



PLANNING FOR DEVELOPMENT OF SCHEDULED SEWAGE SERVICE IN THE CITY OF DENPASAR

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ABSTRACT

Environmental quality improvement is one of the development priorities in Denpasar City . The main objective of this study is to analyze the scheduled sewage service planning. The research was carried out in Peguyangan Village involving 55 samples determined by *quota sampling*. The data were analyzed using SOAR (Strength, Opportunity, Aspiration, Result). The results of the study found that in Denpasar City, especially in Peguyangan Village, North Denpasar District, the scheduled sewage service system has the potential to be developed because it has not been served by integrated piping services and still uses *septic tanks*, with desludging and transportation patterns.

Keywords: planning, environment, waste, feces, domestic

I. INTRODUCTION

The island of Bali is a world tourist destination so that its relation to the sustainability of environmental conservation plays an important role and is an obligation for the people of the island of Bali to maintain and preserve the environment. Along with the increasing number of domestic and foreign tourist visits to Bali, it is necessary to follow with environmental care to maintain the comfort of tourists. Based on this, improving environmental quality is one of the development priorities in Denpasar City. Based on the existing conditions, there is a lot of environmental pollution, especially in river areas, beaches, and resident wells caused by waste water. Water use activities by local residents and tourists will increase the production of wastewater which is generally discharged directly into drainage channels or rivers without any prior treatment. The presence of pollutants contained in wastewater, such as organic substances, nutrients, solid particles, or other harmful compounds can pollute the aquatic ecosystem. Wastewater discharged into rivers or drainage channels will be carried into the sea



and potentially pollute marine ecosystems (Denpasar City Government, 2013).

Based on data from the Working Group (2013) in Denpasar City Sanitation, 62% of domestic wastewater is discharged directly by the community into drainage channels, 26% is accommodated in septic tanks, and 12% is discharged into the yard. In handling wastewater from the tourism industry, there are 35% star hotels and 10% budget hotels that have a *Sewerage Treatment Plant* (STP). Efforts made by the central government, the Bali provincial government, the Denpasar city government, and the Badung district government are to provide sanitation infrastructure and facilities, especially in waste water management, one of which is the construction of a centralized wastewater treatment system (*off-site*). This development is known as the *Denpasar Sewerage Development Project* (DSDP). Based on Denpasar City Regulation Number 27 of 2011 concerning Spatial and Regional Planning of Denpasar City 2011-2031, the municipal wastewater treatment system consists of centralized wastewater treatment (*off site*), namely the *Denpasar Sewerage Development Project* (DSDP) and communal wastewater treatment. (*on site*) through the *sanimas* (community sanitation) program. *The Denpasar Sewerage Development Project* (DSDP) aims to connect all residential houses and tourism facilities in Denpasar City to the Wastewater Treatment Plant (IPAL) through a network of wastewater pipes. The existence of the *Denpasar Sewerage Development Project* (DSDP) is one of the efforts to increase community access to sanitation (Denpasar City Government, 2013).

The Bali Provincial Government in maintaining and preserving the environment is actualized in the program in *Tri Hita Karana* line with the Vision of the Governor of Bali *Nangun Sat Kerthi Loka Bali* which means to maintain the sanctity and harmony of Bali's nature and its contents, to realize a life of *manners and gumi* Balinese that is prosperous and happy on a *scale. and niskala* with universally planned development towards the New Era of Bali.

In the 2015-2019 National Medium-Term Development Plan Law (RPJM), one of the priorities of the Government of Indonesia is the provision of wastewater infrastructure and facilities to achieve the target of achieving universal access to sanitation by 2019. Wastewater management infrastructure and facilities that have been prepared by the government To support this achievement, one of them is the local Waste Water Management System (SPAL), which is a management system that starts with the collection of feces in facilities such as a septic tank, cubluk, then the sewage is sucked up and transported to be further processed at the Sludge Treatment Plant (IPLT). . Based on the calculation of the population and the accumulation of fecal sludge produced by each person per year, the potential for fecal sludge that should be treated by the Sludge Treatment Plant (IPLT) is quite high, but in reality the volume of fecal sludge treated at the Sludge Treatment Plant (IPLT) is minimal. , so that 90% of the Sludge Treatment Plant (IPLT) that is built has *idle capacity* a fairly large. This is related to the quality of the local system facilities that do not meet the standards and services for desludging that are still based on consumer demand (*on call based*) (L2T2 Guidelines, 2015).

