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To what Extent has the Single-Use Plastic Ban in Bali Impacted its Local Economy?

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Abstract

This paper aims to evaluate the economic implications, both positive and negative, of Bali's single-use plastic ban since its implementation on July 1, 2019. Since the regulation, the use of plastic bags, straws, and styrofoam has significantly decreased, indicating a successful reduction in plastic waste. However, this research will explore whether these environmental benefits have come with economic costs, such as potential disruptions to businesses and the tourism industry.

By examining factors such as local businesses, tourism, environmental sustainability, and the broader economic landscape, this study seeks to comprehensively assess the impact of the ban and identify any unintended economic consequences. In an era where environmental initiatives are increasingly prioritized to combat climate change, it is essential to scrutinize the efficacy and reliability of such solutions. Understanding the economic ramifications of Bali's single-use plastic ban will provide valuable insights for future policy development, ensuring a balance between environmental sustainability and economic viability.

I. Introduction

The controversy surrounding single-use plastics has been a major environmental concern for many years, especially due to rising concerns about climate change and the role of plastic waste in exacerbating it. Today, the world produces around 350 million tonnes of plastic waste annually.[1] Unlike some other materials, plastic is not biodegradable, making it difficult to get rid of. Attempts at disposing of plastic waste result in dangerous accumulations of this material in natural environments, including the ocean. Now, this buildup is approaching or has approached catastrophic levels in fragile environments around the world. Plastic pollution has resulted in sea life ingesting and choking on plastic debris, soil and groundwater being damaged, and health impacts on various organisms, including humans.[2] According to the Natural Resources Defense Council, at least 1,565 wildlife species have been found to have accidentally ingested plastic and

[1] Hannah Ritchie, Veronika Samborska, and Max Roser, "Plastic Pollution," Our World in Data, last modified 2023, https://ourworldindata.org/plastic-pollution?insight=around-05-of-plastic-waste-ends-up-in-the-ocean#key-insights.
[2] UN Environment Programme, "Understanding plastic pollution and its impact on lives," The United Nations, last modified June 5, 2023,https://www.un.org/africarenewal/magazine/may-2023/understanding-plastic-pollution-and-its-impact-lives#:~:text=Unlike%20other%20materials%2C%20plastic%20does,can%20cause%20serious%20health%20impacts.

plastic waste has become a severe health hazard, especially in situations where plastic waste is incinerated, as those who inhale the toxic fumes are at high risk of conditions ranging from skin rashes to cancer.[3]

Despite these environmental concerns, plastics remain pervasive due to their valuable qualities, namely being cheap, sturdy, and easily manufacturable, plastic appears in almost every facet of human activity. Furthermore, due to its advantages, plastic is also useful in single-use contexts, such as disposable bottles, grocery bags, packaging, and more. Since these single-use applications inherently involve people discarding plastic constantly, the issue of plastic pollution is an even more pressing concern. With the inability to degrade, plastic accumulation as a result of single-use plastic waste is poisoning natural environments.

Figure 1: *Single-Use Plastic Waste on Balinese Beaches (The Bali Sun, 2022).*[4]

One answer to this problem is, at face value, extraordinarily simple: ban single-use plastics. The idea of this solution is to prevent the use of plastics in contexts where they are usually discarded after one use, such as plastic water bottles and plastic bagging for groceries, and instead incentivize the use of sustainable, reusable, or biodegradable alternatives, such as utilizing reusable water bottles or grocery bags made out of biodegradable material. While many areas around the world have not implemented this solution due to various reasons including economic concerns from plastic-dependent industries, lack of means to enforce these bans, or lack of infrastructure for non-plastic alternatives, one region that is known to have introduced regulations on restricting single-use plastics is the island of Bali.

[3] Courtney Lindwall, "Single-Use Plastics 101," NRDC, last modified April 30, 2024, accessed July 20, 2024, https://www.nrdc.org/stories/single-use-plastics-101#what.
[4] "Bali To Ban Single Use Plastics By End Of 2022," The Bali Sun, last modified May 30, 2022, https://thebalisun.com/bali-to-ban-single-use-plastics-by-end-of-2022/.

The province of Bali in Indonesia has implemented their form of a single-use plastic ban through a legal act called the Regulation of the Governor of Bali No. 97/2018 on Restrictions on the Generation of Disposable Plastic Waste, which has been in effect since July 1, 2019.[5] This act targets disposable plastic products, especially plastic bags, styrofoam, and plastic straws by ordering producers, suppliers, and businesses to switch to non-plastic replacement products. Individuals and communities are also called on to reduce their own disposable plastic use. The act also outlines that penalties would be imposed on those who violate the terms of the regulation. Since the implementation of the regulation, the use of plastic bags has gone down by around 51-57%, straws down around 66-70%, and styrofoam down around 77-81%.[6]

However, although this regulation can arguably be seen as a success from an environmental standpoint, one possible concern is the regulation's possible impact on the regional economy in Bali. This invites this paper's research question.

Research Question: To what extent has the single-use plastic ban in Bali impacted its local economy?

II. Literature Review

In recent years, many researchers have studied the complex relationships between environmental policies like a single-use plastic ban on various aspects of modern society, particularly economies. Before discussing the regional economic ramifications of the single-use plastic ban in Bali, this paper examines the trends researchers have seen in other countries that may be similar to those in Bali. The conversation around single-use plastic bans in the context of local economies have been rather mixed, demonstrating the multi-faceted nature of the issue. Prior to more recent single-use plastic bans in the last few years, including Bali's, researchers have expressed concern in the negative impact that possible bans could have on various aspects of the economies that are affected.

Caliendo (2013) investigated the impact of implementing a ban in certain areas in Los Angeles showed how a ban or premium on single-use plastics can negatively impact sales in areas where the ban is implemented and increase sales in areas where the ban is not implemented.[7] This demonstrates how single-use plastic bans or regulations that require customers to pay premiums to use single-use plastics drives away consumers, resulting in lessened economic activity in areas where the ban is implemented. Here, a clear relationship between consumers and the ban can be seen, demonstrating how demand for certain products or services can be impacted by single-use plastic bans. The same study also found that the ban had an impact on jobs, resulting in a 10% reduction in employment in stores under a single-use plastic ban.

Vimal et al. (2020) identified barriers responsible for difficulty in eliminating single-use plastics and examined the interplay between those barriers.[8] Using a Decision Making Trial and Evaluation Laboratory (DEMATEL) framework to examine the situation in India, the study found the primary issues with single-use plastic bans were a lack of manufacturing facilities for biodegradable alternatives, a lack of government initiatives to promote alternatives, and a high cost for technologies to create sustainable single-use products. Due to these issues with cost and lack of supply for

[5] Government of Bali, "Peraturan Gubernur Bali Nomor 97 Tahun 2018 tentang Pembatasan Timbulan Sampah Plastik Sekali Pakai" [Regulation of the Governor of Bali Number 97 Year 2018 on the Restrictions on the Generation of Disposable Plastic Waste], Kabupaten Buleleng, last modified 2018, https://bulelengkab.go.id/assets/instansikab/56/bankdata/pergub-no-97-tahun-2018-tentang-pembatasan-timbulan-sampah-plastiksekali-pakai-71.pdf.

