid, and the results feel reliable. Since I built this calculator step by step with the help of ChatGPT, I was also able to customize everything, so it matched the goals of my thesis — from the materials I included to the comparison values.

In **Model 2**, Gemini used a very similar structure, but the emission factors felt slightly simplified or rounded. The logic still works, and the results are visually similar, but I noticed that the values didn’t reflect the same level of detail or sourcing. It still performs

well, and it's interesting to see that even with two completely different AI tools, the results are not that far off.

What this showed me is that AI is consistent and powerful — but also that it still depends a lot on how you guide it. If you want precise data, meaningful comparisons, and context, you need to know how to ask and how to interpret the answers. This also shows that even without knowing how to program, I was able to create and publish two functional tools that raise awareness about construction's impact on the environment. That's exactly the point of my thesis: that AI can make complex topics more accessible — not just in theory, but in practice.

CO₂ Calculator Model 2

Surface Area (m²):

100

Construction Material:

Asphalt (Recycled) (50 kg CO₂/m²)

Calculate Emissions

Calculation Results:

Total CO₂ Emissions: **5000.00 kg**

Equivalent Beef Burgers: **1000.00** 🍔

Figure 7

Gemini
2.5 Flash

Build a simple web-based CO₂ calculator. The user will enter a surface area in m² and select the...

Show thinking

I can certainly help you build a web-based CO₂ calculator! This tool will allow users to estimate CO₂ emissions based on surface area and construction material, and then compare that to the equivalent number of beef burgers.

I'll create an HTML file with embedded JavaScript and use Tailwind CSS for a modern, responsive design.

Here's the CO₂ calculator:

Ask Gemini

Deep Research Canvas

Gemini can make mistakes, including about people, so double-check it.
Your privacy & Gemini

CO₂ Calculator Model 2

```

1 <!DOCTYPE html>
2 <html lang="en">
3 <head>
4   <meta charset="UTF-8">
5   <meta name="viewport" content="width=device-width, initial-scale=1.0">
6   <title>CO2 Calculator Model 2</title>
7   <script src="https://cdn.tailwindcss.com"></script>
8   <style>
9     /* Custom font for a better look */
10    body {
11      font-family: 'Inter', sans-serif;
12      background-color: #f3f4f6; /* Light gray background */
13    }
14  </style>
15 </head>
16 <body class="flex items-center justify-center min-h-screen p-4">
17   <div class="bg-white p-8 rounded-xl shadow-lg w-full max-w-md">
18     <h1 class="text-3xl font-bold text-center text-gray-800 mb-6">CO2 Calculator Model 2</h1>
19
20     <div class="mb-4">
21       <label for="surfaceArea" class="block text-gray-700 text-sm font-semibold mb-2">Surfa
22       <input type="number" id="surfaceArea" class="shadow-sm appearance-none border rounded
23     </div>
24
25     <div class="mb-6">
26       <label for="material" class="block text-gray-700 text-sm font-semibold mb-2">Construc
27       <select id="material" class="shadow-sm border rounded-lg w-full py-3 px-4 text-gray-7
28       <option value="">Select a material</option>
          
```

Figure 8

6.4 Interview with Carlota Bruna

1. What first motivated you to become a climate activist?

Ever since I was little, I felt a very strong connection to nature. But I think the turning point was during a trip to Southeast Asia, in Bali, when I saw the real consequences of pollution and climate injustice. That's when I decided to use my voice and platforms to raise awareness.

2. What has been one of the most impactful moments in your work as an activist?

Definitely seeing the Atacama Desert in Chile full of discarded clothes. Not only the environmental damage — soil, microplastics — but the social injustice as well. These communities suffer the consequences of a problem they didn't cause.

3. Do you think your work has helped change behaviors?

Yes. I receive many messages from people who've stopped eating meat, eliminated plastic from their lives, or even changed the school menu thanks to one of my videos. That's what keeps me going.

4. How do you think social media affects how people perceive climate change?

They are a double-edged sword. They have the power to inform, connect, and inspire. But also, to misinform. That's why it's so important to communicate these issues carefully and honestly.

