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Seminar on

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Urban Deprivation : A Challenge to Sustainable Urban Settlements

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Research Institute for Human Settlements

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Urban Deprivation: A Challenge to Sustainable Urban Settlements

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**Research Institute for Human Settlements
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Ministry of Public Works Indonesia**

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PREFACE

In developing countries which are mostly located in the tropical zones, population is concentrated in urban areas. The proliferation of urban migrants has caused many people lack of access to many kinds of infrastructure facilities, such as sanitation, transportation, or durable houses. The reduction of inequalities within cities has been constantly mentioned to the importance of sustainable development.

Urban services should not discriminate against poorer urban inhabitants. Urban deprivation has become a characteristic of large cities in all parts of the world, which mostly occurs due to the limited capacity of the cities to meet people's needs. Therefore, to ensure future progress in the improvement of economic, social, and environmental conditions in urban settlements, we must begin with recognizing and dealing with urban deprivation.

Poor management and planning and the absence of coherent urban policies create urban problems especially environments rather than urbanization. Deteriorating environmental conditions can cause serious impact on human health and welfare, particularly the urban poor. Harmonized environments can only result from urban settlements that are planned, developed and improved by considering all sustainable development principles and their components. This concept has been adopted in most countries to address the issue of today's increasing world temperature, whilst the climatic characteristics relate to the form of cities, urban designs, and buildings.

Since 2006 the Research Institute for Human Settlements has organized Bi-annual International Seminars on Ecosettlements and this year's Seminar is the third. It is a settlement concept that harmonizes social, economic, and ecological aspects in the quest of developing a sustainable tropical ecosystem. Given the serious issues associated with urban deprivation, the 2012 Seminar's theme is Urban Deprivation: a Challenge to Sustainable Urban Settlements.

A total of 35 papers from different countries were accepted and categorized into three major issues: *new approach in sustainable urban planning and design, ecological concern in green building and urban infrastructure accessibility*. They have been orally presented in the parallel sessions on Day One and Day Two. Optional field-trips were held on Day Three to Tapak Bumi Eco-village.

On this occasion, I would like to express my sincere gratitude towards all the parties for their remarkable contribution that made this Seminar possible. I do hope this Seminar can provide the opportunity for academics and industry practitioners to share their views and experiences from both tropical and non-tropical countries on how to deal with urban deprivation problems.

Jakarta, 2 November 2012

Dr. Anita Firmanti E. S.

Director of Research Institute for Human Settlements

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TABLE OF CONTENT

	Page
PREFACE.....	i
STEERING COMMITTEE	ii
TABLE OF CONTENT	iv

Issue : New approach in sustainable urban planning and design

A-01 DEVELOPING GREEN OPEN SPACE IN URBAN RESIDENTIAL AREAS THROUGH COMMUNITY PARTICIPATION APPROACH <i>By Agung Wahyudi</i>	1
A-02 RESIDENTIAL MOBILITY AND SPATIAL EXTERNALITIES AS A CHALLENGE TO SUSTAINABLE URBAN SETTLEMENTS IN SURABAYA CITY <i>By Alen Miftahul And Dian Rahmawati</i>	11
A-03 DEFINING URBAN ACUPUNCTURE AS AN ALTERNATIVE STRATEGY TO CURE THE CITY PROBLEMS OF INDONESIA <i>By Astri Anindya Sari And Shirleyana</i>	21
A-04 THE ACHIEVEMENT OF SUSTAINABILITY ON VERTICAL HOUSING DEVELOPMENT THROUGH WHOLE SYSTEM DESIGN <i>By Christiono Utomo And Yani Rahmawati</i>	31
A-05 RIVERINE ECOLOGY DEGRADATION AND HUMAN SETTLEMENT VULNERABILITY IN CITARUM RIVER BANK AND ADJACENT AREA <i>By Harri A. Setiadi</i>	41
A-06 THE INFLUENCE OF VEGETATION TO THE INDOOR TEMPERATURE IN TROPICAL AREA <i>By Khalid A.Mannan , Elisa Anggraeni , Aisyah N. Hayati Aulia F. Muchlis</i>	55
A-07 A STUDY ON THE EXTERNALITY OF GAS-STATIONIN URBAN AREA, A CASE STUDY OF BANDUNG, INDONESIA <i>By Mahatma Sindu Suryo And Arip Pauzi Rachman</i> ..	65
A-08 DEVELOPMENT OF A RAPID SYSTEM FOR URBAN AIR QUALITY INDEX MEASUREMENT BASED ON PHOTONIC CRYSTAL SENSOR <i>By Mamat Rahmat, Muhamad Azis ,Erus Rustami, Wenny Maulina, Isnaeni, Husin Alatas, Arief S. Yuwono, Yong- Hoon Cho And Kudang B. Seminar</i>	73
A-09 THE SYSTEMIC DEPRIVATION OF URBAN GREEN OPEN SPACE: A CHALLENGE OF MAKING AN URBAN ENVIRONMENTAL-FRIENDLY <i>By Martinus B. Susetyarto</i>	85

