Supplementary Material

Recycling, Material Flow, and Recycled Content Demands of Polyethylene Terephthalate (PET) Bottles towards a Circular Economy in Korea

Chonghee Lee, Yong-Chul Jang *, Kyunghoon Choi, Byeonghwan Kim, Hakyun Song and Youngsun Kwon

Department of Environmental Engineering, Chungnam National University, Daejeon 34134, Republic of Korea; cheelee0214@gmail.com (C.L.); choikhoon@gmail.com (K.C.); bhkim0104@gmail.com (B.K.); hakyunsong1126@gmail.com (H.S.); deu04320@gmail.com (Y.K.)

* Correspondence: gogator@cnu.ac.kr; Tel.: +82-42-821-6674

Prediction of the consumption amounts of PET bottles until 2040, was made referring to the following five mathematical models: Linear model, Arithmetic series, Least square method, Logistic model, and Gompertz model. Detailed information including equations of each model is shown in Table S1.

Table S1. Five mathematical models and related equations

Mathematical model	Content	Equation
Linear model	Predicts continuous audiences based on a linear relation relationship between the audience and one or more predictors	$y = ax + b$ y: Estimated waste generation x: Number of years from base year to forecast year *a, b*: Constant
Arithmetic series	Relatively easy and straightforward to estimate waste generation; suitable for cities with stable waste generation growth rates	$P_n = P_0(1 + rn)$ $r = \frac{1}{n}(\frac{P_n}{P_0} - 1)$ P_n: Waste generation in year n P_0: Waste generation in the base year r: Average growth rate n: Number of years from base year to forecast year
Least square method	Suitable for cities with large fluctuations in waste generation; applicable to most cities	$y = a + bx$ $a = \frac{\sum y}{n} - b\frac{\sum x}{n}$

		$b = \frac{n\sum xy - \sum x \sum y}{x\sum x^2 - (\sum x)^2}$ y: Estimated waste generation x: Number of years from base year to forecast year a, b: Constant n: Number of materials
Logistic model	Initially, the growth of waste generation is slow, then it increases rapidly after a period of time, and then the growth rate decreases to maintain a constant number (converges to a threshold); used when you want to tighyly control the amount of waste generation in a metropolitan area up to some upper limit; can provide relatively accurate estimates of waste generaion	$y = \frac{K}{1 + e^{a+bx}}$ K: Carrying capacity a, b: Constant (b<0) x: Number of years from base year to forecast year
Gompertz model	A type of mathematical model that represents a growth cycle as an S-curve; one of the growth curve methods of time series analysis	$y_t = Ka^{b^t}$ K: Carrying capacity a, b: Constant t: Time variables y_t: Cumulative waste generation over t period