[6] "The Single-Use Plastic Ban Regulation Has an Impact on Reducing the Generation of Plastic Waste in Bali," Dietplastik Indonesia, https://plasticdiet.id/en/the-single-use-plastic-ban-regulation-has-an-impact-on-reducing-the-generation-of-plastic-waste-in-bali/.

[7] Heather Caliendo, "The economic effect of plastic bag bans," Plastics Today, last modified February 6, 2013, https://www.plasticstoday.com/business/the-economic-effect-of-plastic-bag-bans.

[8] E. K. Vimal et al., "Analysis of Barriers That Impede the Elimination of Single-use Plastic in Developing Economy Context," Journal of Cleaner Production 272 (November 2020), https://doi.org/10.1016/j.jclepro.2020.122629.

sustainable alternatives to single-use plastics, there is little support from businesses for single-use plastic bans and difficulties in businesses to replace their single-use plastics. The study also emphasizes that customers are still dependent on many qualities of single-use plastics that have not been fully replicated in the alternatives being used, including plastic being light, flexible, leak-proof, and water-resistant. As one of its future policy suggestions, the study argues that governments should give financial support to incentivize alternatives to single-use plastics and that those alternatives should be readily available.

Excelle (2019) supports these suggestions, arguing that the reason that there is not full success with single-use plastic bans is due to a lack of incentives being offered for utilizing alternatives to single-use plastics.[9] This study suggests that these incentives could come in the form of government subsidies of single-use plastic alternatives.

This paper now examines the case studies for other locations that have implemented some form of single-use plastic ban to identify the economic implications that came with those bans, in hopes that it could inform the discussion around Bali's situation. Thorne, Phillips, and Roopnarine (2020) focuses on Trinidad and Tobago after its single-use plastic ban in 2020, using a cross-sectional analysis of the ban to examine its direct impact on the local economy.[10] In this analysis, the ban was shown to have a 0.058% direct impact on annual GDP, accounting for 6 key economic subsectors. This impact is considered small and overall finds the single-use plastic ban as a success, despite the more expensive costs of sustainable alternatives like plant-based materials for straws and Bagasse for boxes instead of cheaper plastic straws and styrofoam boxes.

On the other hand, Amankwaa & Danquah (2024) conducted a study in Ghana by collecting survey results and data from plastic manufacturers, retailers and households in Accra, Kumasi, Sekondi-Takoradi, and Tamale, showcasing a more negative impact on the economy as a result of Ghana's current and potential single-use plastic bans.[11] Firstly, Ghana's manufacturers and retailers were found to be against a ban due to a lack of suitable alternatives. Other issues included a limited state capacity to implement and enforce a ban, a thriving black market, and the fact that the plastic industry has an instrumental role in the Ghanaian economy. Findings also hypothetically show how the ban would lead to increased unemployment and loss in government tax revenue, which would negatively impact exports and foreign exchange, along with increasing the cost of living. According to the study, the total loss in labour income would sum up to around GHC3.5 million ($648,148) per week and over GHC14.4 million ($2.6 million) per month. The total loss of government tax revenue would sum up to GHC5.4 million ($1 million) weekly. However, the study also mentions how households and the general population are mostly in support of the ban due to its "positive aesthetic, environmental and health benefits." The study ultimately concludes that the issue requires a solution that prioritizes the circular economy, incentivizes business to innovate, offers suitable alternatives, and adopts a community-drive approach.

There are also other doubts towards the efficacy of single-use plastic bans. Herberz, Barlow, and Finkbeiner (2020) found that, while the proposed ban would decrease marine pollution in the European Union by approximately 5.5% (around 0.06% globally), the increased emissions due to manufacturing non-plastic alternatives could contribute to marine aquatic toxicity by 1.4% in the EU, which could show that single-use items may be harmful to the environment regardless of the

[9] Carole Excelle, "127 Countries Now Regulate Plastic Bags. Why Aren't We Seeing Less Pollution?," World Resources Institute, last modified March 11, 2019, accessed June 19, 2024, https://www.wri.org/insights/127-countries-now-regulate-plastic-bags-why-arent-we-seeing-less-pollution.
[10] Elizabeth Thorne, Willard Phillips, and Camille Roopnarine, Economic implications of the ban on single-use plastics in the Caribbean: A case study of Trinidad and Tobago, November 4, 2020, https://hdl.handle.net/11362/46280.
[11] Eben Amankwaa and Michael Danquah, "The Plastic Ban Conundrum: Economic and Environmental Effects of Banning Single-Use Plastics in Ghana," January 6 2024, https://doi.org/10.2139/ssrn.4685862.

material.[12] Given the possible economic impact discussed previously, single-use plastic bans could arguably be counter-intuitive and perhaps causes more problems than it solves.

In Bali, perspectives toward the implementation of the single-use plastic ban regulation in 2019 has been similarly divisive. Yunianti (2024) found the Bali Governor Regulation and Denpasar Mayor Regulation on single-use plastics as an environmental success, demonstrating how, since the regulations were implemented, the island has seen decreases of 57% in plastic bags, 81% in styrofoam, and 70% in plastic straws, demonstrating the environmental efficacy of the ban.[13] According to Yunianti, factors of the success include "stringent law enforcement, adequate facilities, and Balinese cultural readiness for environmental compliance." On the other hand, Bali has also faced challenges with compliance in some local businesses, particularly smaller markets and warungs, essentially street vendors, due to this informal sector of the economy lacking a lot of government regulation. This study claims that the best ways for Bali to further the impact of the regulation is to pursue ongoing waste management improvement, continuous public education, and traditional leadership engagement to sustain behavioural change.

Similar conclusions are found in Angriani et al. (2021), which found that success is questionable due to the fact that regulations have been unsuccessful in enforcing the ban upon major contributors to plastic bag waste, including warungs.[14] This is because, although most citizens agree with the ban, the conclusion is that, in order to boast better results, either plastic bags must be even more expensive in order to decrease the demand for it or alternatives need to look more desirable.

The regulation has also impacted Balinese and foreign perspectives toward single-use plastics. Sukmana, O. et al. (2021) found that the movement that campaigned for the regulations, the Bye Bye Plastic Bags (BBPB) movement, had a "growing consciousness and growing interconnectedness" that allowed it to become a global movement and make Bali's single-use plastic ban more well-known.[15] While the relationship with this growing global attention to Bali is not reliably documented, there is a possibility that this global movement could have had an impact on the island's tourism, which would have had an effect on Bali's economy.

