

MODEL OF POLLUTION MANAGEMENT CONTROL IN BADUNG RIVER: ENHANCING ROLE OF TRADITIONAL LAW ON COMMON RESOURCE

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ABSTRACT

Denpasar is the only one city in Bali Province. The character of this city is different than other cities in Indonesia because of the uniqueness of Bali culture. There are traditional institutions that hold an important role on public policy especially on development program for welfare community for managing common resources. The implementation of this traditional law based on traditional norm. Badung River is the big river in Denpasar City and separate Denpasar City being two part that used by community for many activities such as home activities (cleaning, take a bath, water source for drinking and agriculture activities) or industry activities (throwing away the liquid waste). That is why the sustainability of this river has to be done by all Denpasar community. Recently, this river is not clear anymore because of many reasons. This research aimed to know the effectiveness of traditional law on managing pollution of printing and dyeing industries on this big river. This research used survey method for collecting primary data and then analyzed that data by ordinal regression to know the internal and external factors that impact intensity of that pollution significantly. The result showed that the traditional law is not effective enough for decreasing pollution rate produced by printing and dyeing industry on Badung River. Intensity of pollution just influenced by (1) level of waste management knowledge of the entrepreneur, (2) the attitude of the entrepreneur toward public program especially on waste and pollution management, (3) the financial support, (4) the education level of government supervision.

Key word: Pollution Management, Denpasar City, Traditional Law, Common Resource

I. INTRODUCTION

A. Background

Dyeing, screen printing and convection industrial in Denpasar have grown rapidly driven by progress of tourism industries in Bali. Along with the benefits of this industrial activity that create jobs and increase the export of Bali products, this industry create a negative effect such as inevitable in the form of environmental pollution, especially on river due to the indiscriminate disposal of industrial waste.

The negative impact that arising on this industry have caused the health disturbances that associated with industrial activity starting at the production process, delivering the material and finishing the final product. Similarly evidence, the dyeing and screen printing industry at *Pemogan Village*, South *Denpasar* District. Uncontrolled and irrespective growth of liquid waste management in this industry increasing sharply that cause by Industrial activities like environmental pollution, especially in immersion activities (coloring process on the fabric), and on dyeing activities (giving style and color to the fabric).

Previous research conducted by the Environmental Research Center in city of *Denpasar*, showed that water quality of *Badung River*, The biggest river at *Denpasar* City, at some point have been polluted due to the discovery of heavy metal content in water. Waste of small industry such as dyeing and screen printing industry was hazardous and toxic waste, so it can not be processed only with the traditional waste treatment called by *IPAL*.

The other research showed that most of dyeing and prints industries at the Village *Pemogan*, *Denpasar* City, have no legality, but has operated under a license granted by traditional organization known as *Desa Adat*. Their Activity polluted the environment potentially because it does not have *IPAL* (waste water treatment) and did not make efforts to prevent environmental from pollution. The other research conducted by PPLH Bali, *Nusa Tenggara* Region and PPLH *Udayana* University (2006) stated that immersion and dyeing activities in the *Pemogan Village* pollute the rivers potentially with toxic pollutant from Hazardous Materials (B3).

Given the negative impact of dyeing and screening industries, it does not mean that the activities should be banned. All stake holders need to be awareness, understanding of waste handling, which finally can prevent and restore the river water quality is always clean and hygienic. Based on that fact, it is important to do research about role of traditional Law on common properties management so that we can control the water river pollution at *Pemogan Village*.

B. Problem Formulation

1. How does the intensity of waste that produced by dyeing and screen printing business at *Pemogan Village* that pollute *Badung River*?
2. Could we build model for pollution management control that enhancing traditional community role at *Pemogan village*?

C. Objective

1. Knowing the intensity of waste that produced by dyeing and screen printing business at *Pemogan Village*.
2. Formulating Models for Pollution management at *Pemogan Village* that revitalized traditional law to prevent the river.

II. Research Method

A. Design of analysis

The data in this study are quantitative (ratio), such as age, production capacity, the total area of operations, and the amount of labor, and there is a qualitative (ordinal) such as education, knowledge, attitudes, sources of capital, coaching and supervision from the government, and the intensity of waste management. This study was designed by descriptive and analytic approach.

