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Optimizing Industrial Policy: Predicting Population Growth in Kediri Regency Using Mathematical Equations

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ABSTRAK

Tujuan dari penelitian ini adalah untuk memprediksi jumlah penduduk Kabupaten Kediri pada tahun 2030. Kabupaten Kediri dipilih karena di wilayah tersebut terdapat salah satu industri yang bertaraf nasional dan internasional. Metode penelitian yang digunakan adalah penelitian kepustakaan dengan memanfaatkan data kependudukan yang bersumber dari laman resmi Pemerintah Kabupaten Kediri. Pendekatan pemodelan yang digunakan adalah persamaan diferensial, khususnya model pertumbuhan berbasis Persamaan Bernoulli. Hasil dalam penelitian ini adalah diperoleh jumlah penduduk Kabupaten Kediri di tahun 2030, yaitu sebanyak 1.590.753 jiwa. Jika melihat jumlah penduduk di tahun 2020, maka hasil ini mengalami penurunan sebanyak 44.541 jiwa. Walau demikian, jumlah penduduk prediksi masih tergolong tinggi, sehingga apabila dikaitkan dengan kebijakan pemerintah, perlu adanya beberapa penyesuaian seperti di rentang tahun 2010 hingga 2020. Hasil penelitian ini penting bagi pemerintah kabupaten sebagai dasar dalam merumuskan kebijakan, terutama di bidang perindustrian. Wilayah yang berkembang sebagai kawasan industri memerlukan perencanaan berbasis data, sehingga hasil perhitungan persamaan matematika dapat dijadikan acuan yang objektif. Melalui kebijakan yang tepat, diharapkan masyarakat lokal, khususnya putra daerah, dapat bekerja dan berkarir di wilayahnya sendiri. Dengan demikian, potensi sumber daya manusia lokal tetap terjaga dan dimanfaatkan secara optimal. Selain itu, penelitian ini juga dapat diterapkan oleh peneliti atau pemerintah daerah lain untuk memprediksi jumlah penduduk dan menyesuaikan kebijakan dengan kondisi masyarakat setempat.
Kata Kunci: pertumbuhan penduduk, Kabupaten Kediri, persamaan diferensial, kebijakan pemerintah, bidang industri.

ABSTRACT

The purpose of this study is to predict the population of Kediri Regency in the year 2030. Kediri Regency was selected because the region hosts an industry with national and international scale. The research method employed in this study is a literature-based approach utilizing population data obtained from the official website of the Government of Kediri Regency. The modeling approach applied is based on differential equations, specifically the Bernoulli growth model. The result of this study shows that the predicted population of Kediri Regency in 2030 is 1,590,753 people. When compared to the population in 2020, this result indicates a decrease of 44,541 people. Nevertheless, the predicted population remains relatively high, so when linked to government policy, several adjustments are required, similar to those implemented during the period from 2010 to 2020. The results of this study are important for the regency government as a basis for formulating policies, particularly in the industrial sector. Regions that develop as industrial areas require data-based planning, so the results of mathematical equation calculations can be used as objective references. Through appropriate policies, it is expected that local communities, especially local residents, can work and build their careers within their own region. Thus, the potential of local human resources can be maintained and utilized optimally. In addition, this study can also be applied by researchers or local governments in other regions to predict population size and adjust policies according to the conditions of their communities.
***Keywords**: population growth, Kediri Regency, differential equations, government policy, industrial fields.*

1. INTRODUCTION

The study of population and its derivatives is a study in the field of biology. Furthermore, biology is a science that studies the characteristics of living things (Yana et al., 2021). Living creatures have characteristics including breathing, moving, growing, and reproducing (Kinasih, 2019; Windawati et al., 2020). There are still other characteristics of living creatures that make these creatures fall into the category of living creatures. One of the characteristics mentioned above is growth and reproduction. These two things are for interacting with others. Growth can be interpreted as an increase or change in the physical shape of the body, thus leading to greater needs. Meanwhile, breeding is increasing in quantity so that nature can be preserved with continuous care. After breeding occurs, a population will form in a certain area. In biology, which specifically discusses the population of living things in a community, it can be found in a science called ecology (Armawi, 2022; Faizah et al., 2019).

