

## **The Determinants of GDP, Literacy Rate and Life Expectancy on PWE in Sri Lanka: Analysis from 2000-2022**

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### **Introduction**

One of the largest environmental problems of the twenty first century is plastic waste. The management of plastic waste has become more complex due to the world's rapid growth in plastic production and consumption. The worldwide export of plastic waste is an important problem. Plastic's low cost and various uses have made it the most vital materials in a wide range of industries. Plastic manufacturing and usage have been steadily increasing since 1950. Between 1950 and 2015 it has reached about 7800 million tons (Mt). In 1950 the globe produced 2 Mt of plastic annually by 2015, that amount had increased to 381 Mt. Estimates show plastic production is rapidly increasing and may reach 34000 Mt by 2050 ([Salhofer et al., 2021](#)).

Sri Lanka produces around 1.59 Mt of plastic waste each year. Out of that, 33% is collected and a paltry 3% of that is recycled, resulting in serious environmental issues. The country was ranked number five in the world by the amount of plastic waste that gets into the ocean in 2017 ([Rizkiya, 2024](#)). The greater the GDP, the greater is the demand for consumer products. The OECD estimates that in the absence of major policy interventions, plastic waste can reach three times its current levels by 2060, fueled by population and economic growth ([Sonke et al., 2025](#)). In Sri Lanka, economic development has caused plastic consumption to grow. In the absences of waste management infrastructure increase mismanaged waste.

While there are no direct correlations between plastic waste and life expectancy, environmental pollution caused by plastic can have serious implications for public health. Plastics have been detected in drinking water sources and food chains around the world, raising concerns about long-term

health effects and causing environmental degradation, which indirectly affects public well-being and longevity ([Ragusa et al., 2021](#)).

Education plays a crucial role in shaping sustainable waste management behaviors. Higher literacy rates are strongly associated with increased environmental awareness and responsible waste disposal practices. Globally, educational initiatives aimed at promoting environmental stewardship such as school-based environmental Programmes help instill knowledge from an early age. However, turning awareness into action remains a challenge ([Dalu et al., 2020](#)).

### Objectives

The objective of this study is to measure the impact of GDP, LE and LR on PWE generation in Sri Lanka.

### Methodology

This study uses the secondary data covering period from 2000 to 2022 in Sri Lanka. The variables, definitions and sources are given below:

**Table 1: Variables, Definitions and Sources**

| Variable             | Definition                                                                                                                                                                         | Measurement                     | Source            |
|----------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------|-------------------|
| Plastic Waste Export | Waste Export the international shipment of plastic waste from one country to another for disposal, recycling, or other forms of processing.                                        | Plastic waste export per capita | Our world in data |
| GDP                  | A key economic indicator that measures the total value of all goods and services produced within a country's borders during a specific time period, typically a year or a quarter. | GDP per capita                  | Our world in data |

|                 |                                                                                                                                                                                            |                          |                 |
|-----------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------|-----------------|
| Life Expectancy | Life expectancy at birth indicates the number of years a newborn infant would live if prevailing patterns of mortality at the time of its birth were to stay the same throughout its life. | Life expectancy at birth | World Bank Data |
| Literacy Rate   | Literacy Rate indicates the percentage of people aged 15 and above who can both read and write with understanding a short, simple statement about their everyday life.                     |                          | World Bank Data |

We used Multiple Linear Regression (MLR) model to analyze how GDP, LE, LR affect PWE.

$$PWE_t = \alpha_0 + \alpha_1 GDP_t + \alpha_2 LE_t + \alpha_3 LR_t + \varepsilon_t \quad (1)$$

where,  $t$  represents the time period and  $\varepsilon_t$  indicates the random error.

## Results and Discussions

Tables 2 and Table 3 indicate the results of descriptive statistics and MLR estimates.

**Table 2: Summary of Descriptive Statistics of Variables**

| Variables  | Obs | Mean     | Std. dev. | Min      | Max      |
|------------|-----|----------|-----------|----------|----------|
| <b>PWE</b> | 23  | 0.345551 | 0.023187  | 0.004384 | 0.754493 |
| <b>GDP</b> | 23  | 10628.81 | 3135.436  | 6230.031 | 14759.83 |
| <b>LE</b>  | 23  | 74.13909 | 2.448076  | 68.0218  | 77.2996  |
| <b>LR</b>  | 23  | 91.37453 | 0.538486  | 91       | 92.61417 |

Table 2 summarizes descriptive statistics for the PWE, GDP, LE and LR in Sri Lanka. All these variables are based on 23 observations.