Augustina & Aprinica (2021) analyzes the opinions and changes in behaviour of people following the Bali Governor Regulation and Denpasar Mayor Regulation, finding that the ban has had an impact on consumer behaviour, especially with regards to the use of plastic bags.[16] According to Augustina, the policies have made consumers more inclined to bringing their own reusable shopping bags and has made some traders rely on selling reusable bags instead of non-plastic single-use items. As a result of the regulation and the response from consumers and businesses, based on data from CNN Indonesia, shipments of plastic products to Bali have decreased by up to 30% in the initial months of the regulation's implementation, perhaps impacting local plastic production industries.

[12] Timo Herberz, Claire Y. Barlow, and Matthias Finkbeiner, "Sustainability Assessment of a Single-Use Plastics Ban," Sustainability 12, no. 9 (2020), https://doi.org/10.3390/su12093746.
[13] Wahyu Erni Yunianti, "Legal Compliance and Environmental Sustainability: The Case of Single-Use Plastics in Bali," Journal of Sharia and Legal Ethics, June 20 2024, https://journal.aye.or.id/index.php/JSLE/article/view/10.
[14] Parida Angriani et al., "Ban on Plastic Bags Usage: Consumer Perception of Single-Use Plastic Bags in Traditional Market," Atlantis Press, https://doi.org/10.2991/assehr.k.210222.036.
[15] Oman Sukmana et al., Social and Political Issues on Sustainable Development in the Post Covid-19 Crisis : Proceedings of the International Conference on Social and Political Issues on Sustainable Development in the Post Covid-19 Crisis (ICHSOS 2021), Malang, Indonesia, 18-19 June 2021 (Place of publication not identified: Routledge, 2022).
[16] Arik Augustina and Ni Putu Isha Aprinica, "The Effect Of Regulations On Using Disposable Plastic In Community And Tourism Behaviors In Denpasar, Bali," Journal of Business on Hospitality and Tourism 7, no. 1 (2021), https://doi.org/10.22334/jbhost.v7i1.

Spranz, R. & Schluter, A. (2023), a study of behaviors based on information gathered from Balinese shop owners, found that providing the purchase of the customer directly in a plastic bag is good for the sales, which made it difficult for them to adapt to the ban.[17] Almost a quarter of the 60 shop owners surveyed mentioned that the cost of plastic bags alternatives make a big difference for them, resulting in some businesses deciding to not offer any single-use materials at all.

Based on the review of current literature, there does not seem to be much clear discussion of the economic implications of single-use plastic bans in Bali. Most literature focuses on qualitative research based on surveys and interviews of the Balinese public, which provides valuable information on the perspectives and behaviours of general consumers and small business owners. However, there is little information on the macroeconomic impact of the bans on a larger scale, especially in a quantitative standpoint. The economic impact of the Regulation of the Governor of Bali No. 97/2018 on Restrictions on the Generation of Disposable Plastic Waste should be measured through quantitative means such as GDP perhaps, so that the implications could be seen in a clearer manner. In general, this paper should find a combination of qualitative and quantitative methods of measuring the economic ramifications of the single-use plastic ban in Bali in order to come to comprehensive, relevant conclusions and future recommendations for policy.

III. Methodology

This study aims to analyze the impact of Bali's single-use plastic ban, the Regulation of the Governor of Bali No. 97/2018, on various economic factors in the province. Unlike previous researchers who predominantly used qualitative methods, this study integrates both qualitative insights and a quantitative approach. We will evaluate the economic impact quantitatively and supplement it with qualitative data from surveys and other studies. This approach allows for a comprehensive comparison of economic conditions before and after the ban's implementation in 2019.

This study employs a quantitative approach, synthesizing data from various socioeconomic indicators in Bali. Using secondary data from reputable sources, including regional government reports and the Badan Pusat Statistik (BPS), we will analyze key indicators such as Bali's revenues, employment statistics, tourism data, and environmental impact metrics. Data will be collected from 2017-2018 (pre-ban) and 2019-2023 (post-ban). Key economic metrics like the Gross Regional Domestic Product (GRDP), annual foreign visitor numbers, regional unemployment rates, and industry-related import and export data will be examined to assess the economic impact of the ban. Due to lack of available free resources, inability to collect primary data, and lack of means to access better statistics through paid means, this study restricts itself to these publicly accessible datasets.

The quantitative data will be presented in time-series plots. The x-axis will represent the years 2017 to 2023, while the y-axis will denote the economic indicator being analyzed. Separate graphs will be created for each indicator. A vertical line marking the year 2019 will highlight the implementation of the plastic ban, facilitating a clear comparison between pre-ban and post-ban data.

This study will conduct a comparative analysis using data from 2017-2018 and 2019-2023, ensuring consistent indicators and measurements across years. Qualitative insights from interviews and case studies will supplement the quantitative data. Data triangulation will enhance the reliability of results by cross-verifying information from multiple sources, addressing potential biases and inconsistencies.

[17] "Ocean Governance," MARE Publication Series, 2023, 319, https://doi.org/10.1007/978-3-031-20740-2.

IV. Results

Raw data was first collected from the BPS website, Indonesia's official statistics site. We gathered data on Bali province's annual Gross Regional Domestic Product (GRDP), annual number of foreign visitors, annual employment rate, number of rubber & plastics products production workers, annual value of imported plastics and plastic products, and annual output value of goods produced in rubber and plastics industries. GRDP is useful to this study as it encapsulates Bali's overall economic state. Annual foreign visitor numbers will be useful to show the impact on Bali's tourism industry, which is an important part of its economy. Regional unemployment rates will also allow for the study of the impact on Bali's labor force. The plastic industry-related data is useful in studying the direct impact of the ban on specific industries, namely the plastics and plastic products industry. Data was collected from 2016 to 2023, though the plastic industry-specific variables had data available only for certain years, necessitating adjustments.

The collected data was organized into a spreadsheet and verified using BPS sources. Scatter plots were created for each variable, with time (years from 2016 to 2023) on the x-axis and the economic indicator data on the y-axis. Connecting each point visualizes the changes over time. A trendline, shown by a light blue line, represents the linear regression of each dependent variable against time, estimating their linear relationship. Each graph's legend displays the trendline's linear equation and the coefficient of determination (R2), indicating how well the data fits the linear model.