To optimize the local wastewater management system and reduce the *idle capacity of the* Sludge Treatment Plant (IPLT), it is necessary to plan for a regular desludging mechanism or in other words the Scheduled Sludge Service (L2T2) program. Denpasar City is the capital city of



Bali Province, is the largest city in the Nusa Tenggara archipelago and the second largest city in Eastern Indonesia after Makassar.

Denpasar City has become centers of business activity and places Denpasar City as an area that has per capita income and high growth in the Province of Bali. Currently, Denpasar City in managing its domestic waste has collaborated with the Bali Provincial Government through the UPTD. Wastewater Management of the Bali Provincial Public Works and Spatial Planning Service with centralized wastewater piping services through a gravity system and pumping to a wastewater treatment plant (IPAL) located in Suwung which operates 24 hours a day. The number of domestic waste customers from Denpasar City is according to data from UPTD. Wastewater Management of the Department of Public Works and Spatial Planning of the Province of Bali as many as 9,683 customers, of which 9,683 customers 9,041 are customers from the household category, namely 93.39% of the total customers

II. LITERATURE REVIEW

Sanitation is the most important factor for public health, especially people who live in densely populated areas. Currently, many community settlements have liquid waste disposal channels such as *septic tanks* which are not far from springs that are commonly used for daily consumption such as bathing, washing and even drinking and cooking. In this case, it is very likely that people do not know that this condition is very dangerous for health because the spring is polluted by household liquid waste. Likewise, if it is channeled into the river, it will pollute the river that empties into the sea so that it will pollute and damage the biota and marine environment (Denpasar City Government, 2013).

III. RESEARCH METHODS

This research is descriptive qualitative and quantitative, the research location is determined *purposively* in Peguyangan Village, North Denpasar District, the basis for consideration is the dense population and there is no channel *Denpasar Sewerage Development Project* (DSDP).



Figure 1.

Research Location Peguyangan North Denpasar



Population and Sample

The research population is the banjars located in the Peguyangan Village, North Denpasar District, City. For this reason, the chosen sample for this research is the *stakeholders* who are determined based on the *purposive sampling method*, namely determining the informants deliberately based on certain goals and purposes so that the information provided can be more accountable. The informants in this study have met one of the following criteria: have the ability to answer questionnaires that support the research, have local sewage treatment (*septic tanks*, cubluk, defecation), and use clean water. The number of respondents who were taken to give weights and ratings regarding internal and external factors L2T2 was carried out by *quota sampling* as many as 55 people who were carried out by *accident*.

Data Analysis

The analysis used in this research is matrix analysis of IFAS (*Internal Factor Analysis Summary*) and EFAS (*External Factor Analysis Summary*) which produces a general strategy (*grand strategy*). The method used is SOAR analysis. SOAR analysis is a development of the SWOT analysis with the Appreciative Inquiry (AI) approach introduced by Jacqueline M. Stavros, Matthew L. Cole and Jennifer

Hitchcock in 2003. Based on the SOAR (Strength, Opportunity, Aspiration, Result) method, an internal condition analysis was carried out and external to the company to produce the company's strategic objectives. The SOAR analytical approach to strategic planning has several advantages, including allowing organizational members to create the desired future in the whole process by conducting a process of inquiry, imagination, and innovation. In addition, SOAR's internal focus is on organizational strength. SOAR is also used for external analysis, such as customer analysis. Another advantage relates to participation. Usually in organizations, strategic planning only involves people at the highest level, but in the framework of SOAR analysis, it will involve many parties (Stavros, Cooperrider, and Kelley, 2003).

IV. RESULTS AND DISCUSSION

Development Planning L2T2

Sludge Scheduled Service (L2T2) with suction sludge from septic tanks in the village Peguyangan Customers who conducted periodically as required IPLT manager. In L2T2, desludging is carried out according to the desludging period and the specified desludging schedule. L2T2 is provided in response to the manager's demand that requires regular desludging of the septic tank. For customers in Peguyangan Village, L2T2 is a service that must be followed. In Figure 1, it can be explained that there are three stages in L2T2 planning, namely stage 1 (one) septic tank control, 2 scheduled desludging services, and 3 sewage management services