In ecology, one of the discussions is studying changes in population numbers in an area (Adharina & Aulia, 2020). The causes can vary, including the availability of job opportunities, especially in industrial areas whose development cannot be predicted. Industry is the activity of processing or processing goods using facilities and equipment. The connection with population is that the more goods needed, the higher the higher the level of production, so industry owners also need to add employees to the production process. Kediri is one of the districts in East Java Province. The area of Kediri Regency is 5% of the entire provincial area (BPK, 2020). This shows that Kediri Regency has quite broad government coverage. Moreover, in Kediri, there are national and international industries, such as the Gudang Garam Factory Industry, which operates in the tobacco industry. And other industries are also found in Kediri Regency, such as culinary, textiles, mining materials, machine tools, furniture, and service offerings.

In order to maintain the sustainability of an industry in Kediri Regency, it is necessary to pay attention to the environment that requires the goods produced. Community needs cannot be ascertained but can be predicted (Kemenpupr, 2020). This is partly influenced by technological developments. Advanced technology needs to be applied in industry so that it can keep pace with developments over time. For the smooth running of industrial processes, it is necessary to have rules set by the government so that industrial players have the same standards for carrying out their industrial activities. The policies that have been established by the Kediri Regency government also do not always last. There are times when it changes, adapting to the era (Dione, 2018). Especially in the industrial sector, which is closely related to the economic sector, which is not only influenced by technology but also by human resources (HR) in the surrounding area. Policies can be implemented independently by regional governments under regional autonomy, while still adhering to regulations established by the central government. Changes in Kediri Regency government policy can also be determined based on available human resources (HR) (Darmanto, 2015). The larger the population, the more the need to work and fulfill needs increases. To accommodate this community, industry must also be developed. Or you can also create a home industry that can be managed by individuals or small groups. To find out or predict the population in the future, you can use differential equations with the Bernoulli equation type, which is more specifically called the logistic equation. These equations are studied in the field of mathematics.

Mathematics plays a critical role in modeling and predicting real-world phenomena, including population dynamics (Putra & Mashuri, 2017; Winarni et al., 2020). This is because mathematical tools like differential equations can describe how quantities change over time, providing insight into complex systems (Surur et al., 2023; Diana et al., 2024). For example, the logistic differential equation, a form of Bernoulli differential equation with (n=2), has been widely used to model population growth that approaches a carrying capacity, demonstrating how such equations represent population dynamics in ecological and social contexts (Qiuling, 2022). Additionally, mathematical studies have shown how Bernoulli and related differential equations can be transformed and solved to analyze nonlinear growth behavior in applied problems (Osmani, 2025). These findings support the use of differential equations in forecasting demographic trends and informing policy decisions in diverse regions. In conclusion, differential equation models such as Bernoulli's offer robust tools for quantitative population analysis.

Mathematics can be interpreted as a learning activity that is essential for understanding and solving complex real-world problems (Siagian, 2016; Surur et al., 2025). This importance is seen when mathematical models such as differential equations are used to predict trends like population growth for policy planning. In this study, the process began with collecting historical population data, then formulating the general Bernoulli differential equation, transforming it to a linear form to obtain the specific ($P(t)$) equation used for prediction, after which data were substituted into this model to generate the predicted population figure for Kediri Regency. Previous research shows that logistic and Bernoulli equations effectively model population dynamics when parameters are properly estimated (Jain et al., 2025; Andini et al., 2024). Likewise, numerical methods for solving Bernoulli equations have been successfully applied in applied sciences (Emmanuel et al., 2024; Oyedepo et al., 2022). These predictions can then inform industrial policy adjustments and planning. In conclusion, using Bernoulli equations provides a structured way to forecast populations for policy decisions.