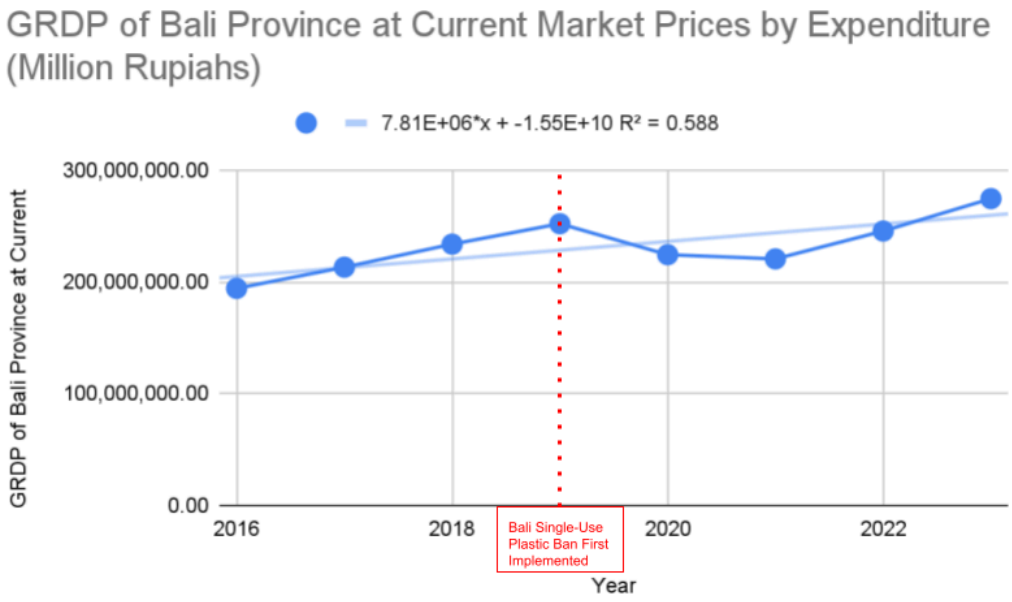

Figure 2: *Annual GRDP of Bali Province at Current Market Prices by Expenditure (Million Rupiahs)*[18]

[18] "Yearly GRDP of Bali Province at Current Market Prices by Expenditure (Million Rupiahs), 2021-2023," Badan Pusat Statistik, https://bali.bps.go.id/indicator/154/146/1/yearly-grdp-of-bali-province-at-current-market-prices-by-expenditure.html.

Figure 2 is the first scatter plot in this study. In Figure 2, the GRDP of Bali province, measured in a million Indonesian Rupiah, is the dependent variable, with time, measured in years from 2016 to 2023, as the independent variable. GRDP over time is a simple, succinct way to monitor Bali's overall economic wellbeing, making it useful to analyze the potential impacts of certain events on the economy, like the ban. The linear equation of the trendline, y=7.81E+06x-1.55E+10, in the legend represents the estimated linear relationship between Bali's GRDP and time. Since the equation has a positive coefficient of x and the trendline slopes upwards, there is a positive relationship between GRDP and time, in years from 2016 to 2023, indicating that, in general in this period of time, GRDP increases as time progresses. This suggests that Bali's overall economic state is generally on a upward trend in these past few years. The coefficient of determination, the R2 value, is a 0.588. Since the value is closer to 1, which indicates the strongest relationship, rather than 0, which indicates no relationship at all, this shows that the linear approximation between the variables is not the strongest, but does indicate a relationship.

In the years prior to 2019, the GRDP of Bali is increasing in mostly in a positive linear relationship, with the initial peak at 2019 with a GRDP of 251,934,097.83 millions of rupiah. This indicates that Bali's overall economy had been thriving. Following 2019, the year when the single-use plastics ban was implemented on the island, Bali's GRDP dropped in 2020 and 2021, reaching a low of 220,466,429.79 millions of rupiah, and grew again between 2021 and 2023, reaching a new peak of 274,355,724.40 millions of rupiah. This indicates that Bali's overall economy had suffered from 2020 to 2021 but made a recovery that set Bali's economy on the thriving path it was on prior to 2019. While the dip in 2020 and 2021 could have been impacted by the 2019 single-use plastic ban, other overwhelming factors must also be considered in discussion, especially the COVID-19 pandemic that began in early 2020 and resulted in closures and mandated quarantines that is proven to have had a large impact on global economies. These COVID-19 responses resulted in a severe downturn in tourism, lockdown measures that prevented Balinese citizens from performing their daily routines, and disrupting business operations.

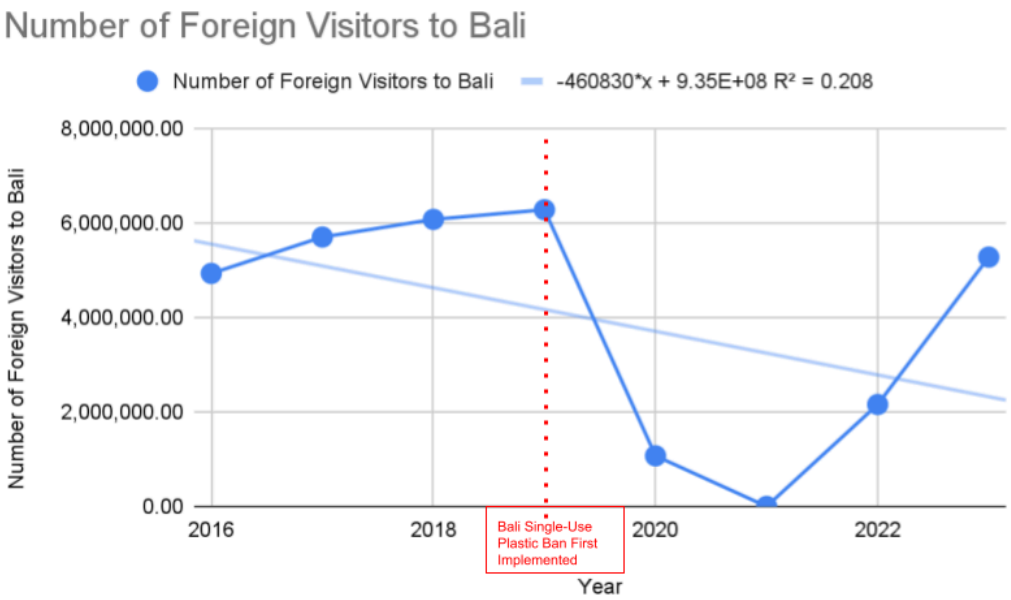

Figure 3: *Annual Number of Foreign Visitors to Bali.*[19]

In Figure 3, the number of foreign visitors to Bali is the dependent variable with time, in years from 2016 to 2023, as the independent variable. This dependent variable is the closest proxy in this study to analyze the impact of the ban on the tourism industry. The linear equation of the trendline, y=-460830x+9.35E+0.8 , in the legend represents the estimated linear relationship between Bali's number of foreign visitors and time, which was collected from BPS. The negative coefficient of x in this equation suggests that, generally, there is a negative relationship between time from 2016 to 2023 and the number of foreign visitors in Bali. The R2 value is a 0.208. Since it is closer to 0, indicating no relationship at all, rather than 1, this shows that this linear relationship is not very strong and reliable enough for analysis.

