Environmental performance of a polyamide base thermoplastic compound with brominated flame retardants

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MAIN RESULTS

- Upstream phases causes the greatest environmental impact especially in the endpoint impact category Human Health.
- The impacts are mainly caused by the consumption of electricity in the production processes of raw materials.
- The introduction of sustainable raw materials is crucial to mitigate environmental impacts.

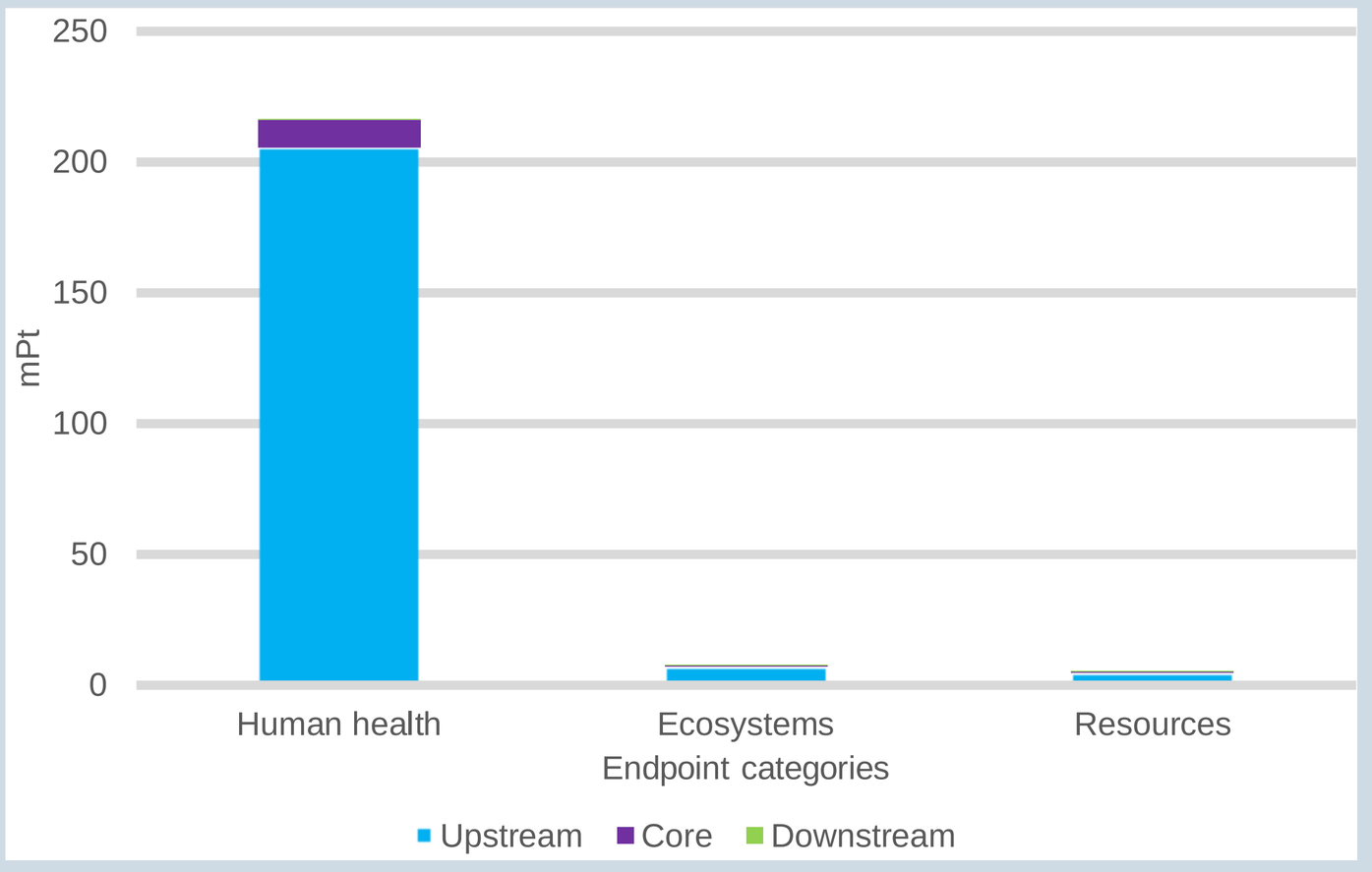

Figure 1. Environmental profile – Endpoint categories per processes.

Introduction

- Thermoplastic compounds are present in various industrial, domestic and consumer applications thanks to their strength, lightness, flexibility and processing properties.
- Thermoplastics are often derived from polymers formed from non-renewable sources, such as petroleum.
- The raw materials production have a high consumption of energy. For this reason, assessing the environmental impacts caused by the production process is of primary importance.
- This study evaluates the environmental performance of a polyamide-based thermoplastic compound with brominated flame retardants.
- The objective of the analysis is to understand which phase of the production process has the most significant impacts.