A-10	ECOTOURISM DEVELOPMENT IN THE ENVIRONMENTAL OF TRADITIONAL OF HUMAN SETTLEMENTS IN THE UNDISAN VILLAGE - BALI PROVINCE <i>By Muhajirin And Iwan Suprijanto</i>	95
A-11	LANDSCAPE CHANGES IN DENPASAR CITY <i>By Ni Made Yudiantini</i>	109
A-12	MODEL OF GREENSPACE RANGE EFFECT TOWARDS SURFACE TEMPERATURE IN URBAN AREA <i>By Putri Yasmin Nurul Fajri</i>	119
A-13	THE STUDY OF SO ₂ POLLUTANT EMISSION FROM BOILER STACK OF BIODIESEL PLANT USING ATMOSPHERIC DISPERSION MODELLING <i>By Rosmeika, Arief S. Yuwono And Armansyah H. Tambunan</i>	129
A-14	THE EMERGENCE OF INFORMAL RIVERSIDE SETTLEMENTS AND CHALLENGES FOR PLANNING: THE CASE OF KALI MAS IN SURABAYA, INDONESIA <i>By Shirleyana And Astri Anindya Sari</i>	137
A-15	THE CONTRIBUTION OF HOUSING SECTOR TO ANTICIPATE THE INCREASED DEGRADATION OF URBAN AREAS: A CASE STUDY OF BANDUNG CITY <i>By Siti Zubaidah Kurdi</i>	149
A-16	HIGH-DENSITY HOUSING IN KAMPUNG BRAGA IN BANDUNG <i>By Sri Suryani And Ismet B. Harun</i>	157
A-17	THE CAPACITY OF URBAN ENVIRONMENT, A CASE STUDY OF URBAN KAMPONG AT BANDUNG <i>By Surjamanto W And Sahid</i>	167
A-18	LANDSCAPE ON LIMITED YARD AS A MICROCLIMATE CONTROL: A CASE STUDY OF MAKASSAR SUBURBAN HOUSING <i>By Veronica N And S. Wunas</i>	173

