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Environmental Externalities of Morbi's Ceramic Industry: An Economic Perspective

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Abstract

Industrial development has almost become a necessity for any country that wants to move forward, and Morbi is a good example of how fast growth can change a region. Being called the Ceramic Capital of India, Morbi has grown rapidly and contributes a lot to Gujarat's economy today. But, as this growth continued, concerns about pollution—particularly in the Machhu River—also started increasing. This study tries to understand whether the ceramic industries are actually affecting the river's water quality, and how government policies at both the state and central level are influencing the industry's everyday functioning. For the research, primary data was collected from 40 ceramic operators, and secondary data like COD, BOD, and pH levels were taken from the Gujarat Pollution Control Board. After running statistical tests, the COD numbers did show a small rise over the years, but the limited dataset makes it difficult to strongly blame the industry. However, government policies clearly showed a noticeable impact on how the operators work, as many respondents shared mixed and sometimes confusing experiences while dealing with approvals and regulations. The recommendations of the study were shaped partly by economic theories such as the Coase Theorem, Myrdal's Backwash Effect, and Pigouvian taxation, which help explain how pollution costs, uneven regional development, and environmental responsibilities can be managed better. Overall, the study suggests that Morbi's industrial progress can continue, but it needs a more balanced approach so that economic growth does not come at the cost of the environment.

Keywords

Environment, Industrial Growth, Chemical oxygen demand, biological oxygen demand, Externalities, Back wash Effect, Pigouvian Taxation.

Introduction

Nowadays, every country is trying in its own way to grow and develop. Some nations have already moved far ahead in this race and are called *developed countries*, while many others are still working hard to push themselves forward—these are what we call *developing countries*.

Ever since the Industrial Revolution, countries have been depending a lot on industries to boost their economy. Honestly, without industrial growth, it almost feels impossible for any nation to achieve real economic progress. That's why developing nations today are trying to follow the path that developed countries took through industrialization, hoping to bring development to their own nation as well.

Industrialization is an important part of development, but if it isn't planned properly, it can create a lot of negative impacts on the environment. These bad effects are seen not only in developing countries but even in fully developed ones. Basically, the whole world's environment gets affected.

We can see this in things like global warming and the changing pattern of seasons. These issues then create many other problems in different countries, and still, no nation has a perfect solution for them. That's why environmental economics tries to understand and solve these kinds of questions.

And the same situation applies to the city of Morbi, which is in Gujarat and is known as the Ceramic Capital of India. Morbi produces around 70%–80% of India's ceramics, and because of that, it has become one of

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the key industrial cities of our country. But with the rapid rise in industrialization, it has become a serious concern that the water pollution in the Machhu River—where most of the city's industrial waste is disposed—is getting worse year by year.

This paper aims to explore what can be done so that the industrial production and growth in Morbi can continue smoothly without causing harm to the water bodies. And will also shade light on the Ceramic industry from the Chinese Import threat.

Literature Review

The ceramic industry of Morbi has received a lot of attention in recent years, mainly because of its rapid growth and also the environmental concerns that come with it. Many researchers have tried to understand how this industrial expansion is affecting the air, water, and overall surroundings of the city.

One of the most eye-opening studies was done by Kharol et al. (2019). They used NASA's satellite data to check Sulphur dioxide levels above Morbi. Their results showed that the SO_2 released from Morbi's ceramic units is almost equal to what big power plants emit, which honestly puts Morbi on the national pollution map. This study is often mentioned because it surprised even policymakers who didn't expect such high emission levels.

Another area that researchers have been worried about is the wastewater and sludge that ceramic factories produce. Pathak (2024/2025) focused on the sludge collected from Wastewater Treatment Plants (WTPs) in Morbi. The study explains what this sludge is made of and why it shouldn't be dumped casually. Pathak also suggested that the sludge can be reused in eco-friendly ways, for example, by mixing it in construction materials. But adoption of such practices is still low.

Similarly, Jain et al. (2022) worked on Effluent Treatment Plant (ETP) sludge and tested whether it could be used as a cement additive. Their findings were quite positive—they showed that the sludge, once treated properly, can replace a small portion of cement without reducing strength. This kind of research is important because it provides simple, practical solutions to manage industrial waste.

Objective of Study

1. To know the Effects of disposal of Ceramic Industries in Morbi on Machhu River
2. To study the impact of environmental policy imposed by the Government on ceramics industries.

Methodology

The study mainly depends on **primary data**, because we wanted to capture the *real, on-ground situation* from the ceramic industry operators in Morbi and Secondary data in order to check the pollution levels for Macchu river from Gujarat pollution control board. The study exercised a **survey method**, applying **random sampling** so that every ceramic operator had an equal chance of being selected. We developed a **structured questionnaire** with different kinds of questions—some factual, some opinion-based, and some that measure difficulty levels of certain operations. After visiting and contacting many factories, we finalized around **40 ceramic operators** as our respondents. Chi – square Goodness of Fit was used, and two tail t test was done for the following Hypothesis.

1. There is no significant relation between the Ceramic Industry and pollution in Macchi River.
2. There is no significant impact of Government policies imposed on Ceramic Industry in the city of Morbi.

Data and Analysis

Various data has been collected from the randomly selected Ceramic operators in Morbi City with a tailored questionnaire that matches our objectives.