Prior to the year the single-use plastic ban was implemented, the annual number of foreign visitors was increasing every year since 2016, with a peak of 6,275,210 visitors in 2019. After 2019, there was a drastic dip in the number of annual foreign visitors to Bali in 2020 and 2019, with the lowest being 2021, where there were only 51 foreign visitors to Bali. However, after 2021, the number of foreign visitors to Bali increased rapidly in 2022 and 2023. While these trends may have been, in some capacity, a result of the ban, it is also worth noting that Bali and Indonesia as a whole, in response to the COVID-19 pandemic beginning in 2020, enforced strict travel restrictions that certainly impacted the number of foreign visitors entering Indonesia, reflecting the global tourism trends during the pandemic.

[19] "Number of Foreign Visitors to Bali by Region (Person), 2021-2023," Badan Pusat Statistik, https://bali.bps.go.id/indicator/16/129/1/number-of-foreign-visitors-to-bali-by-region.html.

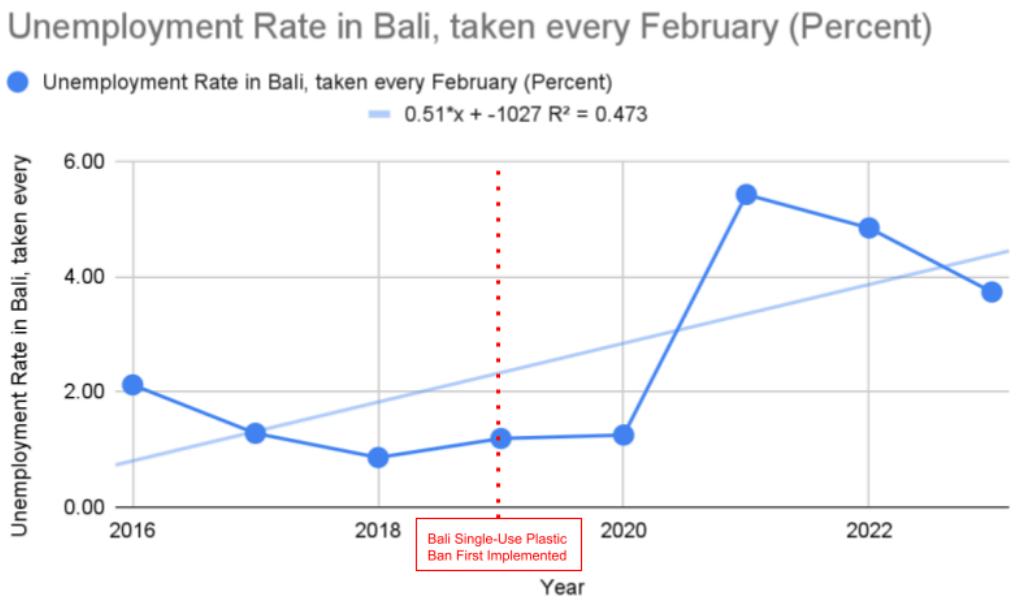

Figure 4: *Annual Unemployment Rate in Bali.*[20]

In Figure 4, the dependent variable is the unemployment rate in Bali, which is plotted against time, in years from 2016 to 2023. The linear equation of the trendline, y=0.51x-1027, in the legend represents the estimated linear relationship between the variables. The positive coefficient of x in this equation suggests that, generally, there is an increasing trend in the unemployment rate from 2016 to 2023. The R2 value is 0.473. Since the value is somewhere in the middle between 0, indicating no relationship, and 1, indicating a strong relationship, this shows that this linear relationship is moderately strong.

Prior to 2019, the annual unemployment rate in Bali had been decreasing since 2016. This trend reversed slightly in 2019 and 2020, with the unemployment rate rising to 1.25% in 2020. A significant spike occurred in 2021, where the unemployment rate reached a peak of 5.42%. Although the unemployment rate started to decline post-2021, it remained significantly higher than pre-2019 levels. While the single-use plastics ban may have contributed to job losses in the plastics and related industries, the COVID-19 pandemic likely played a more substantial role. The pandemic led to widespread business closures and layoffs due to quarantine measures and reduced consumer activity. However, the potential impact of the plastics ban on employment should not be dismissed entirely.

[20] "Unemployment Rate and Labour Force Participated Rate of Bali Province (Percent), 2022-2024," Badan Pusat Statistik, https://bali.bps.go.id/indicator/6/318/1/unemployment-rate-and-labour-force-participated-rate-of-bali-province.html.

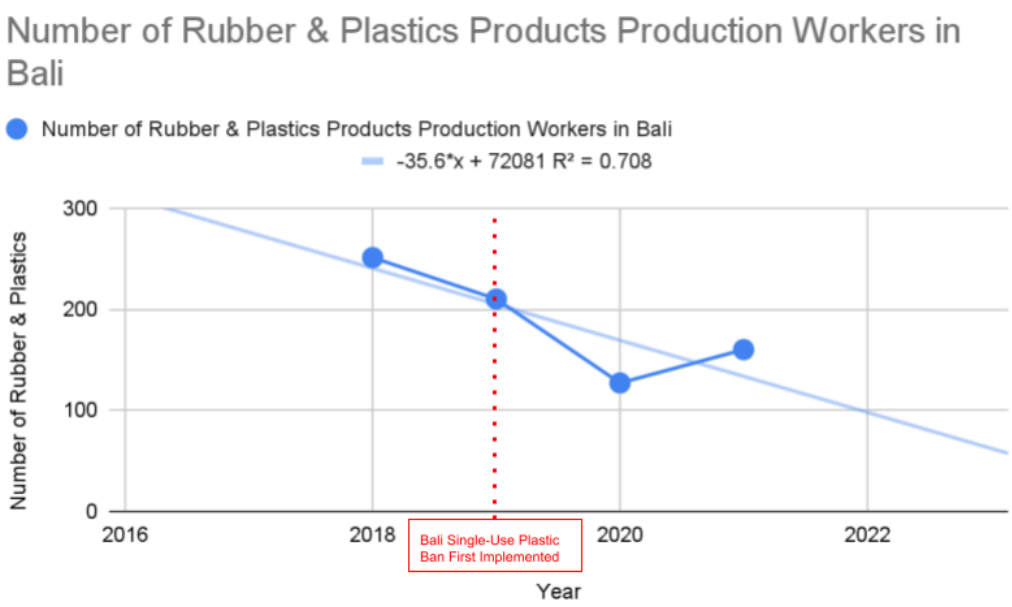

Figure 5: *Annual Number of Rubber & Plastics Products Production Workers in Bali.*[21]

In Figure 5, the dependent variable is the number of rubber and plastic products production workers in Bali and the independent variable is time, in years from 2018 to 2021. The linear equation of the trendline, y=-35.6x+72081, in the legend represents the estimated linear relationship between the variables. The negative coefficient of x in this equation suggests that, generally, there is a decreasing trend in employment of production workers in the rubber and plastics industry from 208 to 2021. The R2 value is 0.708, indicating that this linear relationship is strong. While the large dip in 2020 could also be explained by the COVID-19 pandemic, the strength of the linear relationship and the lack of a full recovery of the number of production workers to pre-2020 numbers in 2021 in the rubber and plastics industry could suggest the impact of the ban, as the restriction of single-use plastics would have decreased the demand in this industry and result in fewer workers being necessary.

