Appendix: Case Simplifying Assumptions

For the purpose of this case, make the following simplifying assumptions:

- Consider a dynamic problem with N yearly planning buckets. WBR decides in the beginning of the year on the number of bicycles for donation and sale. In year 1, WBR can only donate bicycles. Starting from year 2, WBR can both donate and sell bicycles.
- The demand D_t for (sold) BB bicycles in period t is a function of the quantity of philanthropic (q^d_{t-1}) and sold (q^s_{t-1}) bicycles in the previous period and of the total number of bicycles used by customers in the field, denoted by total field inventory I_{t-2}. For simplicity, consider a linear functional dependence with two parameters, θ_I and θ_q:

$$D_t = \theta_I I_{t-2} + \theta_q (q^d_{t-1} + q^s_{t-1})$$

- Assume the country has a maximal demand:

$$D_t \leq \bar{D}$$

- For simplicity, assume equal monetary donations $\delta_t = \delta$, say, δ = \$4,500,000. Assume no grants will be available in the years to come.
- WBR funds the sourcing, assembly, and distribution costs of *both types* of bicycles (i.e., for sale (q^s_t) and philanthropic (q^d_t)) from cash (i.e., the organization's money supply M_t, which derives from donations δ_t and proceeds from the for-profit sales q^s_{t-1}).
- Assume the average lifespan of each bicycle used in the field is constant, say, L = 4 years.
- Introduce "social impact" parameter α where $0.5 \leq \alpha \leq 1$. Assume, for simplicity, that "Power of Bicycles" is proportional to:

$$\alpha q^d_t + (1-\alpha) q^s_t$$