### ****Data Dictionary****

| **Field Name** | **Description** | **Type** | **Example Values** |
| --- | --- | --- | --- |
| **Recycled\_Pallets** | Number of recycled pallets sold on the marketplace. | Integer | 0–1000 |
| **New\_Pallets** | Number of new pallets sold on the marketplace. | Integer | 0–1000 |
| **Total\_Pallets** | Total number of pallets sold (Recycled\_Pallets + New\_Pallets). | Integer | 0–1000 |
| **Price\_Recycled** | Price per recycled pallet. | Numeric (USD) | 8–12 |
| **Price\_New** | Price per new pallet. | Numeric (USD) | 13–18 |
| **Revenue\_Recycled** | Total revenue generated from recycled pallets (Recycled\_Pallets × Price\_Recycled). | Numeric (USD) | 2400 |
| **Revenue\_New** | Total revenue generated from new pallets (New\_Pallets × Price\_New). | Numeric (USD) | 7200 |
| **Total\_Revenue** | Total revenue from pallet sales (Revenue\_Recycled + Revenue\_New). | Numeric (USD) | 9600 |
| **Supply\_Capacity** | Total number of pallets available for sale (combined recycled and new pallets). | Integer | 1000 |
| **Min\_Recycled\_Demand** | Minimum buyer demand for recycled pallets that must be met. | Integer | 300 |
| **Min\_New\_Demand** | Minimum buyer demand for new pallets that must be met. | Integer | 400 |
| **Sustainability\_Ratio** | The ratio of recycled pallets to total pallets sold to ensure sustainable practices. | Numeric | 0.6 (e.g., 60%) |
| **Profit** | Total profit generated from pallet sales (Revenue - Costs). | Numeric (USD) | 5000 |

### ****Key Concepts and Constraints****

#### ****Recycled\_Pallets & New\_Pallets****

* These represent the **decision variables** in the optimization problem. The goal is to determine the optimal number of recycled and new pallets to sell that maximizes revenue while meeting constraints.

#### ****Supply\_Capacity****

* Represents the **upper limit** of pallets available for sale by all sellers combined.
* Example: If sellers have a total of 1,000 pallets available, then: \text{Recycled\_Pallets} + \text{New\_Pallets} \leq \text{Supply\_Capacity}

#### ****Min\_Recycled\_Demand & Min\_New\_Demand****

* These constraints ensure that the **minimum buyer demand** for each type of pallet is met.
* Example: If buyers demand at least 300 recycled pallets and 400 new pallets: \text{Recycled\_Pallets} \geq 300 \text{New\_Pallets} \geq 400

#### ****Sustainability\_Ratio****

* Reflects PalletTrader's commitment to sustainability. For instance, ensuring at least 60% of pallets sold are recycled can be written as: \text{Recycled\_Pallets} \geq 0.6 \times (\text{Recycled\_Pallets} + \text{New\_Pallets})

#### ****Price\_Recycled & Price\_New****

* These represent the price range for recycled and new pallets, based on **market conditions**.
* Example: The price for recycled pallets is constrained between $8–$12, while new pallets are priced between $13–$18.

#### ****Revenue\_Recycled & Revenue\_New****

* The revenue generated from each type of pallet is calculated as: \text{Revenue\_Recycled} = \text{Recycled\_Pallets} \times \text{Price\_Recycled} \text{Revenue\_New} = \text{New\_Pallets} \times \text{Price\_New}

#### ****Total\_Revenue****

* The total revenue is the sum of the revenue from recycled and new pallets: \text{Total\_Revenue} = \text{Revenue\_Recycled} + \text{Revenue\_New}

#### ****Profit****

* The total profit is calculated as: \text{Profit} = \text{Total\_Revenue} - \text{Total\_Costs}

### ****Purpose of the Data Dictionary****

* **Decision Support:** Helps identify and understand the variables that will be used in the pricing optimization.
* **Model Design:** Ensures constraints and objectives are properly defined for the optimization problem.
* **Real-World Context:** Maps abstract variables like "demand" and "supply" to PalletTrader's operations.