[21] "Jumlah Perusahaan Industri Besar dan Sedang, Tenaga Kerja, dan Pengeluaran Tenaga Kerja Menurut Golongan Pokok Industri di Provinsi Bali, 2018-2021" [Number of Large and Medium Industrial Companies, Workforce, and Labor Expenditure by Main Industrial Group in Bali Province, 2018-2021], Badan Pusat Statistik, https://bali.beta.bps.go.id/id/statistics-table/1/NzYjMQ==/jumlah-perusahaan-industri-besar-dan-sedang-tenaga-kerja-dan-pengeluaran-tenaga-kerja-menurut-golongan-pokok-industri-di-provinsi-bali-2018-2021.html.

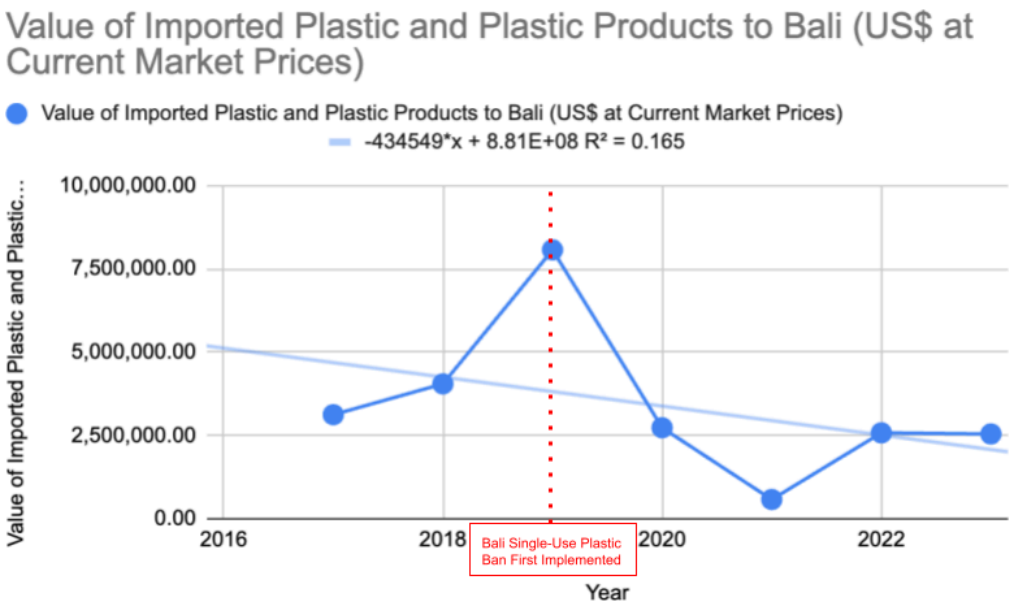

Figure 6: *Annual Value of Imported Plastic and Plastic Products to Bali.*[22]

In Figure 6, the dependent variable is the annual value of imported plastic products in Bali and the independent variable is time, in years from 2017 to 2023. The linear equation of the trendline, y= -4344549x+8.81E+08, in the legend represents the estimated linear relationship between the variables. However, the R2value is 0.165, suggesting that this linear relationship is very weak. The major trends that can be seen are the general increases in the value of imported plastics from 2017 until 2019, reaching a peak of 8,068,484 US dollars. After 2019, there is a significant decrease in the value of imported plastics from 2019 until 2021, reaching a low of 577,626 US dollars. While this is more likely an effect of the COVID-19 pandemic, the ban may have had some impact on these statistics. While there has been an increase since 2021, the value of imported plastics in Bali seems to have stagnated, suggesting that single-use plastics still are not being imported as much as they were prior to the ban, despite COVID-19 regulations having been lifted.

[22] "Impor Provinsi Bali Menurut Kelompok Komoditas Utama, 2017-2023" [Bali Province Imports by Main Commodity Groups, 2017-2023], Badan Pusat Statistik, https://bali.beta.bps.go.id/id/statistics-table/1/NDIjMQ==/impor-provinsi-bali-menurut-kelompok-komoditas-utama-2017-2023.html.

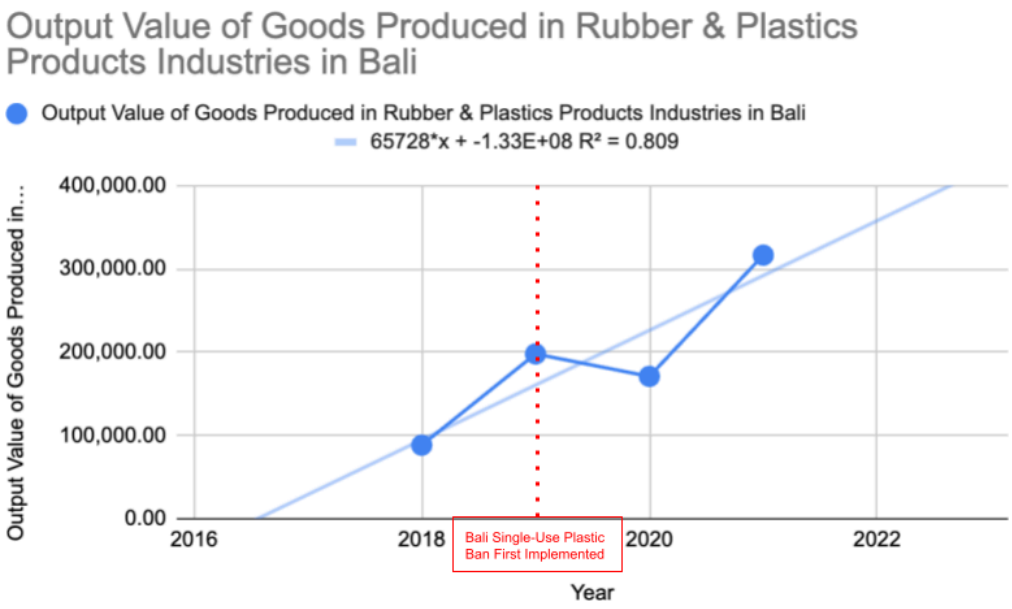

Figure 7: *Annual Output Value of Goods Produced in Rubber & Plastics Products Industries in Bali.*[23]

In Figure 7, the dependent variable is the annual output value of goods produced in Bali's rubber and plastic industry and the independent variable is time, in years from 2018 to 2021. The linear equation of the trendline, y= 65728x-1.33E+08, in the legend represents the estimated linear relationship between the variables. The positive coefficient of x in the equation suggests that the annual output of goods produced in these industries is generally on an upward trend since 2018. The R2value is 0.809, suggesting that this linear relationship is very strong. The growth in the output value of these goods seem to have been steady, despite a dip in 2020. It is hard to say whether it was the impacts of COVID-19, since the pandemic impacted nearly all industries in the world, or the single-use plastic ban that resulted in the dip, so more context may be needed to analyze this in the Discussion section.