Analysis of model of pollution management built by ordinal regression that analyze the significance of the influence of internal factors (the characteristics of the business, and business) and external factors (guidance and supervision from the government) to the intensity of dyeing and screen printing waste management.

Ordinal regression method was used because the response variable, namely the intensity of waste management by businesses measured with ordinal scale, whereas the independent variables / predictors of (X_t) can be measured by the ratio and ordinal scales. According to Mason et al (1999), ordinal regression coefficient estimates reflect the magnitude of change Predictor variables jointly affect changes in response variables (change in LJ).

To estimate the coefficient by ordinal regression was used SPSS 15 software.

$$\text{link}(Y_{ij}) = \theta_j - [\beta_1 x_{i1} + \beta_2 x_{i2} + \dots + \beta_p x_{ip}]$$

$\text{link}(Y_{ij})$ is *link function*

Y_{ij} is cumulative probability from category j to case i

θ_j is *threshold* for category $-j$

p is sum of total coefficient regression

$x_{i1} \dots x_{ip}$ is value of predictor for case j

$\beta_1 \dots \beta_p$ is coefficient regression

III. RESULTS AND DISCUSSION

Description of the dyeing and silk-screening business characteristics described in this regard include: the total area of business, production capacity, the amount of labor, capital resources and the level of profits. Benefits of this description is to get a figure of the dyeing and screen printing business and also as explanatory

variables of the intensity of waste management undertaken by dyeing and screen printing business.

A. The business area

The area of dyeing and screen printing owned by respondents ranged 150-750 m², with an average area of 400 m². Most respondents, 19 people or (50.00%) have a business area large enough (350-549 m²). Respondents who have a broad business area (500-750 m²) is as many as four people or 10.53%, and which has a narrow business area (150-349 m²) is as many as 15 people or 39.47%.

Usually, the businesses area are associated with capacity of production. More greater the production capacity coupled with the increased volume of waste as well.

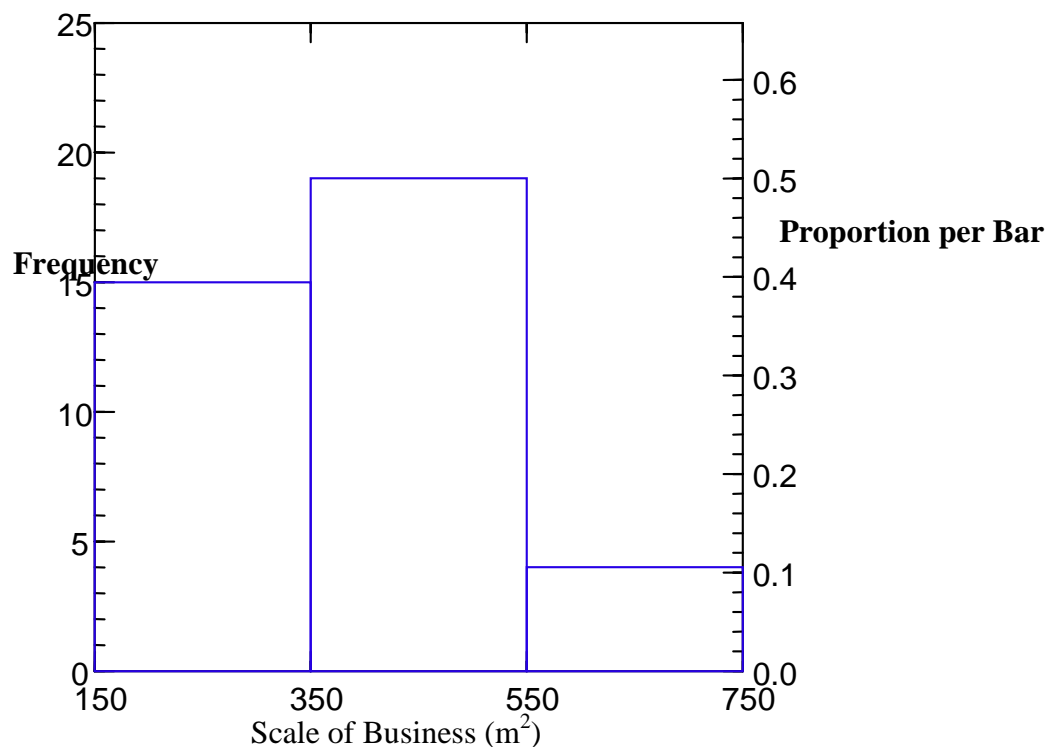


Figure 1. Histogram area dyeing and screen printing business (m²)

The results showed that there are discrepancy between the total area of business, production capacity and waste treatment system. This indicated that there are lack of knowledge about good and worse waste treatment system, as well as waste treatment technology.