2. METHODOLOGY

2.1. Research Design

The research employs a qualitative library research method to systematically examine population prediction and policy relevance (Hadi, 2002). This method is appropriate because the study relies on conceptual analysis and secondary numerical data rather than field observation. Library research allows researchers to critically synthesize theories, documents, and official records relevant to population modeling and policy analysis. Previous studies show that library-based mathematical modeling research is effective for developing population prediction frameworks using differential equations (Qiuling, 2022). Similar approaches have been applied successfully to analyze nonlinear growth systems in applied mathematics (Osmani, 2025). Therefore, a qualitative library research design is methodologically suitable for this study.

2.2. Data Sources

This study uses secondary data sources obtained from official government publications and documents. Secondary data are used because population statistics and policy information are already formally recorded and accessible (Ridwan, 2001). Primary data, which provide direct information (Ali, 2002), are not required due to the predictive and analytical nature of the study. Prior research confirms that secondary population data are sufficient for constructing and validating Bernoulli-type differential equation models (Qiuling, 2022). Furthermore, secondary datasets have been widely used in numerical and analytical studies of Bernoulli equations with reliable results (Osmani, 2025). Thus, secondary data sources adequately support the research objectives.

2.3. Bernoulli Equation Steps

The population prediction method applies the Bernoulli differential equation through a structured mathematical procedure. The steps consist of: (1) collecting historical population data from official government websites, (2) formulating the general Bernoulli equation, (3) transforming it to obtain the specific population function (P(t)), (4) substituting empirical data into the model, (5) generating population predictions, and (6) applying the results to industrial policy planning. Previous studies demonstrate that logistic and Bernoulli equations effectively model population growth trends when applied through systematic steps (Qiuling, 2022). Numerical investigations further confirm the robustness of Bernoulli-based models in applied contexts (Osmani, 2025). Hence, this step-by-step approach ensures analytical clarity and policy relevance.

2.4. Data Analysis Techniques

Data analysis in this study combines content analysis and hermeneutical analysis to interpret mathematical results and policy implications. Content analysis enables systematic examination of written documents and numerical information (Afifuddin & Saebani, 2009; Mukhtar, 2013). Hermeneutical analysis supports deeper interpretation of texts related to population policy and industrial development (Tim, 2009; Mahfudz, 2013). Prior methodological studies indicate that combining qualitative interpretation with mathematical modeling strengthens policy-oriented research conclusions (Qiuling, 2022). Such integrated analysis has also been applied in studies involving nonlinear differential equations (Osmani, 2025). In conclusion, this analytical framework ensures both mathematical rigor and contextual understanding.

3. RESULTS AND DISCUSSION

3.1. Kediri Regency

Kediri has existed since the kingdom era. This is written in the Harinjing A Inscription dated March 25, 804 AD (Kompas, 2023). Based on this authentic evidence, every March 25th is set as the date of birth of Kediri. This has also been formalized in the Regent's Decree to the Level II District of Kediri dated January 22, 1985, number 82 of 1985 concerning Kediri's anniversary, article 1 of which reads, "March 25, 804 AD, was designated as Kediri's anniversary.

Kediri Regency is a level II region in East Java Province. The address of the Kediri Regency government office is located at Jl. Soekarno Hatta No. 1, Kediri Regency, with a telephone number of 0354 687945 (Admin, n.d.). Overall, the area of Kediri Regency is around

1,386.05 km2, or around 5% of the area of East Java Province. Kediri Regency consists of 26 sub-districts.

Like other regions, the Kediri Regency area also regularly carries out population censuses every 5 years, and the most recent census was in 2020. The following are the population figures for each sub-district in the last three editions of the population census.