Issue: Ecological concern in green building

B-01	THE COMPARATIVE STUDY OF THE INFLUENCE OF BUILDING FORM TOWARDS THE THERMAL COMFORT IN FLATS BUILDINGS <i>By Arief Sabaruddin And Rumiati R. Tobing</i>	181
B-02	INTEGRATED DESIGN AND PLANNING PROCESS TOWARDS GREEN BUILDING DEVELOPMENT CASE STUDIES IN DAHANA OFFICE BUILDING AND MINISTRY OF PUBLIC WORKS OFFICE BUILDING <i>By Dian Fitria</i>	187
B-03	PRELIMINARY STUDY OF GREEN BUILDING IN MALANG CITY; CASE STUDY OF COMMERCIAL PUBLIC BUILDINGS <i>By Fitria A. Feliciani, Andika Citraningrum, Agung Murti Nugroho, Damayanti Asikin</i>	199
B-04	FLEXURAL BEHAVIOR OF REINFORCED LIGHTWEIGHT CONCRETE SLAB WITH WASTE PUMICE AGGREGATE <i>By Hazairin, Bernardinus Herbudiman And Syarief Abdurrachman</i>	211
B-05	THE EFFECTIVENESS OF VEGETATION AS A NOISE REDUCTION IN A BUILDING <i>By Imam Baihaqi , Irwan Suminto Adi , Nur Lailatul Fitria Sulianto , Ernaning Setiyowati</i>	219

B-06 THE INDEPENDENT HOUSE ENERGY FROM RESOURCES THE ENERGY OF POTENTIAL FROM ATMOSPHERE <i>By Lilik Slamet S</i>	227
B-07 ENERGY-EFFICIENT STRATEGY IN JAVANESE TRADITIONAL HOUSE <i>By Mohammad Pranoto Soedjarwo</i>	235
B-08 RESOURCES CONSUMPTION ASSESSMENT TO ACHIEVE FUTURE GREEN OF PRINCE OF SONGKLA UNIVERSITY, SURAT THANI CAMPUS <i>By Piyamas Samsuwan And Sontip Danteravanich</i>	243
B-09 PEOPLE’S BEHAVIOUR IN THE MARKET WASTE MANAGEMENT: RAU MARKET, SERANG BANTEN <i>By Retta Siagian</i>	253
B-10 ROLE OF PASSIVE AND ACTIVE STRATEGY IN GREEN BUILDING CONTEXT <i>By Sahid, Surjamanto W And Sugeng Triyadi</i>	261
B-11 NEW APPROACH POSSIBILITIES OF USING A SIMPLE LIGHT REFLECTION FOR SAVING ENERGY IN URBAN BUILDINGS <i>By Suriansyah. Y And Gunawan. R</i>	269
B-12 PROBLEMATIC OF HIGH-RISE BUILDING FLATS IN INDONESIA BASED ON THERMAL COMFORT AND FIRE SAFETY PERSPECTIVES <i>By Wahyu Sujatmiko , Hermawan K. Dipojono, Soegijanto, And F.X. Nugroho Soelami</i>	275
Issue: Urban infrastructure accessibility	
C-01 BASIN MANAGEMENT SYSTEMS APPROACH TO OFF-SET INFRASTRUCTURE INACCESSIBILITY UNDER RAPID URBANIZATION AND DUE WEAK GOVERNANCE <i>By J Matsushita And Suharyanto</i>	285
C-02 STRATEGIC STUDY OF SPAM DEVELOPMENT IN PONTIANAK CITY FOR MDGS TARGET ACHIEVEMENT 2015 <i>By Laili F. Mahdi And Prof. Arwin A. Sabar</i>	297
C-03 DOMESTIC WASTE MANAGEMENT FOR REDUCING RIVER POLLUTION: A CASE STUDY CIBEUREUM VILLAGE AND MELONG VILLAGE, DISTRICT OF SOUTH CIMAHI <i>By Puti Renosori, Chusharini Chamid And Yuliadi</i>	309
C-04 WASTE REDUCTION THROUGH 3 R (REDUCE, REUSE AND RECYCLING) PROGRAM: A CASE STUDY OF SURABAYA CITY, INDONESIA <i>By Sri Darwati</i>	319
C-05 OPTIMAL SCALE OF WATER SUPPLY PROVISION IN INDONESIA <i>By Sri Maryati</i>	329