5. What kind of content works best to raise awareness without causing alarm or fear?

I believe in positive and inspiring communication. Telling people that there are things we can do. I try to share hope and reality at the same time.

6. Are there any climate topics that you feel don't get enough attention on social media?

Absolutely. For example, climate justice from an intersectional perspective (how it affects women more), or the connection between climate and mental health.

7. Have you seen content about the impact of construction on the environment?

Very little. Construction is one of the most polluting sectors, and yet it doesn't have much presence on social media. I did see something about roads being made with recycled plastic in India, which seemed very interesting to me.

8. Why do you think construction gets less attention than food or transportation?

Because it's a very technical topic. It's easier to connect with a turtle choking on plastic than with a graph showing cement emissions. Also, because it's a highly politicized issue.

9. What is your opinion on the use of artificial intelligence to talk about environmental issues?

I think it can be a great tool, but always used responsibly. It can help a lot in communication: in simplifying data, making it more visual, etc.

10. Do you think it can make environmental information more accessible to people without technical knowledge?

Yes, if used well. I believe it can help democratize access to information.

11. Do you think there's a risk in allowing algorithms and automation to decide what content gets attention?

Definitely. Algorithms promote what is viral, not what is important. And we lose the emotional depth of the message.

12. What actions do you recommend to young people who want to help the planet?

To start close and small. Speak up, inform others, support sustainable businesses, local farming... But above all, be critical and take initiative.

13. What advice would you give to someone who wants to talk about sustainability on social media?

Just start. Don't be afraid to share your process. Be honest and talk about what you're learning.

14. Any project that inspired you recently?

Yes. Coral Gardeners, a group that is restoring coral reefs in French Polynesia. They mix science, action, and communication in a way that I love.

How this interview connects to my thesis

Carlota's answers reinforce many of the key ideas in my thesis. She confirms that the construction sector is barely visible on social media, which matches the results I got in my survey — most people had never seen content about the environmental impact of road building. She explains that this lack of visibility is partly because the topic is too technical and doesn't trigger emotional responses the way other issues do — something I also realized while designing my CO₂ calculator.

Her emphasis on hopeful and relatable content supports my decision to compare road emissions to burgers — a simple, everyday image that makes the numbers easier to understand. She also highlights that emotional connection works better than fear, and that change happens when people feel empowered, not overwhelmed. This is exactly what I'm trying to do with my practical tool.

Carlota also talks about AI with a balance of optimism and caution. She believes it can be useful if it's used ethically — to simplify and spread knowledge, not replace human sensitivity. This echoes the ideas in Cristina Aranda's book *Vidas Futuras*, where she describes AI as a “copilot” that should support and not dominate. Both Carlota and Cristina support the idea of using AI to democratize environmental knowledge, which is what my thesis is all about: showing that even without technical experience, I was able to build a tool that teaches something important.

Finally, Carlota reminds us that algorithms reward what is viral, not what is important — and that's exactly why tools like mine are needed. Not to go viral, but to bring attention to topics that matter and have been invisible for too long.

7. Analysis and Findings

The survey I conducted with over 80 participants showed that 92.5% of respondents had little or no awareness of construction's impact on climate change. This confirmed one of my main assumptions: that construction is an invisible polluter in public perception.

When asked which industries pollute most, most respondents named transportation and food. Very few mentioned constructions. However, when I shared emissions data — especially in comparison to food, like hamburgers or daily meals — many people

responded with surprise or even shock. One participant wrote: "I had no idea that a road could pollute more than a steak."

The interview with Carlota Bruna highlighted how powerful social media is for making these topics visible. She explained that people need emotional connection, not just numbers. This really shaped how I designed the calculator — not just to give data, but to translate it into something understandable.

To visualize the gap between total CO₂ emissions and the share caused specifically by the construction sector, I created two maps using Datawrapper. The first map shows each country's total carbon emissions, and the second shows only the estimated emissions that come from construction — assuming 39% of total emissions, based on UNEP data.

I wanted to do this because it's one thing to say, "construction pollutes a lot," but it's another thing to see how it compares across countries. What surprised me most was how invisible this impact is — even though construction contributes a huge portion of emissions, it rarely gets the same attention as transportation or agriculture.

