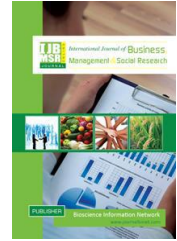


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## Analysis of risk based asset management plan to increase performance of water local company (PDAM) in aceh

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### ABSTRACT

*This study aims to obtain the concept of risk-based asset management planning with consideration of government regulations and international standards of asset management that can improve the Performance of Regional Water Company (PDAM) of Aceh Province. This plan consists of asset procurement plans, asset operating plans, asset maintenance plans, and asset deletion plans. Major risks that can occur in asset management planning include the mismanagement of asset needs, debt settlement failure and corporate financial failure, lack of strong local commitment, real loss, apparent loss, environment, lack of optimal planning and the use of operational costs effectively and efficiently, and the lack of subscribers due to the dominance of people who use groundwater that has an impact on the reluctance of people to buy water through PDAM.*

**Keywords:** Risk based asset management, Asset management plan, Risk, Pdam aceh and Risk evaluation

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### I. Introduction

Clean water management for the community is done by Perusahaan Daerah Air Minum (PDAM). To provide optimal water needs of the community, PDAM must have a good performance. In 2015, PDAM have a good performance of 53.3%. For more details, PDAM performance development in Indonesia and Aceh were tabulated as in [Table 01](#).

The government institution that covers all PDAMs in Indonesia, is the Agency for the Improvement of the Implementation of Drinking Water Supply System (BPPSPAM). PDAM performance appraisal report of 2017 explained that the dominant factors affecting the performance of PDAM are the level of water loss (Non Revenue Water), billing effectiveness and less than 24 hours. Moreover, the level of water loss (Non - Revenue Water) problem give huge impact on the performance of the PDAM where the water

loss rate is tolerated is 20%, while the average PDAM Indonesia is still far from the tolerance limit that is in the range of 32.5%. This problem of water loss /leakage rate is closely related to the management of company assets i.e. network pipes and physical assets in PDAM water supply and distribution.

**Table 01. Data on PDAM operations audit results throughout Indonesia**

Performance category	2013		2014		2015		ACEH (2015)	
	JML	%	JML	%	JML	%	JML	%
Healthy (Good)	176	50.3	182	50.7	196	53.3	3	20
Less Healthy (Less Good)	104	29.7	103	28.7	100	27.2	6	40
Pain (Poor)	70	20	74	20.6	72	19.5	6	40
Total	350	100	359	100	368	100	15	100

Susanto and Cristina (2014) stated that problems faced by PDAM is high level water leakage (Non-Revenue Water) which reflects PDAM did not maximize the management of major water company assets. Therefore, improving the value of PDAM's performance and good asset management is required. Asset management provides advice to the organization and establishes the best procedures for achieving company goals. So, risk-based asset management planning is a good starting point for PDAMs as they did not have asset management policies. There have been several studies have been done on risk based asset management. What distinguishes this research from previous research is that this research examines international standards of asset management, government regulation, and incorporates Auditor's perception as PDAM Performance Evaluator. Asset management, such as general management activities, is the process of organizing, planning, designing and controlling acquisitions, maintenance, repair and disposal of infrastructure and asset engineering to support services. It is a systematic and structured process that encompasses the entire life cycle of physical assets. The purpose of Asset management is to optimize the potential of asset delivery services and to minimize the risks associated with costs and ensure a positive increase in natural and social capital over the life cycle of assets. Good governance, use intelligent business systems, processes and human resources are key aspects of this effort. One of the standards for drawing up asset management is ISO 55000. ISO 55000 is an asset management standard that outlines reviews, concepts and terminology in asset management. Apart from ISO 55000, there is also another standard that is PAS 55: 2008. PAS 55: 2008 is a physical asset optimization management system where the main objective is to improve the performance of physical assets. One of the principles of asset management according to PAS 55 is basis risk/risk based.

