The Potential for Energy Recovery from End-of-Life Tire Recycling in Cameroon: A System Dynamics Approach

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Introduction

- Cameroon is a country in Central Africa facing an energy crisis since 2000.
- Energy demand in Cameroon is greater than supply.
- Energy recovery from End-of-life tire (ELT) recycling has been increasing in many other countries.

Figure 1: Geographical location of Cameroon
https://www.pinterest.com/pin/385831893049816423/

Figure 2: Environmental degradation from waste vehicles and tires (photo by Kaiho Industry Co., Ltd)

Objective: To estimate the amount of energy recovered from the recycling of ELTs in Cameroon, a potential energy source.

Method

- The system dynamics model
- Data sourced from World Bank, 2018.
- Projections were up to 2035, when Cameroon visions to become an emerging economy.

Main variable equations;

ELTs generated: $X_{elt} = 4 \times X_{elv} - E_{elt}$

ELT recycling Capacity: $C_{elt} = f(X_{elt}, X_{policy}, X_{demand})$

Energy recovered: $R_e = C_{elt} \times X_{atw} \times X_{wnm} \times H_e$

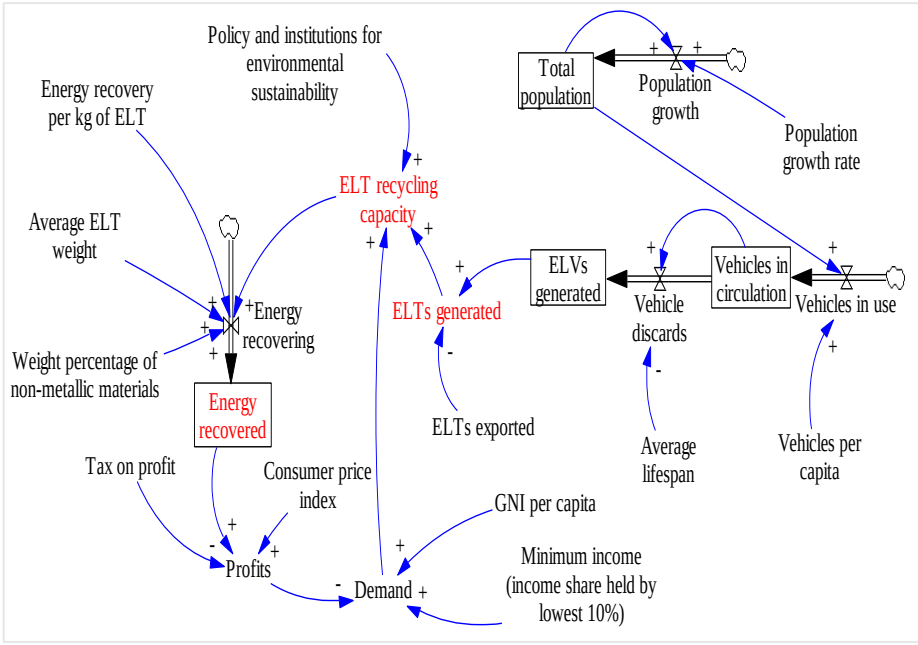

Figure 3: Stocks and flows diagram of the system dynamics model

Model Estimation;

- **Case 1**: Estimating the amounts of energy recovered given different average vehicle lifespan scenarios. Assumed lifespan of 20years
- Increasing average vehicle lifespan of 21 years (scenario 1)
- Decreasing average vehicle lifespan of 19 years (scenario 2)
- **Case 2**: Estimating of the amounts of energy recovered, given different policy scenarios. Current World Bank rating is 3.5
- The policy scenarios had ratings of 3 and 4, representing cases when policy worsens and improves, respectively.

Results and Discussion

- **Case 1**: Scenarios 1 and 2 decrease and increase energy recovered by 0.18e+21MJ and 0.20e+21MJ, respectively (Figure 4).
- **Case 2:** Both policy scenarios showed no changes on energy recovered.

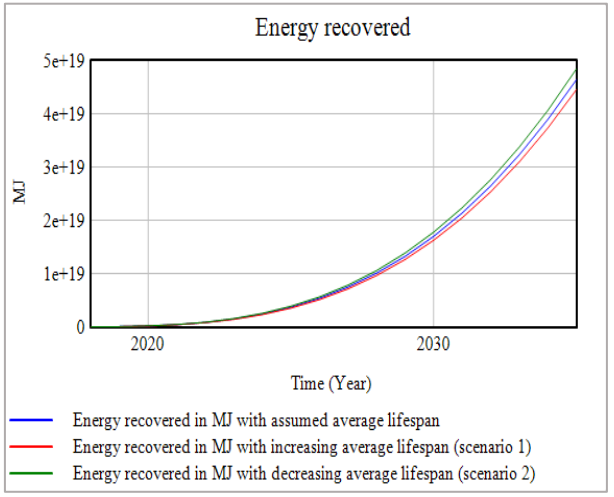

Figure 4: Average lifespan scenarios for energy recovered from ELT recycling in Cameroon

Conclusion

- Policy does not have a direct impact on energy recovered, but it has an indirect impact through the average vehicle lifespan.
- The recycling of ELTs in Cameroon will therefore provide a feasible source of energy and also reduce the environmental pollution