Part 1

The most significant insight I gained from this course was a deeper understanding of the entire supply chain emissions associated with BEVs, which challenged and refined my prior beliefs and knowledge about their environmental implications. Before taking the course, I held the belief that BEVs were unequivocally cleaner than ICE cars and were a crucial step towards achieving sustainability goals. This belief was based on the idea that BEVs could be charged with electricity generated from renewable sources, which I assumed made them a sustainable choice.

However, the course exposed me to a more complex reality. I learned that the sustainability of BEVs is not as straightforward as I initially thought. In particular, I realized that the upstream production of BEVs involves various components and processes that may not be as environmentally friendly as I had assumed. For example, the production of batteries and the mining of minerals for these batteries can result in significant carbon emissions and have sustainability concerns. This revelation challenged my belief in the inherent environmental superiority of BEVs.

This insight forced me to re-evaluate whether BEVs are currently a sustainable alternative to ICE cars and, if so, how long it might take for them to become more environmentally friendly. It reminded me of the broader concept that sustainable choices are not always evident at first glance. Just like the push for reusable shopping bags compared to single-use plastic bags, I learned that even seemingly eco-friendly products can have hidden carbon footprints and require a certain level of usage before they genuinely become environmentally friendly.

This course has taught me the importance of not taking claims at face value and the need to delve deeper into the complexities of sustainability, considering the entire life cycle and supply chain of products and technologies. It has reinforced the idea that a critical and in-depth analysis is necessary to form well-informed opinions and make sustainable choices.

Word count: 317

Part 2

My initial perception of interdisciplinary courses was that they would attempt to blend or juxtapose fields that may not naturally complement each other. However, upon completing this module, my perspective has shifted significantly. I now understand that interdisciplinary courses are not about forcing the integration of disparate fields but about recognizing the inherent interconnectedness of various disciplines in addressing real-world complexities.

This course brought together primary concepts from Chemistry and Economics in a way that highlighted their profound influence on each other. A key illustration of this was the recycling of lithium-ion batteries (LIBs), a critical component of EVs.

In this context, economic principles came into play as governments and policymakers recognized the unsustainable nature of mineral mining for LIBs and the negative externalities associated with it. These externalities implied that the production of LIBs exceeded the socially optimal level, leading to detrimental environmental consequences. Consequently, there was a compelling need for government intervention to regulate and reduce mineral utilization in LIBs.

This was most prominent with the example mentioned in lecture about the European Union (EU) introducing legislation in 2020 to address battery waste (Keynes, 2021). This legislation embodied the economic concept of "extended producer responsibility," which required manufacturers to take responsibility for the collection and recycling of their products. It also specified targets for the use of recycled materials in battery production, thereby increasing demand for sustainable practices.

This economic initiative, in response to environmental concerns, would most likely catalysed significant changes in the EV industry. EV companies, understanding the economic incentives and regulations at play, would begin to modify the composition and design of their batteries. These modifications aimed to make recycling more efficient and cost-effective, aligning with both economic and environmental objectives.

In this course, I witnessed first-hand how the collaboration between Chemistry and Economics was not about merging two unrelated disciplines but about recognizing their interdependence and their role in driving innovation and sustainability in the realm of EVs. This experience has transformed my understanding of interdisciplinary education, highlighting the power of combining diverse fields to tackle complex, real-world issues effectively.

Word Count: 346

Part 3

From my group project, I've gained valuable insights into the constant evolution of research within the EV space. One particularly intriguing method I discovered involves the use of micro-organisms for recycling LIBs. This approach stands out for its environmental friendliness, as it circumvents the need for high-temperature processes like pyrometallurgy or the use of strong acids as in hydrometallurgy. Consequently, it consumes less energy, contributing to a more sustainable approach. However, it's important to note that this method has its drawbacks, such as longer processing times and specific operational conditions. For it to become a viable solution for large-scale production, further research is essential. This could involve the search for more suitable micro-organisms or the development of alternative recycling methods. The urgency stems from the depleting resources required for LIB production, which is causing production costs to rise. Consequently, the EV industry must continually innovate to produce the best EVs in the most sustainable way.

From my classmates' group presentation, I've learned a critical lesson in the importance of tailoring policies to a country's unique circumstances. The presentation compared the approaches of China and Singapore. In China, subsidies were initially provided to EV producers to reduce production costs, leading to an increased supply of EVs, lower prices, and a subsequent surge in EV ownership. However, as EV adoption rates have become quite high in China, subsidies are being scaled back and replaced by a credit system. This shift is primarily driven by the realization that the production phase of EVs generates significant carbon emissions. A credit system offers a more equitable way of accounting for these emissions, allowing companies to trade carbon credits. On the other hand, Singapore's EV market is still in its nascent stages, making rebates a more effective policy tool for encouraging higher adoption. Additionally, Singapore does not have local EV manufacturers, which further supports the choice of rebates for consumers over subsidies. This distinction underscores the necessity for countries to align their EV policies with their specific circumstances and the stage of their EV market development.

Word count: 340

Bibliography

Keynes, A. (2021, March). Retrieved from Transport & Environment: https://www.transportenvironment.org/wp-content/uploads/2021/07/How%20the%20new%20EU%20battery%20law%20can%20make%20‘made%20in%20Europe’%20green%20batteries%20a%20reality.pdf