According to Hidayat (2012), asset management plan consists of four types:

- The procurement plan, which describes the assets needed or replaced within the planning period and which prepares the sources and cost of funding for procurement;
- The operational plan which describes the existing asset usage policy and may include such things as hours of operation, usage, energy management and cleaning;
- The maintenance plan which sets standards for assets to be maintained, how standards will be achieved and how maintenance services will be provided; and
- The deletion plan which describe all assets that will be eliminated within the planning period, the selected removal method and the expected results from the deletion.

There are many possible risks to asset management activities that must be considered in the preparation of an asset management plan. Based on the assessment of BPKP auditors of aceh province on the identification of risks that have impacts on 3k (quantity, quality and continuity) that are closely related to asset management, and this 3k aspect is the main target of pdam. It is found that risk profile threatens the operation of PDAM, among others include risk of deficient raw water, risk of unit damage/ water treatment plant (IPA), distribution network damage risk, real loss risk, apparent loss risk, water leak risk, drinking water tariff ratio smaller PDAM than cost of goods sold or cost of production, risk can not comply with liability, illegal connection risk, lack of supply/excess inventory, polluted water risk, pipeline relocation risk, risk of losing land control, risk of groundwater tariff lower water supply, risk of

tera meter equipment not functioning well, risk measuring water pressure measures on the network, less accurate water quality test result risk, unsecured/competent HR risk, political intervention risk, risk of payment of military and police bill account.

PDAM is a Regional Owned Enterprise (BUMD), in other words PDAM is a company owned by regional government and bound by government regulation. So the government regulation should be included in the preparation of the PDAM asset management plan. Government regulation as reference of asset management policy formulation for PDAM can be guided by SPAM asset management guidance on preparation of guidelines for assessment and application of SPAM asset management from ministry of public works, regulation of minister of public works number 18 year 2007 on implementation of development of drinking water supply system, government regulations related to PDAM assets as state property/regional property (BMN/BMD) such as permendagri no. 17 of 2002 on technical guidelines for management of BMD and PP no. 6 of 2006, government regulation no. 38 of 2008 and government regulation no 27 of 2014 management of BMN/BMD.

## II. Materials and Methods

This research adapts the qualitative approach. Interviews were conducted with selected respondents which are BPKP national auditor, BPKP auditor of aceh province and management of PDAM aceh province. Data analysis consists of: sketching ideas and making notes, summarizing field notes work with words, identify code/process coding. In this stage the researcher performs the process of abstract coding or concrete coding, calculating the frequency of the code, connecting categories, connecting categories with analytical framework in literature, creating point of view, and displaying data. The validity and reliability test for this research data is by using triangulation. Data analysis is performed by describing the procedures involved in the analysis of interview transcripts through coding techniques. Coding is done for the code descriptive asset management planning practices, asset management planning according to standards and regulations, as well as risks in the management of PDAM assets. Interview sources consisted of management of PDAM aceh and west java, BPKP aceh auditor as evaluator of PDAM performance in aceh province, and BPKP auditor of other provincial representatives.

## III. Result and Discussion

**Table 02. Points in each asset management plan**

Management plan	Point
Procurement Plan	<ul style="list-style-type: none"> <li>a. Explanation of required assets</li> <li>b. Explanation of replaced assets in the planning period</li> <li>c. Source of funding for procurement</li> <li>d. Funding costs for procurement</li> </ul>
Operational Plan	<ul style="list-style-type: none"> <li>a. An asset usage policy</li> <li>b. Hours of Operation</li> <li>c. Use of Assets</li> <li>d. Energy Management</li> </ul>
Maintenance Plan	<ul style="list-style-type: none"> <li>a. Standards for assets to be maintained</li> <li>b. Achievement of standards</li> <li>c. Maintenance services</li> </ul>
Removal Plan	<ul style="list-style-type: none"> <li>a. List of assets to be written off within a certain period</li> <li>b. Method of deletion</li> <li>c. Expected results from deletion</li> </ul>

### International standard asset management

Aceh's PDAMs have no asset management policy, and from interviews conducted with PDAM management most of them are unaware of the existence of international standards of asset management such as ISO 55000 and PAS 55. In the absence of this asset management policy, it can be said that the implementation of the PDAM's asset management is inconsistent with international standards ISO

55000 and PAS 55 where in both standards there is an asset management cycle in which there is an asset management plan or strategy, objectives and asset management plan.