Methodology

- The analysis was carried out through the Life Cycle Assessment (LCA) methodology using SimaPro v9.5, Ecoinvent v3.9 database and ReCiPe 2016 v1.07 impacts assessment method.
- The primary data were generated and collected in a factory in northern Italy.
- The System Boundaries included an approach from cradle-to-gate.
- Functional Unit considered is 1 kg of final product.

Results and Conclusions

- Upstream phase affects for more than 90% of the environmental profile (Figure 1), especially in Global warming (around 60% of the total impacts) and Fine Particulate Matter Formation (around 30% shares) (Figure 2).
- As regarding Global Warming Potential, entire process production delivers a total impact of 6.17 kg CO_{2}-eq per kg of the final product.
- In conclusion, this research indicates that most of the impacts are caused by the production of raw materials. For this reason, it is necessary to introduce more sustainable and environmentally friendly raw materials.

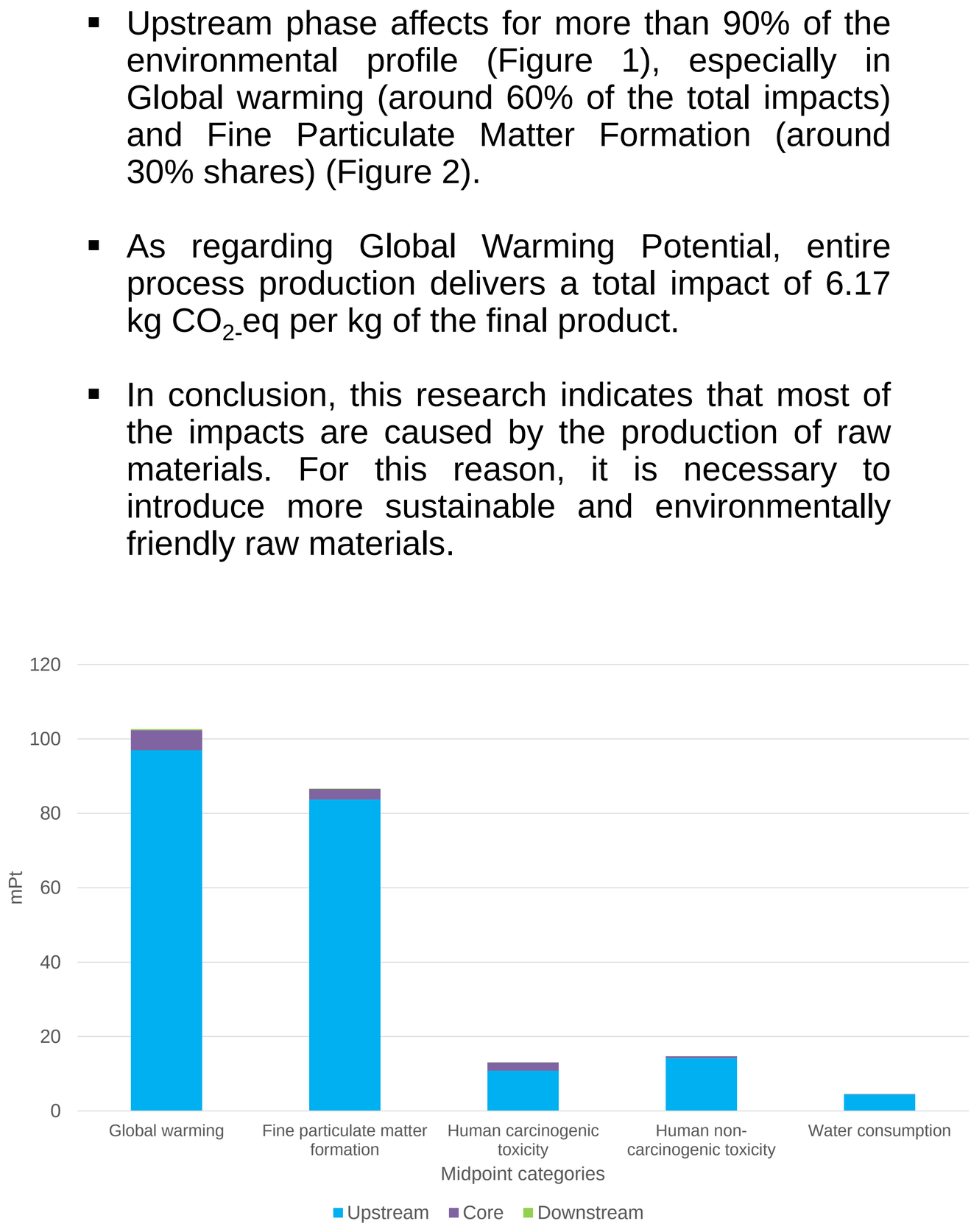

Figure 2. Environmental profile – Midpoint categories per processes.