

## MULTIPLE OBJECTIVE LINEAR PROGRAMMING MODEL APPLIED TO SUSTAINABILITY

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## ABSTRACT

*This research studies sustainability which is viewed from triple bottom line (TBL) perspective. Multiple objective linear programming (MOLP) model is applied to sustainability. We further narrow down to triple objective of minimization of production cost, carbon emission generated and life-threatening accidents associated with work for a business case and discuss the tradeoffs of TBL. The example of the business case and its solution shed light for other businesses to achieve and balance goals in sustainability.*

**Keywords:** Sustainability, triple bottom line, multiple objective linear programming, goal programming, carbon emission, weight.

## 1. INTRODUCTION

Traditionally, business focuses on maximizing its financial return known as “bottom line”. In today’s global economy, big or small, it is under pressure to show how it plans to commit and deliver their goods and services in a sustainable manner. The pressure comes from customers, who request more green products, competitors, the first mover receives more benefits, and government agencies who regulate environment impact. More and More businesses are embracing environmental and social responsibility in addition to profitability, addressing sustainability from triple bottom line (TBL) perspective. Tesla produces electric cars powered by clean energy. Walmart, since 2005, has strived to collaborate with other partners across its supply chain to eliminate waste and reduce carbon emission, select reasonable sources, and promote more green products. Starbucks aims to provide more healthcare and other benefit to its full time and part time employees. The TBL is also used as a vehicle to articulate and report to stakeholders about progress towards sustainability. Many businesses voluntarily report their sustainability initiatives such as their carbon footprint level, goals for emission reductions, carbon reduction activities and plans to become carbon neutral to stakeholders through the Carbon Disclosure Project and Global Reporting Initiative websites (Goel, 2010; Jackson et al., 2011; Dienes et al., 2016).

The Triple Bottom Line (TBL) introduced and discussed by Elkington (1997, 1998, 2018), provides a framework for businesses to promote the three pillars performance - economic, social and environmental. The three pillars also correspond to profit, people, and planet (3Ps). The profit dimension refers to the traditional “bottom line” earnings of a firm, the people dimension refers to the corporate social responsibility of a firm and the planet dimension refers to the environment impact the firm is responsible for. As shown in Figure 1, the 3Ps in TBL collectively contribute to the sustainability concept. A pragmatic approach to the triple bottom line can often be conflicting. Will each objective of three pillars weight equally to sustainability and how do managers allocate resources to balance the triple bottom line to achieve sustainability? This research applies multiple objective linear programming (MOLP) model to sustainability from TBL perspective and its solution provides guidance to business to achieve tradeoffs in TBL. Our research also contributes to the current literature on sustainability.