Asset management planning as in accordance with PAS 55 considers risk as part of its plan as PAS 55 is risk based. ISO 55000 also taken into account risk management in Risk Management Planning (AM Plans) which adopts ISO 31000 as its risk management standard (ISO 2009 and 2014).

The risk management process consists of risk identification, risk evaluation, Risk Control technique selection, and implementation and review of risk control decisions. So these four stages must be done to the whole process of asset management planning both in procurement planning, asset operating planning, asset maintenance planning and asset deletion planning.

**Government regulation related to PDAM**

Based on related government regulations, it can be formulated that must be considered PDAM in asset management planning process among others as follows:

**Table 03. Things to look for PDAMS in planning management based on government regulations**

Planning activities	Planning activities to be attempted
Procurement Plan	<ul style="list-style-type: none"> <li>• Procurement planning is taking into account the procurement of goods through the mechanism of purchasing assets solution, borrowing, lease, leasing, non-asset solutions or other mechanisms more effectively and efficiently according to the needs of government administration such as over the status of Users Other goods or grants</li> <li>• Planning is guided by standard of goods; standard needs; and / or price standards</li> <li>• Basic principles are efficient, effective, open, competitive, transparent, fair and accountable.</li> <li>• The PDAM is a regional-owned company, therefore, the procurement of its assets must be coordinate with the local government.</li> </ul>
Operational Plan	<ul style="list-style-type: none"> <li>• Asset operational activities, in government regulations related to BMN are:               <ol style="list-style-type: none"> <li>1. Activities on the use of BMN, which can be differentiated into the determination of the usage status on the user of the goods, the determination of the use status operated by other parties, the transfer of usage status, and the determination of BMN in the form of idle land and / or buildings.</li> <li>2. Activities of BMN utilization, which includes BMN lease, borrow use, cooperation of utilization, and wake up for handover or hand-over.</li> <li>3. Moving activities of BMN, which may be made by way of sale, exchanged, granted, or included as government capital.</li> </ol> </li> <li>• Planning for the utilization of state / regional property can be done for a period of one year and three years</li> <li>• Planning is guided by standard of goods, standard needs, and / or price standards</li> </ul>
Maintenance Plan	<ul style="list-style-type: none"> <li>• Planning for maintenance of State / Regional Property can be done for period of one year and three years</li> <li>• Planning is guided by standard of goods, standard needs, and / or price standards</li> <li>• The goods, users, or procurement administrators of the goods are responsible for the maintenance of state / region goods.</li> <li>• Maintenance is guided by list of goods maintenance requirement.</li> <li>• The cost of maintaining a state / local property shall be borne by the state / regions budget.</li> </ul>
Removal Plan	<ul style="list-style-type: none"> <li>• Planning for the elimination of state / regional property can be done for a period of one year and three years</li> <li>• In government regulations, assets removal activities consist of:</li> </ul>

Planning activities	Planning activities to be attempted
	<ol style="list-style-type: none"> <li>1. Asset abolition, consisting of deletion from user list and / or user power list and removal from BMN / D List.</li> <li>2. asset destruction, is the act of destroying the physical and / or usefulness of BMN / D by burning, crushing, stockpiling, drowning or other means in accordance with the provisions of legislation.</li> </ol> <ul style="list-style-type: none"> <li>• Removal was done based on the following: <ol style="list-style-type: none"> <li>1. The decision and / or report of the deletion of the users of goods, for state / local property located on the users of the goods;</li> <li>2. The decision of the goods manager, for the state property located in the goods manager; or</li> <li>3. The decision of the governor / regent / mayor, for the regional property located in the goods manager.</li> </ol> </li> </ul>

### Risks in the management of PDAM assets

Here are the risks to the asset management plan according to the three groups of PDAM performance levels:

**Table 04. Risk identification in PDAM asset management planning activity according to aceh province**

Asset management planning activities	Good performance PDAM	Less good performance PDAM	Poor performance PDAM
Risk Management of the Company's Most Major Assets	<ol style="list-style-type: none"> <li>1. The difficulty of eliminating assets due to long and complicated mechanisms.</li> <li>2. Damage / theft of assets from people who are not responsible</li> <li>3. Unrecoverable assets / difficult to record assets.</li> <li>4. Damage to assets due to natural disasters</li> <li>5. Unavailability of sufficient funds to reimburse / replace assets</li> <li>6. Decrease in asset performance not yet</li> </ol>	<ol style="list-style-type: none"> <li>1. Unsecured asset purchases with the required</li> <li>2. The risk of asset life damaged more quickly than its economic life.</li> <li>3. Lack of employee understanding about asset management in PDAM</li> </ol>	<ol style="list-style-type: none"> <li>1. Damage / theft of assets from people who are not responsible</li> <li>2. Unable to rehabilitate / replace the asset because no funds are available.</li> <li>3. Proposed errors for asset disposal due to non-performing asset condition analysis according to procedure</li> </ol>
Procurement Plan	Activity of asset procurement is an increase in the price of water provider infrastructure assets - (may occur due to increases of inflation rate, the rise of foreign exchange rate against	<ol style="list-style-type: none"> <li>1. Increase in asset price of water supply infrastructure for fuel oil).</li> <li>2. Mismanagement of asset requirement (asset requirement plan was not prepared based on survey of consumer needs).</li> <li>3. Failure of forest settlement and financial of the company</li> </ol>	<ol style="list-style-type: none"> <li>1. Increased pricing of water provider infrastructure - (may occur due to increases of inflation rate, the rise of foreign exchange rate against rupiah,</li> </ol>

Asset management planning activities	Good performance PDAM	Less good performance PDAM	Poor performance PDAM
	Rupiah, and the increase of fuel price).	4. Budget plan cost of asset procurement at mark up; no cheap source of finance available; 5. Suppliers deliver assets with different specifications, below quality standards, and late delivery time	and the increase of fuel price). 2. Budget plan the cost of asset procurement at mark up; no cheap source of finance available; 3. Suppliers deliver assets with different specifications, below quality standards, and late delivery time.
Operational Plan	1. Lack of raw water availability. 2. Actual loss of water - 3. Clear water loss (apparent loss) - 4. Not optimal use of assets / (Many assets are not productive / idle) 5. Less than optimal planning and use of operational cost are not efficient and effective	1. Lack of raw water availability. 2. Actual loss of water - 3. Clear water loss (apparent loss) - 4. Not optimal use of assets / (many assets are not productive / idle) 5. Less than optimal planning and use of operational cost are not efficient and effective	1. Appropriate loss of apparent water - 2. Not optimal use of assets / (many assets are not productive / idle) 3. Less than optimal planning and use of operational cost are not efficient and effective
Maintenance Plan	1. Damage / theft of assets from irresponsible persons; 2. Unable to rehabilitate / replace the asset because no funds are available. 3. Data information systems such as PDAM asset inventory data are disrupted / lost due to natural disasters	1. Damage / theft of assets from irresponsible persons; 2. Delays routine in checking of assets condition. 3. Unable to rehabilitate / replace the asset because no funds are available. 4. Data information systems such as PDAM asset inventory data are disrupted / lost due to natural disasters 5. The lack of stock tools in the effort to accelerate the handling of network problems, due to the limitation of financial PDAM	1. Damage / theft of assets from irresponsible persons; 2. Delay of routine checking of assets condition. 3. Unable to rehabilitate / replace the asset because no funds are available .4 Asset Abolition Activities.