B. Production capacity and profit

Production capacity per month of dyeing and screen printing industry's respondents ranged 100-220 meters, with an average of 158.8 meters. Histograms of production

capacity per day of dyeing and screen printing business are listed in Figure 2. Most respondents, 16 people or (42.11%) have a production capacity per day of moderate (140 - <180 M). Respondents who have a production capacity per day is high (180-220 M) is as much as 13 people or 34.21%, and which has a production capacity per day is low (100 - <140 M) is as much as nine people or 23.68%.

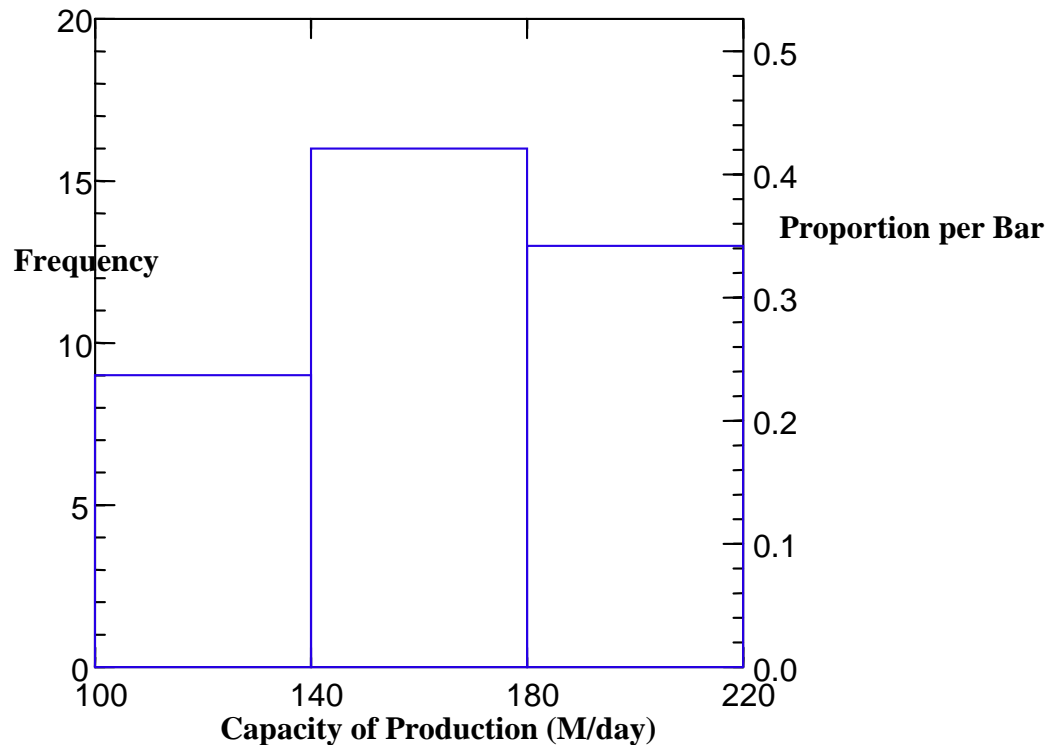


Figure 2. Histogram production capacity of dyeing and screen printing industry (M / day)

Per month operating profit level dyeing and screen printing business is measured based on the assessment, namely: less profitable, profitable, and very profitable. Level of profit of dyeing and screen printing business was described by Figure 3. The majority of respondents, 17 persons or 44.74% stated that his business is profitable. 8 people or 21.05% is very profitable and 13 people or 34.21% have less favorable rates of return.