Table 1. Population per Sub-District of Kediri Regency (BPS, 2023)

No	District	Kediri Regency Population Census Results per District (People)					
		Male			Female		
		2000	2010	2020	2000	2010	2020
1	Mojo	35.401	37.425	40.808	34.505	36.050	38.809
2	Semen	22.790	25.303	27.858	22.967	24.970	26.884
3	Ngadiluwih	33.975	36.743	40.033	33.889	36.830	39.991
4	Kras	25.824	28.055	31.385	26.604	28.471	31.231
5	Ringinrejo	23.532	25.380	28.865	23.118	24.625	28.041
6	Kandat	25.803	28.116	31.303	26.120	28.044	30.978
7	Wates	39.394	42.003	45.661	39.035	41.622	45.111
8	Ngancar	20.986	22.707	25.448	20.917	22.328	24.965
9	Plosoklaten	32.107	34.007	37.554	31.559	33.439	36.730
10	Gurah	35.997	39.318	41.698	35.351	37.867	40.875
11	Puncu	27.502	29.450	32.356	26.983	28.904	31.303
12	Kepung	40.362	41.665	43.562	38.192	39.017	41.878
13	Kandangan	22.759	23.283	26.023	22.328	23.787	25.660
14	Pare	46.725	49.179	53.288	46.825	49.415	52.719
15	Badas	27.762	29.937	34.301	27.353	29.382	32.985
16	Kunjang	16.467	16.715	18.509	16.432	17.016	18.256
17	Plemahan	25.631	27.750	30.527	26.154	28.138	30.128
18	Purwoasri	25.809	26.565	29.433	26.723	27.866	29.532
19	Papar	22.897	24.032	26.312	23.468	24.561	26.088
20	Pagu	17.006	18.336	20.195	17.054	18.430	19.983
21	Kayenkidul	20.533	21.528	23.614	21.101	21.894	23.536
22	Gampengrejo	14.692	16.173	17.947	14.350	15.791	17.581
23	Ngasem	27.270	30.962	33.441	27.595	31.099	33.533
24	Banyakan	26.551	26.995	29.686	26.474	27.180	28.839
25	Grogol	20.899	22.394	24.321	20.728	22.074	23.207
26	Tarokan	27.061	28.831	31.739	26.793	28.116	30.584
	Amount	**705.735**	**752.852**	**825.867**	**702.618**	**746.916**	**809.427**

In 2020, the population of Kediri Regency was recorded at 1,635,294 people. The following is the distribution of population numbers from each year's edition of the population census.

Table 2. Total population of Kediri Regency in the Last 3 Editions of the Population Census

Year	2000	2010	2020
Total Population	1.408.353	1.499.768	1.635.294

In order to fulfill the needs of the people of Kediri Regency, which are as large as these, activities are needed to meet their daily needs, one of which is through the industrial sector. By becoming part of the industry in Kediri Regency, it will be able to meet daily needs and also help increase regional income per capita.

3.2. Kediri Regency Industry

Industry is a business or activity to obtain profits from finished goods that have more benefits by processing raw materials or semi-finished goods (Sukawati & Arka, 2021). Not only finished goods but also industrial products in the form of services. Apart from that, goods repair businesses such as repairs or assembly are also part of the industry.

According to Sandi (2012), industry is about changing the lowest possible prices from raw materials through production activities of goods in large enough quantities into finished goods that have greater value with the highest quality (Darsih et al., 2017). Industrial industry is an economic activity that processes raw materials, semi-finished goods, and/or finished goods into goods with higher value for their use, including industrial design and engineering activities.

The size of the company or industrial business is grouped into four categories according to the number of workers in the company concerned, namely (BPS, 2020):

Large Industry : Total workforce of 100 people or more.
Medium Industry : The total workforce is 20–99 people.
Small Industry : The total workforce is 5–19 people.
RT Craft Industry : Total workforce: 1–4 people.

In Kediri Regency, there are several industries ranging from household level to large industries. The following are the industries in Kediri Regency.

Table 3. Division of Industry in Kediri Regency

No	Type of Processing Industry
1	Food, Beverage, and Tobacco Industry
2	Textile, Apparel, and Leather Industries
3	Wood Industry
4	Paper and Paper Goods Industry
5	Chemical Industries and Goods from Chemicals, Petroleum, Coal, Rubber, and Plastic
6	Non-Metal Mineral Goods Industry (except Oil and Coal)
7	Basic Metal Industries
8	Metal Goods, Machinery, and Equipment Industry
9	Other Processing Industries

To be able to know the development and number of industries in the future, a study is needed to find out the population in the following year, which will later be used as a benchmark for developing an industry.