Asset management planning activities	Good performance PDAM	Less good performance PDAM	Poor performance PDAM
Removal Plan	<ol style="list-style-type: none"> <li>1. Long asset removal activities due to long and complicated deletion mechanisms.</li> <li>2. Proposed errors for asset disposal due to non-performing asset condition analysis;</li> </ol>	<ol style="list-style-type: none"> <li>1. Proposed errors for asset disposal due to non-performing analysis of the assets condition according to the procedure;</li> <li>2. Long asset removal activities due to long and complicated deletion mechanisms.</li> <li>3. There is a violation of the law because the mechanism for the elimination of assets is not in accordance with the rules / legal provisions;</li> <li>4. There is an unilateral effort to eliminate assets without involving matters related to asset deletion.</li> </ol>	<ol style="list-style-type: none"> <li>1. Proposed errors for asset disposal due to non-performing analysis of the assets condition according to the procedure;</li> <li>2. Long asset removal activities due to long and complicated deletion mechanisms.</li> </ol>

### Risk evaluation

From the identified asset management risks, interviews with BPKP Auditors and PDAM management of which risks are most likely to threaten asset management were conducted. From the results of this risk evaluation, the following lists of risks were identified:

**Table 05. Key risk evaluation in PDAM asset management**

Asset management activities	Risk in asset management activities
Procurement Plan	<ol style="list-style-type: none"> <li>1. Mismanagement of asset requirements</li> <li>2. Failure of forest settlement and financial of the company</li> <li>3. Weak commitment of local governments in the provision of asset procurement budget.</li> </ol>
Operational Plan	<ol style="list-style-type: none"> <li>1. Actual loss of water</li> <li>2. Clear water loss (apparent loss)</li> <li>3. Environmental pollution</li> <li>4. Less than optimal planning and use of operational cost are not efficient and effective</li> <li>5. Lack of subscribers due to dominant people who still use the ground water, impact from the reluctance of the community in buying water through PDAM</li> </ol>
Maintenance Plan	<ol style="list-style-type: none"> <li>1. Unable to rehabilitate / replace the asset because no funds are available.</li> <li>2. Other risks, i.e. the condition of existing assets that has not been recorded well.</li> </ol>
Removal Plan	<ol style="list-style-type: none"> <li>1. Long asset removal activities due to long and complicated deletion mechanisms.</li> </ol>

### Risk based asset

Management planning which adopts international standards asset management and related with government regulations.

**Table 06. PDAM asset management planning**

	Procurement plan	Operational plan	Maintenance plan	Removal plan
Asset management concept review	<ul style="list-style-type: none"> <li>• Explanation of required assets</li> <li>• Explanation of replaced assets in the planning period</li> <li>• Source of funding for procurement</li> <li>• Funding costs for procurement</li> </ul>	<ul style="list-style-type: none"> <li>• An asset usage policy</li> <li>• Hours of operation</li> <li>• Use of assets</li> <li>• Energy management</li> <li>• Cleaning</li> </ul>	<ul style="list-style-type: none"> <li>• Standards for assets to be maintained</li> <li>• Achievement of standards</li> <li>• Maintenance services</li> </ul>	<ul style="list-style-type: none"> <li>• List of assets to be written off within a certain period</li> <li>• Method of deletion</li> <li>• Expected results from deletion</li> </ul>
Standard of asset	<p>• One of the principles of asset management in pas 55 is risk consideration and in iso 55000 in the asset management plot is the asset management plans stage using risk management (risk management) that is iso 31000 standard.</p>			
Government regulations related to pdam assets	<ul style="list-style-type: none"> <li>• Can be done with:</li> <li>• Asset solutions, such as buying, building or leasing</li> <li>• Non-asset solutions such as changing the status of other users of goods or grants</li> <li>• Basic principles consisting of efficient, effective, open, competing, transparent, fair and accountable.</li> <li>• Pdam is a regional-owned company, so in the procurement of its assets, they must coordinate with the local government.</li> </ul>	<ul style="list-style-type: none"> <li>• Asset operational activities, in government regulations related to bmn, that can be included in this category are:</li> <li>• Bmn usage activities, can be differentiated into determination of usage status on the user of the goods, determination of usage status operated by other parties, transfer of usage status and determination of bmn in the form of idle land and / or buildings.</li> <li>• Activity of bmn utilization, which includes bmn lease, borrow use, cooperation of utilization, and wake up for delivery or wake of handover.</li> <li>• Transfer activities of bmn, which may be made by sale marketing, exchanged, granted, or included as government capital.</li> </ul>	<ul style="list-style-type: none"> <li>• Budget planning includes budget for procurement activities and maintenance budget of bmn / d.</li> </ul>	<ul style="list-style-type: none"> <li>• In government regulations, assets removal activities consist of:</li> <li>• Asset deletion is a deletion from user list and / or user power list and removal from bmn / d list.</li> <li>• Destruction of assets is the act of physical destruction and / or the use of bmn / d by burning, crushing, stockpiling, drowning or other means in accordance with the provisions of legislation.</li> </ul>