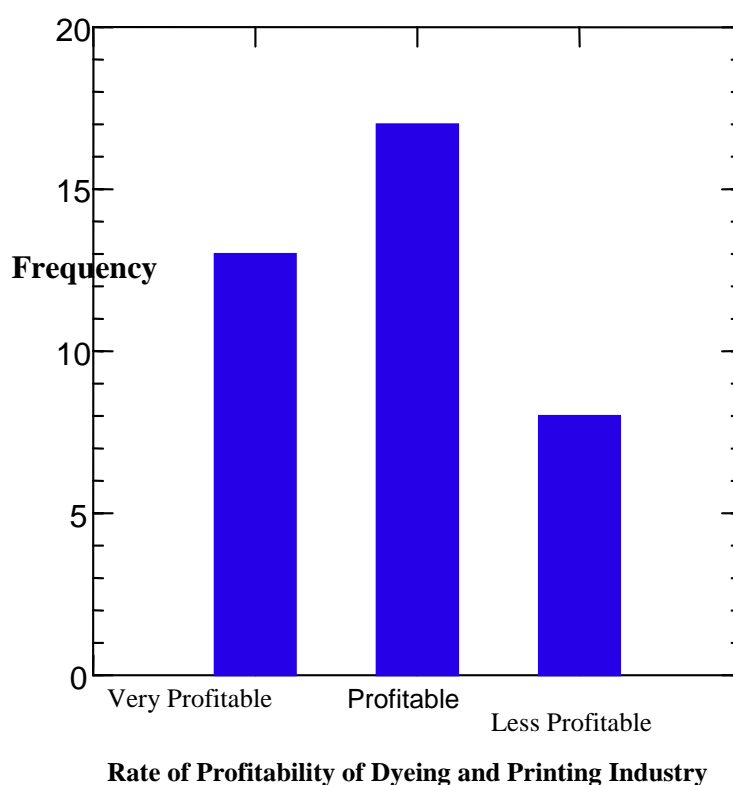


Figure 3. Bars on the level of business profits dyeing and silk screening

Production capacity and greatly affect the level of business profits of an industry in managing its waste. With production capacity and high profit levels, businesses will be able to build wastewater and manage its waste properly.

C. Labor and sources of financial capital

Range of number of labor that is used in dyeing and silk-screening business is 20 - 10 people, with an average of 5 persons. Most (50%), dyeing and screen printing business that using labor as much as 2-4 persons. Dyeing and screen printing business using labor as much as 5-6 people is 47.37% and only 2.63% using labor is 7-10 people. Source of dyeing and screen printing business financial capital is bank loan and their own saving. 14 people or 36.84% using the bank loan and 24 people or 63.16% use their own capital.

D Intensity of dyeing and screen printing waste

Intensity of dyeing and screen printing waste is measured by the ownership and effectiveness used of wastewater, has a value ordinal scale ranging from 0-3. Description of intensity of dyeing and screen printing waste listed in Figure 4.

Number of industry of dyeing and screen printing that have no wastewater treatment is five or 13.16%. Twelve or 31.58% Industries have WWTP, but less effective to

neutralize the waste. Industry that have the WWTP and effective enough to neutralize the waste is seven or 18.42%, and industry that have very effectively neutralize of wastewater is as much as 14 or 36.84%.

Overall, the effectiveness of waste treatment of dyeing and silk screening are still low, because 24 firms or 63.16% having a waste management intensity values less than 2. To 24 dyeing and screen printing business has the potential to do environmental pollution of river water, soil and the well population. And so we need to reorganize their efforts in improving waste management dyeing silk screening business.

