1 Estimating the Carbon Footprint Impact of Straw Houses

Let's consider the following variables:

- C: Total carbon footprint from all sources.
- H: Percentage of total carbon footprint caused by the housing industry.
- S: Number of straw houses, assuming exponential growth from the selected starting year.
- R: Reduction in carbon footprint per straw house.
- `starting_year`: The year from which the exponential growth in straw houses begins (default 1950).
- `degradation_rate`: The rate at which the carbon footprint reduction due to straw houses degrades over time.
- `growth_rate`: The exponential growth rate of straw houses.

The total carbon footprint contributed by the housing industry can be represented as:

$$C_{\text{housing}} = C \times \frac{H}{100}$$

The number of straw houses grows exponentially from the selected starting year:

$$S = (\text{year} \geq \text{starting\_year}) \times \exp(\text{growth\_rate} \times (\text{year} - \text{starting\_year}))$$

The degradation of the reduction effect of straw houses is applied as:

$$S\times = (1 - \text{degradation\_rate})^{(\text{year}-\text{starting\_year})}$$

The total reduction in carbon footprint due to straw houses can be represented as:

$$C_{\text{straw}} = S \times R$$

Therefore, the adjusted carbon footprint for the housing industry, considering the subtractive effect of straw houses, is:

$$C_{\text{adjusted}} = C_{\text{housing}} - C_{\text{straw}} = C \times \frac{H}{100} - S \times R$$

This equation helps in understanding the potential impact of building houses with straw, reflecting a temporary decrease in CO2 emissions, considering the exponential growth of straw houses and the degradation of the reduction effect over time.