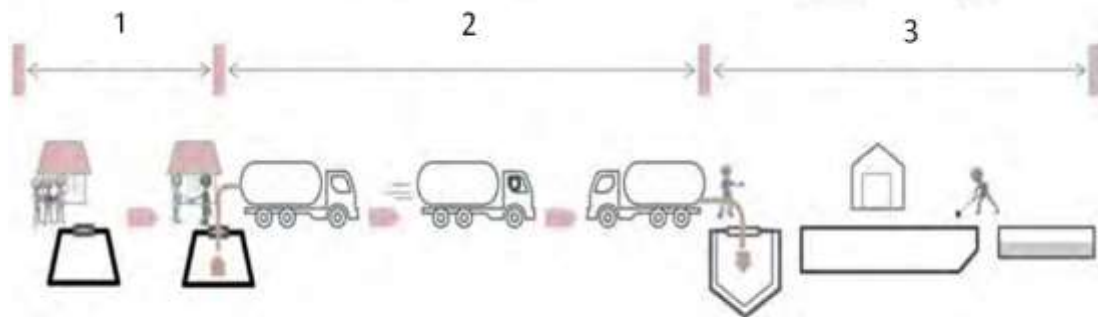


Figure 1
Scheme of Scheduled Sludge Services (L2T2)

Sludge desludging is not carried out due to a request from the customer. Like it or not, need it or not, desludging will be carried out according to the schedule. The L2T2 desludging period ranges from once every 2 – 3 years as shown in Figure 2

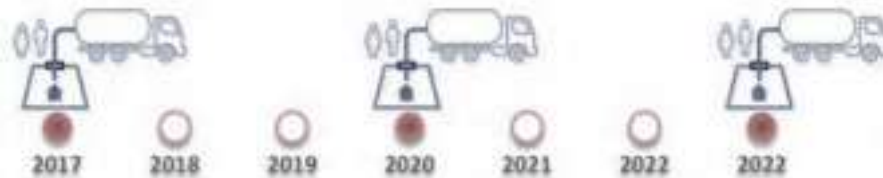


Figure 2.
Schematic of L2T2 desludging schedule.

The desludging period is carried out in a span of 3 years between the first desludging and subsequent desludging. This means, with a 3-year desludging period, a septic tank will receive desludging services in 2017, 2020, 2013 and so on. L2T2 is determined by the IPLT manager. The L2T2 operator agency will determine the schedule for desludging the septic tank for each customer building. In carrying out its operations, this L2T2 operation management agency involves entrepreneurs for suctioning feces to become operating partners. A septic management system consists of 2 (two) components (1) desludging the septic tank and transporting feces. This component, L2T2 only includes 2 (two) components, namely desludging the septic tank and transporting sewage sludge. Sludge processing is not part of L2T2. The transportation pattern implemented by the direct transportation pattern occurs in this pattern, there is no transfer of fecal sludge from one desludging unit to another. This transportation pattern is suitable to be applied because the service zone is not far from the IPLT and has roads that can be passed by dirt trucks and the distance is less than 20 kilometers. In a fixed suctioning pattern, the L2T2 operator will remove a constant volume of fecal sludge from each septic tank, with a constant suction of 1.5 m³, the sewage truck will always remove 1.5 m³ of fecal sludge from the 2 m³ septic tank or from the septic tank. 3 m³ septic tank. The



operation of the desludging unit can be more efficient with a fixed desludging pattern.

Aspects of L2T2 Development Planning

Aspects that need to be considered in L2T2 Development Planning, namely aspects of operating patterns, customer aspects, infrastructure aspects, institutional aspects, procedural aspects, financial aspects and regulatory aspects. These 7 aspects are formed in a unified system that supports each other to ensure that L2T2 operations run well and sustainably. The L2T2 operation pattern with the desludging period is carried out for a span of 3 years by transporting feces trucks, L2T2 customers are the people of Peguyangan Village, North Denpasar District, Denpasar City.

Infrastructure Sludge treatment plant (IPLT) to treat sewage transported by car (stool truck) with a capacity of 400 m³/day, located in Suwung which operates 24 hours a day. The desludging and transportation infrastructure is supported by 16 drain services, all of which total 40 drains. Centralized Wastewater/WWTP Piping Service with a capacity of 51,000 m³/day through a gravity system and pumping to a waste water treatment building (IPAL)

The management agency of UPTD Wastewater Management Bali Provincial PUPR Service is stipulated based on Regional Regulation Number 10 of 2016 concerning the Establishment and Composition of Regional Apparatuses. The elaboration is through the Governor of Bali Regulation Number 102 of 2017 concerning the Organization and Details of the Main Duties of Regional Technical Implementation Units within the Bali Provincial Public Works and Spatial Planning Office. UPTD Wastewater Management led by an Echelon III as Head UPTD the charge of the 3 (three) Echelon IV, namely: Head of Sub Division of Administration, Monitoring and Evaluation Section Chief, Section Chief of the Technical Executive. For the sustainability of L2T2 UPTD Wastewater Management, the Bali Provincial PUPR Service is supported by the Bali Provincial Government which is an institution that has specific functions, namely planning, infrastructure procurement, regulatory compliance, operations management (operator) and operation supervision. L2T2 involves private partners from drain services, totaling 16 services, all of which are 40 badly drained.