STRATEGIC STUDY OF SPAM DEVELOPMENT IN PONTIANAK CITY FOR MDGS TARGET ACHIEVEMENT 2015

Laili F. MAHDI¹, Prof. Arwin A. SABAR²

ABSTRACT: In terms of quantity, availability of raw water is quite abundant, but in terms of quality of raw water sources are threatened seawater intrusion in normal and dry year at dry season. Groundwater in Pontianak City is a peat-coloured water and acidic. In existing condition, at dry season in normal year, when intake in Pontianak City gets sea water intrusion, they take raw water from Penepat Intake and only 30 % of habitants in Pontianak City get served. Drinking water is needed to meet the needs of the community, both in terms of quality, quantity, and continuity. Therefore, we need Master Plan of SPAM (*Sistem Penyediaan Air Minum*) Development (RIP-SPAM) PDAM Pontianak City that is based on design criteria for development of water supply and water demand projections for a period which is divided into several stages. This study will discuss the master plan for development of SPAM for shortterm until 2015 for MDGs target achievement in Pontianak City, 82,5% of inhabitants could be served. With Quantitative Method, we will calculate drinking water needs, then make Scenario Development of SPAM Pontianak by revitalization of Intake Penepat and using the reverse osmosis. With SPAM developments scenario, 92,64% of inhabitants in Pontianak will be served in 2015 (exceed MDGs target).

KEYWORDS: *Sistem Penyediaan Air Minum* development, Penepat Intake, reverse osmosis.

1 INTRODUCTION

Currently, the supply of drinking water in Pontianak treated by PDAM Pontianak. Source of raw water is from the Kapuas River and Landak River. In terms of quantity, availability of raw water is quite abundant. Groundwater in the area of Pontianak can not be used because it is a tawny-colored peat water, relatively high acid levels, high levels of organic compounds and low hardness (Priyambodo, 2006), so that its processing requires substantial installation costs.

In addition, the raw water source Pontianak also threatened intrusion of sea water depends on the climate (wet, normal and dry), tidal estuary, the river discharge. Intrusion is also highly dependent on the size, depth and nature of the aquifer (Elhamid, 2011). Salinity levels of Cl-occurred with more than 600 ppm, so it does not meet the standards for drinking water standard (PP 82, 2001). Though drinking water is needed to meet the needs of the community, both in terms of quality, quantity, and continuity. It is known that sea water intrusion looked increasingly to the headwaters and the sea water intrusion in the raw water intake became more frequent (Mahdi, 2010).

In the face of uncertainty on the seawater intrusion of water sources, there is a tendency that the operation of the City PDAM Pontianak IPA made with three approaches (Sabar, 2009), namely :

1. In the wet climate, dry season is relatively wet: Imam Bonjol Intake (primary) is not affected by seawater intrusion.

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2. In the climate normal year, dry season: Imam Bonjol Intake (primary) in the driest months (1-2 months) affected by seawater intrusion, Penepat Intake not affected by seawater intrusion.
3. In the dry climate of the year, in the dry season: Intake Imam Bonjol get intrusion (4-5 months) to the raw water intake Panepat backup, so Long Storage Panepat operated. Long Storage Operation Penepat ineffective, because the water is contaminated peat.

Pontianak city have equatorial climate zone, characterized by a bimodal rainfall pattern with the form, the two peaks of rain that usually occurs around March and October, when the sun is near the Equator. So as to have rainfall and high humidity.

Pontianak city also has a type of semidiurnal tides, which occur within 24 hours two times and two times the receding tide. It resulted in a flat and marshy morphology. Because of the decay of plants and animals, forming humus acids which are organic compounds with high molecular weight and dark brown to black. Acid humus consists of humic acid, fulvic acid and humin. Peat water containing dissolved organic compounds which cause the water to be brown and acidic. Raw water quality and river Kapuas Landaks have a relatively high level of color. This is caused by a high content of humus, as the river flows through a region with a thickness of peat swamp > 3 m in the middle to the estuary (PT. Indulexco, 2010).