3.3. Prediction of the Kediri Regency Population in 2030

The population census is carried out every 10 years. The last year the census was carried out was 2020, so the next year will be 2030. The population census is carried out to determine the actual population in a particular year, and then the size of the increase in population can be seen. In mathematics, there are equations that can help predict the population of an area in a certain year.

By using this equation, you will get an idea of the population in a certain year without having to do a door-to-door survey and also wait for a certain year. This equation is the logistic equation. The Logistic Equation is a study in mathematics that is a form of the Bernoulli Equation. Bernoulli's equation is one of the studies in the field of mathematics within the scope of differential equations. This logistic equation is used to predict population size using available population data (Webb, 1986; Herman et al., 2016; Zwillinger & Dobrushkin, 2021). The logistic equation used is

$$\frac{dP}{dt} = kP,\ k > 0,$$
$$P(t) = population\ at\ time\ t\ (time)$$

The population indicated by P is the form of change in population over time. These equations include exponential growth, relative growth, or specific growth rates. Apart from the human population in an area, the logistic equation can also be used to model animal populations in limited spaces. Next, it will be processed to produce $f(P)$ because it adjusts to the population function.

$$\frac{dP}{dt} = kP \tag{1}$$
$$\frac{dP/dt}{P} = k\,f(P)$$
$$\frac{dP}{dt} = k\,P\,f(P) \tag{2}$$

K: individuals in an area, carrying capacity from Eq

$$f(K) = 0;\ f(0) = r$$
$$f(P) = c_1P + c_2$$
$$c_1 = -\left(\frac{r}{K}\right);\ c_2 = r$$

so that

$$f(P) = c_1P + c_2 = -\left(\frac{r}{K}\right)P + r$$

From equation (2)

$$\frac{dP}{dt} = k\,P\,f(P)$$
$$= k\,P\left(-\left(\frac{r}{K}\right)P + r\right)$$
$$= k\,P\left(r - \left(\frac{r}{K}\right)P\right)$$

Example $a = kr,\ b = k\left(\frac{r}{K}\right)$, so

$$\frac{dP}{dt} = P(a - bP) \tag{3}$$
$$\frac{dP}{dt} = P(a - bP)$$
$$\frac{dP}{P(a - bP)} = dt$$
$$P(t) = \frac{ac_3}{e^{-at} + bc_3} \tag{4}$$
$$P(t) = \frac{ac_3}{e^{-at} + bc_3}$$
$$t = 0 \Rightarrow P(0) = P_0 = \frac{ac_3}{e^{-a.0} + bc_3}$$
$$P_0(1 + bc_3) = ac_3 \Rightarrow P_0 = ac_3 - P_0bc_3$$

Equation 4 becomes

$$P(t) = \frac{ac_3}{e^{-at} + bc_3}$$
$$P(t) = \frac{aP_0}{((a - P_0b)e^{-at} + bP_0)}$$
$$P = \frac{a}{b + [e^{-at}]ac} \tag{5}$$

where:

$P(t)$ = population size at time t
r = intrinsic population growth rate
K = carrying capacity of the population
$a = rK$
$b = Kb$
$P(0)$ = initial population at $t = 0$
t = time
e = Euler's number (the base of the natural logarithm).

Equation 5 is what will be used to predict population size. The data used in equation 5 is from Table 2.

Table 4. Population of Kediri Regency, 1990–2020 edition

Year	1990	2000	2010	2020	2030
Total Population	1.342.507	1.408.353	1.499.768	1.635.294	$\boldsymbol{P(t = 3)}$
t	-	0	1	2	**3**

From Table 2, it was changed to table 4 with the addition of one previous edition of the census, namely 1990 as another chosen quantity to obtain the best equation and 2030 as the year for which the population number was sought according to the time sequence of the population census. t starts in 2000 with $t = 0$, 2010 with $t = 1$, and 2020 with $t = 2$. A minimum of three t is needed because of the need to find the values ofof equation 5. Then 2030 is the year in which the population will be searched using $t = 3$. Initial predictions depart from equation 5.