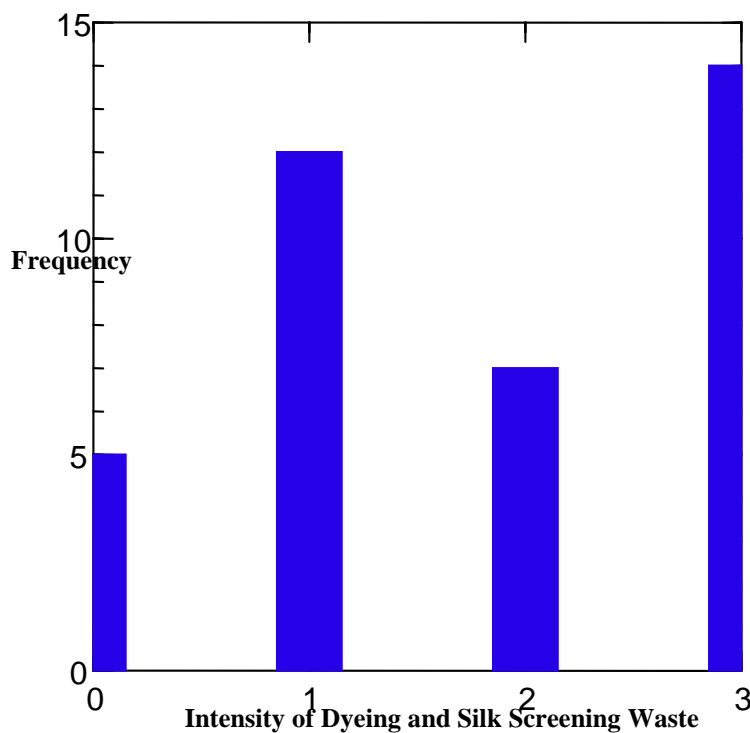


Figure 4. Bars on the intensity of the waste management business dyeing and silk screening

4.6. The Effect of Some Characteristic and Operational Variable toward Intensity of Dyeing and Screen printing waste management

Ordinal regression analysis of some characteristics of businessman and entrepreneurs as well as guidance and supervision by the government that influence toward waste management intensity of dyeing and screen printing industry are listed in Table 1. Characteristics variable of dyeing and screen printing businessman which significantly affect the intensity of dyeing and silk screening waste management are: (1) the level of knowledge; (2) attitudes towards waste management program of dyeing and silk screening industry. While formal education of businessman did not significantly affect the intensity of dyeing and silk screening of waste management.

In general, the level of knowledge and attitudes of businessman is medium category, that is mean that their knowledge and attitudes is good, but there is still tendency to produce pollution. The effort to increase their knowledge and attitudes towards waste management programs can be done through counseling and training about industrial waste management techniques of dyeing and silk screening into environmentally friendly waste management.

The other variable of businessman characteristics that significantly affect the intensity of dyeing and silk screening waste management is the source of capital. While the area of business, production capacity, level of business profits and the amount of labor used in dyeing and screen printing business did not significantly affect the intensity of dyeing and silk screening of waste management. The coefficient showed that there are positive sign of capital sources variable. This means that the low intensity dyeing and silk screening waste management caused by the low of business capital that is used for waste treatment. As it is known that neutralization of dyeing waste require incremental cost for waste treatment. The effort to increase financial capital that they need is providing funding.

Table 1. Results of Ordinal Regression Analysis of Variables that Influenced the Intensity of Waste Treatment in *Pemogan Village*, 2009

Variable	Coefficient	Std. Error	Std <i>Wald</i>	db	Sig.(p)
Age	-0.188	0.124	2.304	1	0.129 ^{NS}
Education Level	-0.728	0.755	0.928	1	0.335 ^{NS}
Entrepreneurs					
Knowledge	0.110	0.081	4.866	1	0.017*
Attitude	0.346	0.130	7.117	1	0.008*
Scale of Business	0.002	0.005	0.183	1	0.669 ^{NS}
Capacity of					
production	-0.017	0.017	0.982	1	0.322 ^{NS}
Benefit	0.139	0.832	0.028	1	0.867 ^{NS}
Source of Capital	2.099	1.337	3.463	1	0.032*
Employment	0.306	0.427	0.512	1	0.474 ^{NS}
Traditional					
organization					
Control	0.406	0.254	2.545	1	0.041*

Source: Primer Data Analysis

Level guidance and oversight by the traditional organization of dyeing and screen printing business in terms of environmental management was also significantly effect to the intensity dyeing and screen printing waste management. The coefficient estimates also has positive sign. It means that guidance and control by the traditional organization toward dyeing and screen printing business especially on environmental management still needs to be raised.

Pollution prevention model based on the studies about the handling waste of dyeing and screen printing industry illustrated in Figure 5. Models showed that waste management intensity of dyeing and screen printing industry depend on (1) the level of knowledge about waste management business, (2) attitudes toward the stencil dyeing waste management program, (3) access to financial capital for developing waste management technology, (4) level of coaching and supervision by the traditional organization.