In the dry climate of the year, Intake Penepat operated and can only serve 25-30% of Pontianak City PDAM customers. Salt levels rise beyond the raw water quality standards for drinking water affects drinking water treatment plant products Pontianak (does not meet drinking water standards).

We need an adaptive strategy, namely finding new sources for drinking water production (Ramaker et al, 2005). Also required planning strategies and development of raw water sources SPAM Pontianak is adaptive to the carrying capacity of natural / coastal environment Kapuas (highly colored raw water sources during the rainy season in the wet climate and the threat of intrusion in the dry season), so as to meet drinking water needs of the City Pontianak in terms of quality, quantity, continuity throughout the year, and competitive prices and services in order to improve sustainable water infrastructure. In addition, drinking water supply system requires infrastructure used for production, transmission, processing, and distribution to be consumed with a good economic value (Ramos et al, 2010).

Therefore, the necessary SPAM Development Master Plan (RIP-SPAM) based on the development of design criteria for SPAM, as shown in Figure 1 and the projected water demand in a period that is divided into several stages:

1. Short-Term Program (2010-2015): Revitalization Penepat intake and response to the reverse osmosis technology.
2. Medium Term Program (2010-2020): Preparation of the canal from the River to River Landak Ambawang.
3. Long Term Program (2010-2030): Making Barrage Ambawang long storage.

This study will address short-term RIP-SPAM for the improvement of service in 2015 for the achievement of the MDGs. On the MDGs target 7th: Ensure Environmental Sustainability, the third part, which is lower by half the proportion of households without sustainable access to safe drinking water and decent sanitation by 2015. Nationally, in 2009, for urban areas, only 49.82% have access while the MDG target of achieving 75.29%. From the data BAPPENAS, for urban areas of West Kalimantan, found that 77.5% had access to drinking water. As for the city of Pontianak, 65% of

the population already has access to drinking water (City PDAM Pontianak, 2010), so that the MDGs are expected to target the population that has access to potable water reached 82.5%.

Source: Sabar, 2009

Figure 1. Development of Design Criteria SPAM

2 LEGAL BASIS OF SPAM

On the Government Regulation no. 16 of 2005, Article 8 Section 2: Government and Local Government to ensure the availability of raw water. Article 37: Development of SPAM is the responsibility of the Government and Local Government to ensure the rights of every person in getting drinking water for a minimum basic needs of daily life in order to meet a healthy, clean, and productive in accordance with the provisions of the legislation.

Based on the Decree of the Minister of Health number 907 of 2002, Article 4 Paragraph 2: Monitoring of water quality conducted on a regular basis at least every 3 (three) months.

On the Regulation of the Minister of Public Works No. 18/PRT/M/2007, in Article 5, paragraph 1: Master Plan for Development of SPAM is a long-term plan (15-20 years) who were part of the planning or early stages of drinking water piping network and not the network piped drinking water demand projections based on a period that is divided into several stages.

3 METHODS

Study site is the City of Pontianak, the capital of West Kalimantan Province. Pontianak is wide 107.82 Km². In 2009, the population of Pontianak reached to 534.996. Water needs of more and more increased with the increase of population. So that the projections of population and facilities are needed in the evaluation and improvement of water supply plans. Several factors affect the

population projections are: the number of residents in an area, the speed of population growth, the projection period. Water demand and water supply can vary within a zone, depending on the climate, the industry demand, the demand for the seasonal distribution, geographic and topographic (Lucas et al, 2010).

There are several kinds of methods of population projection methods such as Arithmetic, Geometric Methods and Least Square Method (Ministry of PU 18, 2007). To get the projection method and the appropriate population can be considered representative of the population growth, it needs to be considered an important factor, namely the standard deviation. Projection method to be used is the projection method has the smallest standard deviation value. Population projections carried out to estimate the amount of drinking water needs during the planning period RIP-SPAM for 20 years, ie 2010-2030.