1. Effect of Ceramic Industry on the Machhu River:

H_0: There is no significant relation between the Ceramic Industry and pollution in Machhu River.

The data was taken from Gujarat pollution control board. Since they don't have enough publication limited data is covered.

Year	PH	BOD	COD
2016	7.23	2.1	7.52
2019	7.49	1.89	7.44
2023	7.67	2.12	8.57

(Gujarat Pollution Control Board)

Chemical oxygen demand (COD): COD measures organic and inorganic measures of pollutants released by the industries and is one of the main causes of water body pollution. This has Glaze waste, chemical additives and suspended industrial solid. It should not be more than 250 mg/dl.

Biological oxygen demand (BOD): BOD contains organic binders, Industrial sludge. It is a secondary pollutant that causes pollution in water bodies.
Here, our major variable to study is COD, which is a major concern in water pollution.

Result:

The COD values of the Machhu River show a slight increasing trend from 2016 to 2023. However, the linear regression test returned a p-value of 0.321, which is above the 0.05 significance level with a positive slope 0.157.

Therefore, we fail to reject the null hypothesis and conclude that there is *no statistically significant relationship* between the ceramic industry and river pollution based on COD alone.
The limited dataset may have reduced statistical power.
While the trend is upward, it is not strong enough to establish a significant effect.

2. Impact of Industrial Policy imposed by Government:

Here, 40 Respondents were taken in the study who were the ceramic operators in the city. The question that was asked to the respondents was how easy or tough it was to get approval from Government in order to set up the industry?

H_0: There is no significant impact of Government policies imposed on Ceramic Industry in the city of Morbi.

	Respondents	Percentage (%)
Easily	6	15
Mostly Easily	21	52.5
Hardly	13	32.5
Total	40	100

For this we have done Chi – square goodness of fit and here are the results:

Statistic	value
Chi - square	8.45
p - value	0.0146
significance level	0.05

$p = 0.0146 < 0.05$

Result:

The chi-square goodness-of-fit test was applied to the responses regarding the impact of government policies on the ceramic industry. The observed distribution of responses (Easily = 6, Mostly Easily = 21, Hardly = 13) was compared against an expected equal distribution.

The test produced a chi-square value of **8.45** with a **p-value of 0.0146**, which is below the 0.05 significance level. Therefore, the null hypothesis is rejected.

This indicates that government policies have had a **significant** impact on the ceramic industry in Morbi, as responses are not evenly distributed and show a statistically meaningful deviation.

Suggestions and Recommendations

1. Internalizing Pollution Costs:

According to the Coase Theorem, pollution problems can actually be solved if people know clearly "who owns what," and both sides can sit and negotiate.

- The government could clearly define pollution rights or river usage limits.
- If a factory pollutes more, it should compensate nearby people or farmers.
- If a factory reduces pollution, that becomes a saving for them.

This makes pollution something that costs the polluter, so industries will naturally try to reduce it. It makes the system fair and reduces unnecessary fights between industries and society.

2. Reducing the Backwash Effect:

Myrdal talked about how sometimes growth in one area can actually hurt nearby areas this is called the **Backwash Effect**.

- The river gets polluted downstream,
- Workers face health issues,
- Nearby rural areas don't get the same benefits that the industrial area gets.

To reduce this, the government could invest more in:

- Better health facilities,
- Cleaner industrial technology,
- Some kind of support for areas around Morbi so development is not one-sided.

This way, the growth spreads more evenly instead of harming surrounding regions.

3.Pigouvian Tax or Subsidy:

Economist Pigou said that when industries create pollution, they should pay something extra for it. So, one idea is:

- A pollution tax based on COD or SO_2 levels,
- Or opposite a subsidy for industries that install new clean technologies.

This pushes industries to do the right thing because now pollution has a price and clean behavior has benefits.

4. Making a Circular Economy in Morbi:

Instead of throwing ceramic sludges in landfills or letting it reach rivers, Morbi can turn waste into useful products.
We can do:

- Less spending on raw materials,
- Less money wasted on dumping,
- And more efficient production.

Government can encourage this through small incentives, training, or even buying such eco-friendly products for public projects.

5. Reducing Information Gaps:

A lot of small operators in Morbi simply don't know the best environmental practices. This is what economists call **information asymmetry**.
If the government or Morbi Ceramic Association regularly shared information in simple terms, it could reduce confusion and fear about rules.

Conclusion

Morbi's ceramic industry has grown impressively, and honestly, it is something Gujarat can feel proud of. It provides jobs, exports, and contributes heavily to the local economy. But with growth always comes responsibility, and this study tried to look at both sides without ignoring anything. The water quality data of the Machhu River showed a small increase in COD, and while this might worry us, the numbers alone weren't strong enough to statistically prove that the ceramic industry is the main reason. One limitation was the lack of continuous and detailed pollution data, which is something even the Gujarat Pollution Control Board struggles with. On the other hand, the responses from ceramic operators clearly showed that government policies affect their operations in real ways, sometimes easy, sometimes frustrating. This mixed experience is also reflected in the significant chi-square test result. Overall, the study suggests that Morbi is growing, but it needs to grow wisely. The city has a chance to become a model for balancing industry and environment if both government and industries make small but serious efforts. Growth should not come at the cost of rivers, land, or health, and with proper cooperation, it doesn't have to.

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