

Reflections on a PhD

“The more I learn, the more I realize how much I don't know”

– Albert Einstein

This dissertation is comprised of four studies, each with their own research questions and methodology, under the umbrella research goal of understanding the societal and business case for sustainable plastic management. Though this thesis is presented as a coherent storyline, with logical steps between the studies and a nice framework which ties it all together, the act of conducting a PhD is far from coherent or logical. There are weeks or months spent diving deep into rabbit holes which are later abandoned, doubts and insecurities that stall research and data gathering, missteps, regrets, and the ever-looming imposter syndrome. Even later in my PhD, as my work progressed and momentum built, I realized just how much there is to read, contemplate, question and study... and I felt small and my work futile within the vastness of science and society. Then - with plenty of help - I worked to chip away at the massive unknown and tackle bite-sized, manageable pieces. This is the crux of many PhDs and a well-worn counsel of supervisors from any discipline: find your niche.

My niche started as ‘business models for marine plastic’, which then grew to encompass business models working on *all* kinds of sustainable plastics. Next, I needed data, which would come from interviews with companies – great! So, I started to reach out to companies, my all-important case studies, the basis of my research... and only a handful of entrepreneurs got back to me. This was an incredibly disheartening roadblock, which led to re-defining my niche (again) to focus on startups and entrepreneurs, since they were the only ones who got back to me. I then needed to figure out what was so important about startups? Do they even have an influence? Sustainability transitions literature seems to think they do... and before I knew it, four years had passed and something resembling a thesis emerged.

This was my favorite part of the PhD, nibbling away at one scientific question and, by chance or necessity, stumbling onto the next. I have dozens of sheets of scrap paper and word documents filled with research questions, potential methodologies and half-baked study designs. One file called ‘Other

paper ideas' contained 28 ideas for research papers - twenty-eight! Reading through them, some I now know have been answered, others are not worth the time, but a few got me thinking...When I wrote this, I had two short months left of my PhD, not nearly enough time to start something new, but the exercise reaffirmed the endless supply of unknowns in the world.

In this sense, I feel really blessed that for over four years my full-time job was to think, question and conduct research. I had the freedom to explore topics and theories and build my niche to fill gaps in the research field, but also to satisfy my personal interest. The niche that emerged led to a focus on the private sector and I was then lucky enough to get to interview and meet with extremely motivated people and get inspired by their stories. I met fellow academics in conferences and at the office and learned from their work and their personal experiences. Skim through my acknowledgements and you'll see: it takes a village to do a PhD.

Beyond the experience of conducting research, there are many meaningful parts of a PhD that are not traditionally included in the pages of this book. Teaching, for one, and being involved in education. I transitioned from a master's student to a junior researcher to a PhD within the same institute and at the same university. I loved being able to teach and supervise students from the same program I had taken, and I learned a lot from the process and the students over the years. I never saw teaching as a chore and was always proud of the students I worked with, especially supervising thesis projects and seeing students conduct their own research. That work is not in this book, but it is as much a part of my PhD as any of the chapters.

Another aspect of my PhD missing from this book is communicating with the world outside of academia. I was lucky that, within my niche, I had many opportunities to go to industry conferences and events, participate in webinars and workshops and share my learnings with what us researchers like to call 'laypeople' or 'external stakeholders'. During the first few years of my PhD, this terrified me, but gradually I grew to really love any opportunity to escape the ivory tower. Looking back, I wish this was more integrated with my research from the start. It is invaluable to gain perspective and get a sense of what questions are being asked in the real world, and this process influenced my later studies (for the better).

I hope my research has been or will be useful, but looking back at the process, I think the main beneficiary of my PhD has been myself. I am knowledgeable about my niche, but more importantly, I can search for answers to unknown questions. Imposter syndrome still looms in the background, but knowing it also haunts my brilliant colleagues has calmed the worst of it. As I wrap up this curious scientific journey, I reflect on Albert Einstein's quote and think, for me, "The more I learn, the more I realize how much *more I want to know*".

Finally, some advice for any new or struggling PhD. This is a difficult process, it can be lonely, disheartening and confusing. It can feel like the most meaningless struggle and the most worthwhile work at the same time. Academia is filled with ego, hypocrisy, bureaucracy and unnecessary harshness (thanks reviewer #2). My advice is to create a support system within academia and to lean on them. PhD mental health is getting a lot of attention lately, and rightfully so. It is a challenging journey, but it does not need to be taken alone. Venting about paper rejections or crappy data or unresponsive partners with my fellow PhDs was a way to release pressure, but also get genuine advice and support. Bonding over the shared PhD struggle has led to some of the most important relationships in my life. So, take that coffee break, go for a beer with the new PhD, offer to proofread someone's paper and make sure to cheer on every milestone big and small. Paraphrasing The Beatles... we get by with a little help from our friends!