**Table 3: Results of MLR Model**

| <b>PWE</b>           | <b>Coefficient</b> | <b>Std. errs.</b> | <b>P&gt;  t  </b> | <b>Hypotheses</b> |
|----------------------|--------------------|-------------------|-------------------|-------------------|
| <b>GDP</b>           | .0000105           | 2.83e-06          | 0.001***          | Significant       |
| <b>LE</b>            | -.0028805          | 0.003096          | 0.364             | Insignificant     |
| <b>LR</b>            | -.0368458          | 0.010915          | 0.003***          | Significant       |
| <b>Cons</b>          | 3.502879           | 1.002594          | 0.002***          |                   |
| <b>Observation</b>   | 23                 |                   |                   |                   |
| <b>R<sup>2</sup></b> | 0.5352             |                   |                   |                   |
| <b>Adj R-squared</b> | 0.4618             |                   |                   |                   |

*Note: MLR denotes Multiple Linear Regression. \*, \*\* and \*\*\* represents the variables are statistically significant at 10%, 5% and 1% level of significant respectively*

As per result GDP shows a positive and statically impact on PWE. This suggests that an increase in GDP may contribute to higher levels of plastic waste being exported, possibly due to greater digital activity driving economic activity. Moreover, LR has a negative significant impact, implying that higher LR may reduce the PWE. However, LE does not show significant impact, as its p- value is above conventional threshold. This shows that LE does not strongly affect PWE.

Also, the results of Variance inflation factor (VIF=4.27), Whites' test (p-value = 0.3098), Durbin Watson test (p-value =0.900) and Jarque- Bera test (p-value = 0.605) reveals that our constructed model don't suffer from multicollinearity, heteroscedasticity, autocorrelation and normality respectively.

The linearity outcome indicates varying associations between plastic waste exports and key socioeconomic factors. Overall, economic development shows a strong positive link with export levels, while higher literacy and longer life expectancy tend to be associated with lower exports. However, the strength of these relationships differs, with literacy showing a clearer negative connection, life expectancy only a weak one, and GDP per capita demonstrating the most consistent positive influence.

## **Conclusion and Policy Recommendations**

The above study produces significant impacts of GDP, LE and LR on PWE in Sri Lanka. Therefore, GDP shows a significant impact on PWE, LE shows an insignificant impact on PWE and LR also gives an insignificant impact on PWE. An increase in GDP tends to rise PWE due to higher production, consumption and economic activities etc. Furthermore, we can build policies to maintain the PWE by encouraging sustainable consumption, and wastage reduction incentives for businesses. When LR increases, PWE decreases according to the findings in Sri Lanka. When human beings are mature people will automatically follow sustainable practices, and educate their children to follow sustainable practices. Also, LR increases PWE decreases because of the values of past data in Sri Lanka. Therefore, human beings are getting educated and knowledgeably they will follow up to concern about the environment. Also, we can build awareness Programs and educated Programs for reducing the wastage impact on environment. The results fall into line with several United Nations SDGs formulated in 2015. SDG 3 (Good Health and Well-being) can also be enabled by limiting plastic pollution and the effects of chemical leakage and plastic burning on our health, adopting lifestyles that would limit plastic materials and exporting of plastic waste elsewhere. SDG 6 (Clean Water and Sanitation) is also directly related to the realms of plastic waste management improvement. Through fostering domestic capacity can make the country less dependent on exporting plastic waste, Sri Lanka will be able to defend its water supply against plastic pollution in an increasingly sustainable fashion. SDG 12 (Responsible Consumption and Production) is the most relevant goal. This framework can inform policies that incentivize low consumption and production of plastic and imports. Also, adoption of effective plastic waste management frameworks.

By incorporation of the combination strategy in implementation, Sri Lanka can create a sustainable economic growth through its management of the export pattern of plastic waste, and this will help in reducing the impacts on the environment of plastic waste systems in the country.

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