$$P = \frac{a}{b + [e^{-at}]ac}$$

information:

$r = 1.635.294$
$K = 1.635.294$
$a = 1.635.294 * k$
$b = k$
$P(0) = 1.408.353$

where

K is the capacity of an area. Kediri Regency cannot predict its regional capacity, so it uses the latest population, namely 2020, as the regional capacity value,
r is the number of individuals in an area, in this case also using the population in the last year, namely the population in 2020,
a is obtained by multiplying r by k, so that $a = r.k$,
b is obtained from the same as k, and
$P(0)$ is obtained from Table 4, which shows the population in 2000, and is used to determine the value of c.

$$P = \frac{a}{b + [e^{-at}]ac}$$
$$P(0) = 1408353 = \frac{1635294\ k}{k + [e^{-a.0}]1635294\ k\ c}$$
$$= \frac{1635294}{1 + 1635294\ c}$$
$$1 + 1635294\ c = \frac{1635294}{1408353} = 1{,}161$$
$$c = \frac{0{,}161}{1635294}$$

After the c value is obtained, the next step is to find the e^{-a} value using the value $t = 1$.

$$P = \frac{a}{b + [e^{-at}]ac}$$
$$P(1) = 1499768 = \frac{1635294\ k}{k + [e^{-a.1}]1635294\ k\ \left(\frac{0{,}161}{1635294}\right)}$$
$$1499768 = \frac{1635294}{1 + [e^{-a}](0{,}161)}$$
$$1 + [e^{-a}]0{,}161 = \frac{1635294}{1499768} = 1{,}09$$
$$[e^{-a}] = \frac{0{,}09}{0{,}161} = 0{,}559$$

After the value of c is obtained and e^{-a}, look for the value when $t = 3$ to find out P in 2030.

$$P = \frac{a}{b + [e^{-at}]ac}$$

$$P(3) = \frac{1635294\ k}{k + [0{,}559^3]1635294\ k\ \left(\frac{0{,}161}{1635294}\right)}$$

$$P(3) = \frac{1635294}{1 + (0{,}175)\ 0{,}161}$$

$$P(3) = \frac{1635294}{1{,}028} = 1.590.752{,}918 \approx 1.590.753$$

From the calculation above, the result is $P(3) = 1.590.753$. This means that from 2020 to 2030, the population of Kediri Regency will decrease by 44.541 people, so the predicted population of Kediri Regency in 2030 is 1.590.753 people. Table 4 is complete with the population figures for 2030, which are shown in Table 5 below.

Table 5. Population of Kediri Regency, 1990–2020 edition

Year	1990	2000	2010	2020	2030
Total Population	1.342.507	1.408.353	1.499.768	1.635.294	**1.590.753**
t	-	0	1	2	**3**

3.4. Kediri Regency Government Policy in the Industrial Sector

The industrial policy of Kediri Regency is regulated through Regional Regulation Number 5 of 2013 and its amendment in Regional Regulation Number 3 of 2018, which must be understood in relation to demographic change. Population dynamics influence industrial demand, labor availability, and regulatory priorities. Therefore, policy revision is not only legally driven but also demographically contextual. Mathematical population prediction shows that from 2020 to 2030 the population of Kediri Regency will decrease by 44,541 people. As a result, the predicted population in 2030 is 1,590,753 people. This demographic trend provides an empirical background for evaluating policy relevance. In conclusion, industrial policy development in Kediri Regency must be interpreted alongside population projection results.

Legal Basis

Regional Regulation Number 3 of 2018 is grounded in several national laws and ministerial regulations governing trade and industry. These legal foundations ensure consistency between regional policies and central government regulations. Alignment with national law is essential to maintain legal certainty and administrative coherence. The regulation refers to Law Number 3 of 1982 on Mandatory Company Registration and Law Number 7 of 2014 on Trade. It also incorporates Presidential Decree Number 53 of 1988 and ministerial regulations issued by the Ministry of Industry and the Ministry of Trade. This combination of laws provides a comprehensive legal framework. In conclusion, the legal basis strengthens the legitimacy of Kediri Regency's industrial policy.