V. Discussion

This study explores the economic implications of Bali's single-use plastic ban, recognizing the multifaceted nature of Bali's regional economy. To understand the impact of the Governor of Bali's Regulation No. 97/2018 on Disposable Plastic Waste, which was implemented in July 2019, a comprehensive analysis is required. The results indicate that 2019, the year the ban was implemented, coincided with significant economic events. Additionally, the onset of the COVID-19 pandemic in late 2019 and early 2020 disrupted nearly all industries in Bali. Therefore, this analysis must account for the effects of COVID-19, utilizing secondary qualitative sources to contextualize the quantitative trends observed.

Examining Bali's economy through its Gross Regional Domestic Product (GRDP) in Figure 2 and unemployment rates in Figure 4, it is evident that post-2019, GRDP decreased, and unemployment rates increased, indicating a negative economic impact. Although these trends occurred immediately after the single-use plastic ban, the quick recovery by 2022

[23] "Nilai Output Menurut Golongan Pokok Industri di Provinsi Bali, 2018-2021" [Output Value by Main Industry Group in Bali Province, 2018-2021], Badan Pusat Statistik, https://bali.beta.bps.go.id/id/statistics-table/1/NzcjMQ==/nilai-output-menurut-golongan-pokok-industri-di-provinsi-bali-2018-2021.html.

suggests these negative impacts were not long-lasting. The significant influence of COVID-19, which imposed strict quarantines and disrupted daily life and the economy, must also be considered. Consequently, while GRDP and unemployment rates provide a broad view of Bali's economic state, they are too intertwined with other factors like COVID-19 to reliably assess the specific impact of the single-use plastic ban.

The tourism data in Figure 3, which measures the annual number of foreign visitors to Bali, is similarly affected by COVID-19, as travel regulations only allowed quarantine-free entry to Indonesia in March 2022. This makes it challenging to determine the impact of the single-use plastic ban on tourism. While Sukmana et al. (2021) noted that the Bye Bye Plastic Bags (BBPB) movement in Bali created a global consciousness and interconnectedness, the direct impact of this on tourism remains unproven by this study's data.[24]

Data specific to the plastic industries may provide insights into the ban's economic impact. Disregarding the 2020 dip likely due to COVID-19, Figure 7 shows that the output value of Bali's rubber and plastic industries continued to grow. This suggests that the single-use plastic ban did not significantly affect production output, potentially because these products were exported rather than used locally. Alternatively, the increased output between 2020 and 2021 might be due to heightened demand for plastic items during COVID-19 quarantines, as people ordered more goods that required plastic packaging.[25]

Figure 6, which tracks the value of imported plastic products to Bali, shows a significant drop during 2020 and 2021 due to COVID-19. Despite this, the stagnation of import values in 2022 and 2023, below pre-2019 levels, suggests a lasting impact from the single-use plastic ban. This indicates that while COVID-19 caused an initial drop, the ban continues to influence the reduced import of plastics.

Since the quantitative study does not focus on Bali's small businesses and informal establishments, like street vendors and warungs, which are utilized by many Balinese people, this paper will utilize secondary qualitative data and sources from the literature review to explore this aspect of Bali's economy. Augustina et al (2021) utilizes qualitative data, including surveys and questionnaires of tourists, traders, and local Balinese people, to claim that traders and small business owners largely agree with the policy and has had to find ways to adapt, utilizing reusable bags.[26] This suggests that they initially conformed to the regulations and found ways to adjust to a market without single-use plastics. However, Angriani et al (2021) uses qualitative data to show that the ban disproportionately impacted larger, modern retail and food service stores rather than small businesses and informal establishments, who were able to continue using single-use plastics to some degree.[27] Muthia (2019) also found that small businesses "widely ignored" the regulations, arguing that "[their] customers expect plastic bags" as part of their service.[28] Given these mixed results based on qualitative data, the impact on small businesses seems to be divisive.

[24] Sukmana et al., *Social and Political*.
[25] Louise, "Bali is finally re-instating the ban on single-use plastic, with the aim of being plastic-free by the end of 2022," Honeycombers, last modified June 9, 2022, https://thehoneycombers.com/bali/bali-plastic-bag-ban/.
[26] Augustina and Aprinica, "The Effect."
[27] Augustina and Aprinica, "The Effect."
[28] Risyiana Muthia, "Bali ban on single-use plastics widely ignored by small businesses on holiday island," South China Morning Post, last modified November 12, 2019, https://www.scmp.com/lifestyle/travel-leisure/article/3036927/bali-ban-single-use-plastics-widely-ignored-small?campaign=3036927&module=perpetual_scroll_0&pgtype=article.

VI. Implications

The broader implications for economic policy and environmental regulation suggest that transitioning Bali from single-use plastics to environmentally friendly alternatives has minimal impact on the province-wide economy, primarily affecting the plastics industry and smaller businesses. This indicates that the environmental regulation does not significantly disrupt Bali's overall economy, supporting the continuation of the policy. However, the data in this study, accessed through free secondary sources, may not fully capture the complete picture. While qualitative data provides some insight into street-level impacts, it is not comprehensive. Recognizing the trends in this study, it is essential to propose policies that mitigate any adverse effects on affected businesses and promote the adoption of sustainable alternatives.

In response to the mixed reactions from retail and food service businesses to the ban, effective policies should focus on helping these businesses adapt to non-plastic alternatives. Priority should be given to cost-effective solutions, such as promoting investment in domestic production of biodegradable and reusable products, and facilitating imports of foreign alternatives. Additionally, compensation mechanisms for potential short-term financial losses incurred by businesses should be established, ensuring a smoother transition.

Policies should focus on businesses struggling with the transition to non-plastic alternatives. While many establishments have adopted reusable tote bags, biodegradable take-away boxes, and bamboo straws, these options often cost more than single-use plastics, placing a heavier burden on smaller businesses. Province-wide policies should prioritize support for small businesses like warungs and street vendors, which are more vulnerable to cost increases. Financial assistance programs, subsidies for sustainable products, and technical support for adopting new practices should be implemented to ensure these businesses can thrive.

Future research should focus on unexamined factors to gain clearer insights into the impact of the single-use plastic ban before making further policy changes. Specifically, comprehensive quantitative data and analysis are needed across various levels of Bali's economy, from macroeconomic indicators to the smallest businesses. Additionally, more extensive qualitative data collection, including interviews and surveys with diverse stakeholders, would provide a more nuanced understanding of the situation. Research questions could explore the long-term economic effects, the effectiveness of alternative materials, and the social acceptance of the ban.