	Procurement plan	Operational plan	Maintenance plan	Removal plan
The risks involved in asset management cycle	<ul style="list-style-type: none"> <li>• Mistakes of asset-requirement planning (asset-requirement plan was not prepared based on consumer demand survey).</li> <li>• Failure of forest settlement and financial of the company</li> <li>• Weak commitment of local government in providing asset procurement budget.</li> </ul>	<ul style="list-style-type: none"> <li>• Actual loss of water</li> <li>• Clear water loss (apparent loss)</li> <li>• Environmental pollution</li> <li>• Less than optimal planning and use of operational cost are not efficient and effective</li> <li>• The dominant community that utilizes ground water give impact on people's reluctance to buy water through pdam.</li> </ul>	<ul style="list-style-type: none"> <li>• Unable to rehabilitate / replace the asset because no funds are available.</li> <li>• The condition of the existing assets has not been properly recorded.</li> </ul>	<ul style="list-style-type: none"> <li>• Long asset removal activity due to long and complicated deletion mechanisms.</li> </ul>
Risk control	<ul style="list-style-type: none"> <li>• Develop asset policies and implement it properly, and coordinate it with the central / local government to obtain assets, given the company's unfeasible financial condition.</li> <li>• Data collection of all assets from the beginning of the company, whether fixed or temporary assets must be recorded</li> <li>• Management is involved in planning assets procurement, the handover of goods to be assets in the process with cooperation of local governments.</li> </ul>	<ul style="list-style-type: none"> <li>• Effective improvement of network leakage by preparing a list of priority on the assets condition that must be repaired immediately.</li> <li>• Perform maintenance routine of strategic assets.</li> <li>• The implementation of deliberation and commitment of both local government and companies (pdam) to improve and find solutions to all problems that occur in pdam</li> </ul>	<ul style="list-style-type: none"> <li>• Conduct an asset inventory and compile a complete asset list with their conditions, and list the assets that are prioritized for improvement by considering the remaining useful life of the asset and its important functions to the company's operations.</li> <li>• By billing the water account to the customer through door to the door, the purchase (stock) tool for acceleration in the effort of snack leakage is better</li> <li>• Control and follow up on any person who utilizes assets outside the company's interests and conduct regular asset checks</li> </ul>	<ul style="list-style-type: none"> <li>• Record of assets must be clear and recorded</li> <li>• Routine care for assets that require care such as pumps, ipa, and others</li> <li>• The availability of funds and human resources can all be controlled and the company's commitment to record assets that have been built</li> <li>• Should be coordinated so that it will not wrongly erase assets that are still productive.</li> <li>• Repair the network by searching for leakage points and improving normal distribution to be maintained</li> </ul>

#### IV. Conclusion

It can be concluded that risk-based asset management plan that considers the government regulation and international standards as mentioned in [Table 06](#) of discussion section. Suggestions that can be made based on this research are as follows:

- Create a risk-based asset management plan in accordance with the framework built from this research.
- Follow up on the suggestions given in the performance evaluation report by BPKP of Aceh Province.
- The local government as the owner of PDAM should provide support and assistance to the PDAM, especially the asset problem that is closely related to the coordination with the local government.
- Cooperation with private parties can also be developed for the progress of PDAMs with assistance of the regional government.

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