China, for example, is clearly leading in both maps. But what the second map shows is that countries like the U.S., India, and even European countries like Spain also have millions of tons of CO₂ just from building roads, bridges, and infrastructure. These maps helped me put numbers into perspective — and they're part of the reason why I decided to create a tool to calculate these emissions in everyday projects.

Making these visuals myself also reinforced how powerful data becomes when we translate it into something people can see and feel. I hope that, like me, others will start to think twice about construction not as something neutral or invisible, but as a key part of the climate conversation.

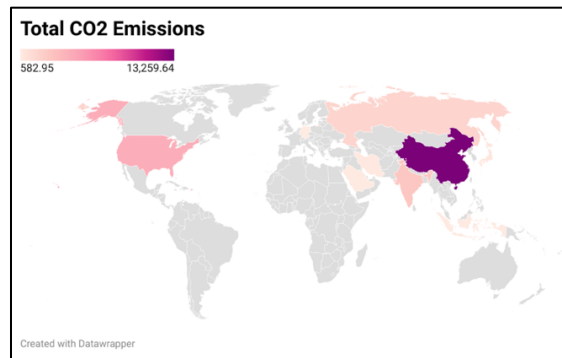


Figure 9

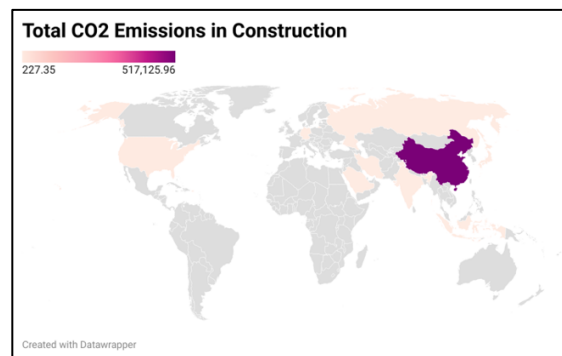


Figure 10

Table 1

flagCode	country	CO2Emissions_TotalCO2Emissions_tonnes_2023	Construction_Emissions_39pct_tonnes
CN	China	13259.64	517.125,96
US	United States	4682.04	1.825,9956
IN	India	2955.18	1.152,5202
RU	Russia	2069.5	807,105
JP	Japan	944.76	368,4564
IR	Iran	778.8	303,732
ID	Indonesia	674.54	263,0706
SA	Saudi Arabia	622.91	242,9349
DE	Germany	582.95	227,3505

8. Discussion

8.1 What This Shows Us

The findings of this thesis confirm that AI and social media can help make underrepresented issues like construction emissions more visible and accessible. People respond more when content is visual, relatable, and emotional — not just technical.

By using AI to create a simple carbon calculator and using social media logic to frame it (comparisons to food, clear visuals, maps), I was able to communicate something that is usually ignored.

8.2 Strengths and Limitations

One strength of this project was how I combined real tools (AI, mapping, calculator design) with research. This made my work both theoretical and practical.

A limitation is that AI-generated content is not always reliable. It can oversimplify or repeat biased patterns. Also, social media logic means that not everything gets seen — platforms reward drama, not depth.

8.3 Personal Reflection

This project changed how I see communication. I realized that even if I'm not a scientist or engineer, I can still contribute to climate awareness by using the tools we already have — AI, data, media. And that the more we simplify and humanize these messages, the more likely they are to have an impact.

9. Final Conclusions

This thesis set out to explore how AI and digital media can contribute to public awareness and understanding of climate change, with a specific focus on a sector that is both highly polluting and largely ignored in public discourse: the construction industry. What began as a personal experience during my internship at Parma Ingeniería quickly turned into a broader reflection on visibility, communication, and accessibility. My goal was not only to uncover how construction affects the planet, but also to demonstrate that climate communication can be understandable and impactful — even when it comes from someone without a scientific or programming background.

Through a combination of theoretical research, public surveys, interviews, media content analysis, and the creation of a practical tool, I addressed three core objectives and responded to key research questions that framed this study.

Objective 1: Understanding the creative and impactful ways media shapes public perception of climate change.