Bali's experience with the single-use plastic ban demonstrates its feasibility for other regions. While this study is not exhaustive and Bali's context may differ from others, it provides valuable lessons for environmental regulation. Bali's case highlights the importance of supporting smaller businesses and implementing financial assistance measures to facilitate the transition to sustainable alternatives. Other regions can learn from Bali's strategies, such as promoting local production of alternatives, providing subsidies, and engaging in public awareness campaigns to ensure widespread acceptance and compliance.

VII. Conclusion

In response to the growing environmental crisis caused by plastic waste, Bali implemented Regulation No. 97/2018 on July 1, 2019, banning single-use plastics. This study analyzed the economic impact of this policy using secondary quantitative data and qualitative insights to understand its effects on Bali's regional economy.

This study examined Bali's economic state through GRDP and unemployment rates, tourism through annual foreign visitor numbers, and the plastics industry through employment and trade data. Findings indicate that the single-use plastic ban had minimal long-term effects on Bali's overall economy and tourism but impacted the plastics industry and small

businesses. Despite data limitations due to COVID-19 and lack of comprehensive datasets, further research is needed. Bali should consider policies that encourage investment in non-plastic alternatives and support smaller businesses. Bali's experience can guide other regions in implementing similar environmental regulations, showcasing both successes and challenges.

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Appendix

Year	2016	2017	2018	2019	2020	2021	2022	2023
GRDP of Bali Province at Current Market Prices by Expenditure (Million Rupiahs).[29]	194,089,575.08	213,035,855.32	233,636,772.68	251,934,097.83	224,225,721.32	220,466,429.79	245,362,879.31	274,355,724.40
Number of Foreign Visitors to Bali.[30]	4,927,937.00	5,697,739.00	6,070,473.00	6,275,210.00	1,069,473.00	51.00	2,155,747.00	5,273,258.00
Unemployment Rate in Bali, taken every February (Percent).[31]	2.12	1.28	0.86	1.19	1.25	5.42	4.84	3.73
Number of Rubber & Plastics Products Production Workers in Bali.[32]			251	210	127	160		
Value of Imported Plastic and Plastic Products to Bali (US$ at Current Market Prices).[33]		3,123,295.00	4,048,091.00	8,068,484.00	2,731,598.00	577,626.00	2,578,306.00	2,544,314.00

[29] "Yearly GRDP of Bali Province at Current Market Prices by Expenditure (Million Rupiahs), 2021-2023," Badan Pusat Statistik, https://bali.bps.go.id/indicator/154/146/1/yearly-grdp-of-bali-province-at-current-market-prices-by-expenditure.html

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Output Value of Goods Produced in Rubber & Plastics Products Industries in Bali.[34]			88,321.00	197,858.00	170,876.00	316,409.00		

Table 1. *Raw Annual Economic Indicator Data in Bali.*

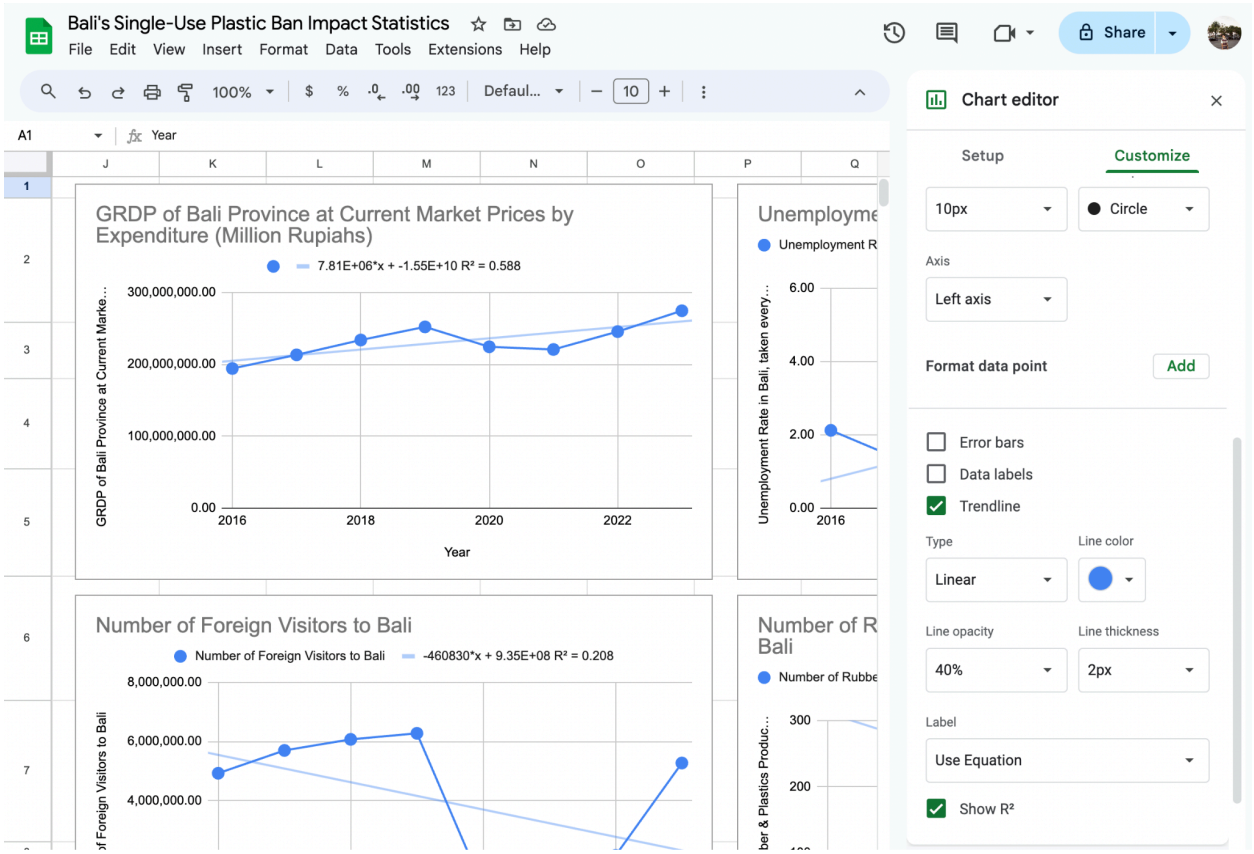

Figure 8. *Screenshots of Method Utilized in Google Sheets to Obtain Linear Regression Equation and R2 Value.*

[34] "Nilai Output Menurut Golongan Pokok Industri di Provinsi Bali, 2018-2021" [Output Value by Main Industry Group in Bali Province, 2018-2021], Badan Pusat Statistik, https://bali.beta.bps.go.id/id/statistics-table/1/NzcjMQ==/nilai-output-menurut-golongan-pokok-industri-di-provinsi-bali-2018-2021.html.