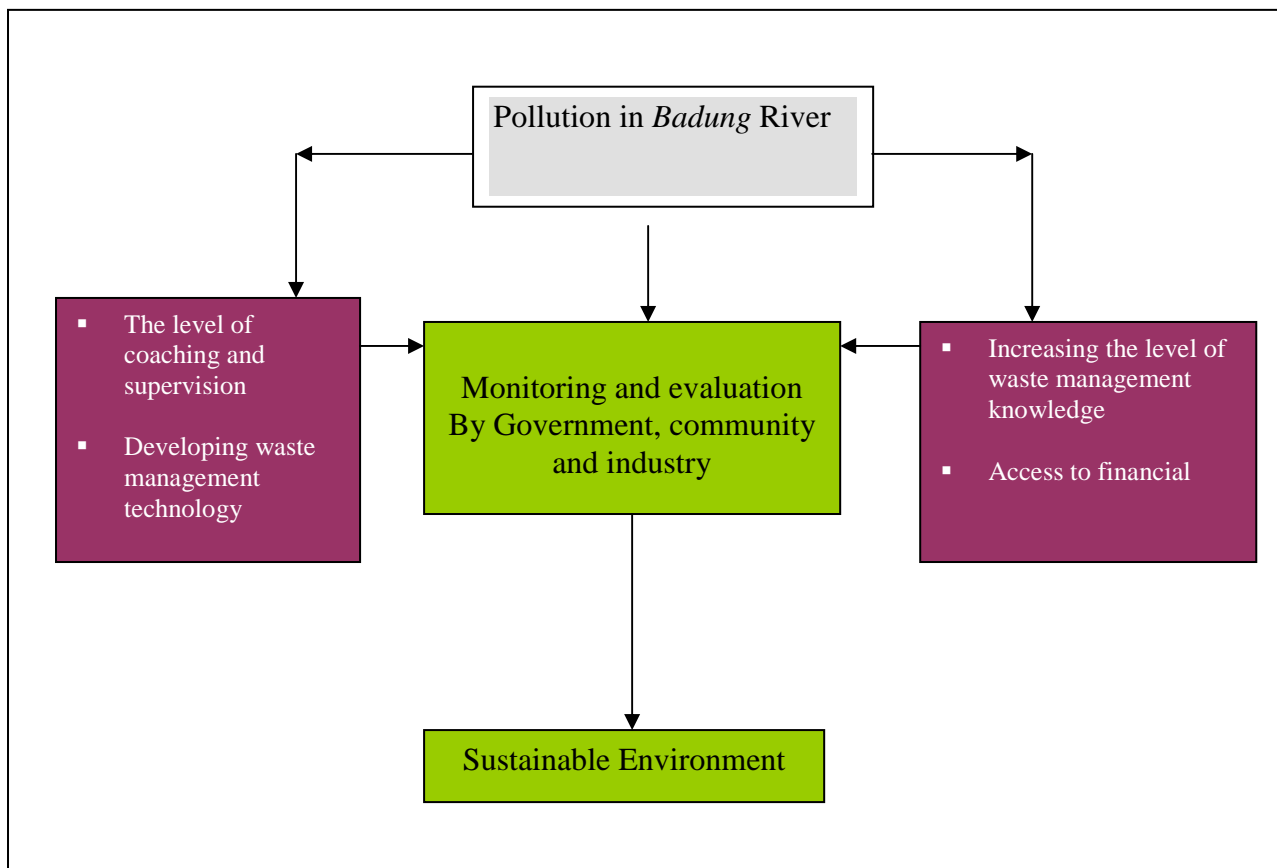


Figure 5. Waste Pollution Prevention Model of dyeing and silk screening Industrial at Pemogan Village, South Denpasar District, 2009

IV. CONCLUSION

Waste management of dyeing and screen printing industry will be effective if the model of controlling, monitoring and evaluate pollution considering the efforts to: (1) increase the level of entrepreneurs knowledge, (2) strengthen the positive attitude of entrepreneurs towards the management of waste program, (3) increase the level of coaching and supervision by the traditional organization by enhancing traditional law, and (4) providing access to capital sources.

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