From the beginning, I wanted to understand how media — especially social media — influences what people know and care about when it comes to climate change. What I found is that media plays a powerful but selective role. My survey confirmed that sectors like food and transport are commonly associated with emissions, while construction

remains largely invisible. At the same time, examples like the DANA floods in Valencia show how platforms like TikTok can turn a climate disaster into a moment of collective action, often more effectively than traditional media.

Carlota Bruna, in our interview, reinforced this idea. She explained that what works on social media is emotional, relatable content — not complex or technical explanations. That directly supports my decision to use familiar comparisons, like hamburgers, to communicate carbon data. This approach helped translate the invisible (kg of CO₂) into something people can picture.

Objective 2: Investigating how AI-powered tools transform climate journalism.

AI is not only changing how we produce content, but also how we visualize and interact with climate information. In this thesis, I used AI tools — including ChatGPT and Gemini — to develop a CO₂ calculator that estimates the emissions of road construction. What's important is that I was able to do this without knowing how to code. I tested two different AI tools and showed how they each responded differently to the same prompt, illustrating both the power and the limits of these technologies.

This project demonstrates that AI can support more accessible, transparent climate communication. Cristina Aranda, in her book *Vidas Futuras*, describes AI as a tool that should be used ethically and inclusively — something that serves people, not replaces them. That philosophy shaped my practical work: not just generating data, but making it easy to understand, interact with, and share. My calculator is simple, but it fulfills exactly what AI should do in climate journalism — turn complex knowledge into accessible insight.

Objective 3: Exploring the intersection of technology, ethics, and media in climate action.

This thesis also explored the ethical and political implications of using technology in climate communication. One of the clearest conclusions is that visibility does not always align with importance. Algorithms promote what is emotional or viral, not necessarily what is urgent. That's why construction — despite being responsible for almost 40% of global energy-related emissions — is barely mentioned online or in mainstream media.

The risks of this are real. As Carlota mentioned in our interview, and as I observed during my media analysis, we're at a point where AI can generate entire articles, images, and even fake climate news. If we don't put clear ethical boundaries in place, we risk misinformation, oversimplification, and greenwashing. The same technology that can help us explain the world can also distort it.

Research Questions – Conclusive Answers

1. How has the media contributed to raising public awareness of climate change?

Media — especially social media — has been a key player in shaping public perception of the climate crisis. It has helped make terms like “climate change,” “carbon footprint,” and “sustainability” part of everyday language. However, this awareness is selective and unequal. Dramatic events like floods, fires, and protests are widely shared. Technical or slow-moving issues, like emissions from cement or asphalt, are not. My survey and content analysis showed that construction is rarely featured, despite its environmental weight. This confirms the need for new strategies — like visual tools and personal storytelling — to shift public attention.

2. In what ways has artificial intelligence helped improve the communication of climate change issues?

AI has made climate data more accessible, faster to generate, and easier to personalize. It allows non-experts like myself to create tools that explain complex environmental processes. Through my calculator, I was able to translate academic data into something people could interact with — choosing a material, entering an area, and understanding the emissions in terms of burgers. This process reflects how AI can democratize climate knowledge, making it visual, emotional, and concrete. However, it also showed me that AI needs to be used critically, always double-checked, and supported by human judgment.

3. What are the potential issues or risks of integrating artificial intelligence in climate change communication?

The main risk is misinformation. As AI becomes more advanced, it can generate fake images, misleading statistics, and automated articles that look credible but aren't. Without clear regulation or digital literacy, we risk normalizing content that simplifies, distorts, or even manipulates climate narratives. My comparison of AI-generated texts versus

traditional media articles revealed important differences in tone, accuracy, and depth. As Cristina Aranda warns, AI must be transparent, accountable, and human-centered. Otherwise, the very tools that are supposed to help us could end up doing harm.

Final Reflection

What this thesis proves is that meaningful climate communication does not have to come from experts, institutions, or governments. It can also come from a student, from an influencer, from an AI tool, or from a well-designed webpage. We all have a role to play in how climate knowledge is shared. And when we combine technology with empathy, ethics, and creativity, we can make even the most overlooked issues — like road construction — part of the conversation.

In the end, this project is not just about emissions or materials. It's about making sure that no one feels like they need a degree to care, to understand, or to act.

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