The L2T2 implementation procedure is in accordance with the SOP at the Sludge Treatment Plant (IPLT), namely the UPTD for Wastewater Management at the Bali Provincial PUPR Service. Financial L2T2 obtains income to cover all operating costs from the Bali Province Regional Budget Revenue and Expenditure Budget in addition to the cost of spark plugs from customers which is managed by the Wastewater Management UPTD of the Bali Provincial PUPR Service.

Minister of Public Works and Public Housing Regulation of the Republic of Indonesia Number 04/PRT/M/2017 of 2017 concerning the Implementation of the Domestic Wastewater Management System. Regulation of the Minister of Environment and Forestry of the Republic of Indonesia Number: P.68/Menlhk-Setjen/2016/2016 concerning Domestic Wastewater Quality Standards. Governor of Bali Regulation Number: 16 of 2016 concerning Environmental Quality Standards and Standard Criteria for Environmental Damage. In the development of L2T2, mandatory regulations are needed but currently there are none, namely: proper use of septic tanks, regular desludging of septic tanks, disposal in IPLT and payment of



service tariffs, service fee payment. In addition to related provisions such as institutional framework, private involvement. If the regulations for mandatory scheduled desludging have not been implemented optimally, it is difficult for a city to have a high service target.

Analysis of Scheduled Sludge Service Development Planning

Planning for the Development of scheduled sewage services (L2T2) for domestic waste is directed based on SOAR Analysis. In using SOAR analysis, it begins by identifying and taking an inventory of the elements of strength, opportunity, and aspiration. Formulate results (results) that can be measured by the strength of the opportunities and aspirations of that has been obtained, are presented in Table 1

Table 1 L2T2 Development Planning Matrix Analysis of Domestic Waste in Sub Peguyangan

Strength (strength)	Opportunities
<ol style="list-style-type: none">1. The installed capacity of 400 m³/day. enough to carry out L2T2 in City Denpasar2. There is an idle capacity of 60%, so to maximize the utilization of IPLT, it is better to carry out the L2T2 program3. Implementation of L2T2 is in accordance with the SOP for the Sludge Treatment Plant (IPLT).4. Lab results for processing Sludge at IPLT UPTD PAL at PUPR Bali Province. for parameters pH, TSS and Escherchia Coli bacteria have met NUMBER 16 OF 2016 concerning Environmental Quality Standards and Standard Criteria for Environmental Damage, and are considered safe because they do not pollute monitoring wells around the IPLT.	<ol style="list-style-type: none">1. Individual Septic Tank Ownership of 88% of all respondents who are PDAM customers2. There are 16 services totaling 40 severely drained3. There is limited funding from the local government for the implementation of activities in the City Sanitation sector.4. Low level of knowledge community about the benefits of IPLT and the purpose of the L2T2 Program.



Aspirations	Results (<i>Result</i>)
<ol style="list-style-type: none"> 1. The government is expected to pay more attention to clean lines. Environmental because Bali is a tourism area 2. Environmental cleanliness is not only the duty of the government, but relies on the cooperation of the private sector 3. The existence of L2T2 not only prevents the occurrence of idle capacity in IPLT, but protects the environment in the surrounding area. 4. Improving hygiene Environmental will support the development of tourism in Bali as factor 5. Sanitation the most important for health, public considering environmental hygiene is the foundation of public health 	<ol style="list-style-type: none"> 1. Self Awareness of society to carry out dewatering Septic Tank rated very low at only 17% of respondents. 2. L2T2 Regulatory Duties to facilitate the implementation of L2T2. 3. There is limited funding from the local government for the implementation of activities in the field of City Sanitation. 4. The level of knowledge Public is low on IPLT and benefits L2T2 intent of the program. 5. The willingness of the community to implement the L2T2 program is 92% of 36 customers as respondents. The community's ability to pay service fees for the L2T2 program is 94% with a tariff of Rp. 10,100 - 15,000 from 33 customers 6.06% Rp. 15,100 – 20,000 from 49 subscribers.