Amendments to Articles

Several articles in the 2013 regulation were substantively amended in the 2018 regulation to improve administrative efficiency. These changes were designed to clarify authority and simplify licensing procedures. Adjustments were also made to align regional rules with evolving governance practices. Article 2 revised the authority to issue licenses and allowed delegation to appointed officials. Article 4 shifted detailed business criteria to follow central regulations rather than local specification. Article 8 removed the obligation for industries to re-register every five years, while Article 9 simplified application terminology. In conclusion, these amendments indicate a move toward more flexible and centralized regulatory alignment.

Trend of Terminological Changes

A notable trend in the policy changes is the systematic revision of terminology used in industrial regulation. Terminological updates reflect both administrative modernization and legal harmonization. Clear and standardized terms reduce ambiguity in policy implementation. For example, the term "Industrial Permit" was replaced with "Industrial Business Permit." Similarly, the phrase "application letter" was simplified to "application." These changes were accompanied by the removal of overly detailed provisions in favor of references to central policy. In conclusion, terminological trends show a shift toward simplification and standardization.

Policy Projection for 2030

Projected population change in Kediri Regency toward 2030 necessitates careful adjustment of industrial policy. Although the population is predicted to decline, the total population remains relatively large and economically significant. This condition requires policies that are adaptive rather than expansion-oriented. Mathematical prediction indicates a decrease of 44,541 people between 2020 and 2030. Despite this decline, the projected population of 1,590,753 people still implies substantial industrial and employment needs. Previous policy trends show responsiveness to demographic and administrative pressures. In conclusion, population prediction results should guide proportional and targeted industrial policy planning.

Industrial policy in Kediri Regency by 2030 is likely to shift toward efficiency, technological integration, and sectoral adjustment rather than mere expansion. A declining yet substantial population encourages optimization of industrial structures and labor utilization. Policy orientation must therefore focus on sustainability and productivity. The predicted population of 1,590,753 people suggests stable but changing labor dynamics. Past regulatory changes show increasing alignment with central policy and administrative simplification. These patterns indicate readiness for further adaptation in response to demographic projections. In conclusion, future industrial policy should be grounded in mathematical population forecasts and long-term structural considerations.

4. CONCLUSION

This study confirms that mathematical population prediction is essential for formulating industrial policy in Kediri Regency. Population size directly affects labor availability, industrial demand, and regulatory priorities. Therefore, policy analysis without demographic modeling risks being misaligned with actual regional conditions. The Bernoulli-based logistic equation was applied to population data to project demographic change. The results show that from 2020 to 2030, the population of Kediri Regency is predicted to decrease by 44,541 people. Consequently, the projected population in 2030 is 1,590,753 people. In conclusion, population prediction provides a quantitative foundation for evidence-based industrial policy.

The findings indicate that industrial policy in Kediri Regency has evolved toward administrative simplification and alignment with central government regulations. Such evolution is necessary to adapt to demographic change and governance efficiency. Regulatory flexibility becomes increasingly important in regions with stable or slightly declining populations. Evidence from policy changes between 2013 and 2018 shows shifts in terminology and authority delegation. Detailed provisions were replaced with references to central regulations, and re-registration requirements were removed. These adjustments reflect responsiveness to changing population dynamics and administrative demands. In conclusion, past policy trends demonstrate adaptive governance informed by demographic and structural considerations.

Looking ahead to 2030, industrial policy in Kediri Regency should prioritize optimization, technological integration, and sectoral adjustment. A declining yet substantial population requires efficient use of human resources rather than expansive industrial growth. Policies must therefore emphasize sustainability and productivity. The predicted population of 1,590,753 people suggests continued industrial relevance with changing labor structures. Emerging technological industries and potential expansion into distribution sectors indicate shifting economic patterns. These developments align with previous trends of policy harmonization and simplification. In conclusion, future industrial policy should be guided by mathematical population forecasts and long-term regional development goals.

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