Sources of data analysis in 2020.

Aspects of strengths, opportunities and aspirations that have been collected further: Improving quality in maintaining and maintaining L2T2 facilities and according to SOPs. These results are obtained from SOAR analysis, IPLT facilities are very adequate, improve facilities and infrastructure as a support in developing L2T2 services, then formulate strategies obtained based on the results of Importance Performance Analysis that these indicators are indicators that are highly prioritized to be improved in terms of performance including, Maintenance of IPLT facilities, perseverance in the work of employees at IPLT.

Before maintaining the facilities and supporting infrastructure that are already available, such as ensuring the readiness of machines and operational personnel properly. These results were obtained from analysis of SOAR, the availability of facilities such as installed capacity of 400 m³/ day, is considered sufficient to carry out L2T2 in Denpasar. There is an idle capacity of 60%, so to maximize the utilization of IPLT, it is better to implement the L2T2 program. The implementation of L2T2 is in accordance with the SOP at the Sludge Treatment Plant (IPLT). The results of the Sludge processing lab at the IPLT UPTD PAL Dina PUPR Bali Province for the parameters of pH, TSS and Escherchia Coli bacteria have met the requirements according to the Governor's Regulation NUMBER 16 OF 2016 concerning Environmental Quality Standards and Environmental Damage Standard Criteria, and are



considered safe because they do not pollute wells monitor around IPLT. The willingness of the community to implement the L2T2 program is 94% of 33 customers as respondents. The community's ability to pay service tariffs for the L2T2 program is 94% with a tariff of Rp. 10,000 - 15,000 from 49 customers, 6.06% Rp. 15,100 - 20,000 from 49 customers. Then formulate the strategy obtained based on the results of the Importance Performance Analysis that the existing indicators are indicators that must be maintained because all indicators make support

Always maintain and improve good management. These results are obtained from SOAR analysis, have IPLT managers and management systems. Then formulate the strategy obtained based on the results of the Importance Performance Analysis on the indicators contained in the quadrant, which are indicators that are considered less important by customers and in fact their performance is not too special or ordinary.

Improve the quality of supporting tools. These results are obtained from SOAR analysis, the availability of supporting facilities such as. Then formulate the strategy obtained based on the results of the Importance Performance Analysis on the indicators contained in the quadrant which are indicators with low expectations but have good performance. The existing indicators are, Individual Septic Tank Ownership by 88% of all respondents who are PDAM customers. There are 16 services that total 40 badly drained. There is limited funding from the local government for the implementation of activities in the field of City Sanitation. Low level of community knowledge about the benefits of IPLT and the purpose of the L2T2 Program. Then formulate the strategy obtained based on the results of the Importance Performance Analysis, namely, the Government's aspirations are expected to pay more attention to environmental cleanliness because Bali is a tourism area. Environmental hygiene is not only the government's task, but relies on the cooperation of the private sector. The existence of L2T2 not only prevents the occurrence of idle capacity in the IPLT, but also protects the environment in the surrounding area. Improving the cleanliness of the environment will support the development of tourism in Bali. Sanitation is the most important factor for public health, considering that in Islam environmental cleanliness is the basis of public health.

Challenges Self-awareness from the community to carry out the draining of the Septic Tank is considered very low, namely only 17% of the respondents. The main task of the L2T2 Regulator, namely the IPLT managed by the UPTD PAL, the PUPR Office of the Province of Bali, has not yet been made. There is limited funding from the local government for the implementation of activities in the field of City Sanitation. Low level of community knowledge about the benefits of IPLT and the purpose of the L2T2 Program.

V. CONCLUSIONS AND RECOMMENDATIONS

Based on the results of research and discussion, it can be concluded as follows

In Denpasar City, especially in Peguyangan Village, North Denpasar District, the L2T2 system has the potential to be developed because it has not been served by integrated piping services and still uses *septic tanks*. The L2T2 development plan is in accordance with the external and internal environmental conditions of Denpasar City, namely the desludging and transportation pattern, namely the overall desludging. In the overall desludging pattern, the



L2T2 operator will remove all the sewage sludge from the septic tank. This desludging pattern will make the septic tank regain its maximum storage volume considering the high variation in the volume of the septic tanks. Suggestions that can be submitted are in developing L2T2 in Denpasar City for the sake of protecting the environment from waste pollution, it is necessary to involve the community and the private sector

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