After getting the population projection, the projection analysis of non domestic facilities that are used to determine the non-domestic water needs. Non-domestic facilities that affect water supply in the city of Pontianak, among others, educational facilities, worship, health, office, trade, sports, culture and industry. Number of city facilities needs to be calculated until the end of the period of service only facilities that are included in the service area of drinking water distribution systems. Calculation of the projection of this facility is calculated based on comparison of the reference population by the number of existing facilities. Comparison is then used to estimate the number of non-domestic facilities during the planning period (Mamoribo, 2006).

After analysis of the projected number of non-domestic facilities, conducted projection analyzes of drinking water needs of the community that domestic water needs, non-domestic, and water loss. Domestic water consumption which is using water for domestic purposes, such as for drinking, cooking, personal hygiene and to outside terrace residence such as cleaning, watering gardens, filling pools, swimming pools and washing cars. Non-domestic consumption of industrial, commercial, and institutional.

Non-domestic water demand analysis carried out with reference to the projected number of nondomestic facilities and non-domestic water demand standards contained SK SNI on Drinking Water. Domestic water needs in the city of Pontianak is still served by a direct line of household and public hydrants. Consumption or water usage rates are essentially different for each area as it is very dependent on the pattern of daily consumption. However, based on historical data using the national drinking water drinking water consumption may be classified by category of (PT Indah Jaya Kusuma, 2010), as shown in Table 1.

Table 1. Domestic Water Usage for Various Classification Town				
Category of City		Total of citizen (Jiwa)	System	Water Need (L/o/h)
No.				
1.	Metropolitan	>1.000.000	Non Standar	190
2.	Big	(500.000-1.000.000)	Non Standar	170
3.	Medium	(100.000-500.000)	Non Standar	150
4.	Small	(20.000-100.000)	BNA Standar	130
5.	Subdistrict	<20.000	IKK Standar	100
6.	Centre of Growing	<3.000	DPP Standar	60

Source: SK SNI Drinking Water in PT Indah Jaya Kusuma, 2010

In SPAM Development Master Plan (RIP-SPAM) for Short-Term Pontianak will launch two programs, namely revitalization Penepat Intake and response to the reverse osmosis technology.

Intake Penepat revitalization program is a transfer of the main intake, from Imam Bonjol (the existing main intake) in Pontianak to Penepat Intake. During this time, Penepat Intake can only meet 25-30% of the drinking water needs of Pontianak at the main intake of sea water terintrusi in the dry season. Transmission pipe size used type of dimension 600 mm DCIP, and just drain the 300-600 liters/sec.

With the revitalization Intake Penepat, required replacement of transmission pipelines that can meet the needs of Pontianak, is expected to drain the water of 1.210 liters/sec to improve water supply in the city of Pontianak. In a turn of the pipe, it takes energy loss analysis calculation that occurs when raw water is transmitted.

In the liquid flowing through a pipe there is a shear stress between the fluid and the pipe wall. Shear stress is the result of the friction force, the amount depends on the nature of the fluid through the pipe, the flow rate, pipe roughness, length and diameter of the pipe (Walski, 2002). Energy loss formula (headloss) is often used Hazen-Williams formula is developed on the basis of empirical and generally only used in turbulent flow conditions. This formula is widely used in modeling the distribution of drinking water especially in the United States. Hazen-Williams formula is generally used to measure the pipe diameter ≥ 50 mm. Hazen-Williams formula as follows:

$$Q = 0.2785 \cdot C \cdot D^{2.63} \cdot (H/L)^{0.54} \quad (1)$$

Where:

Q = discharge (m^3/s)

C = The relative roughness factor

D = diameter of pipe (ft, m)

H = energy loss due to friction (ft, m)

L = distance between point 1 to point 2 (ft, m)

Each node in the hydraulics system has a certain value head. Figure 2 shows the EGL and HGL for a simple pipeline. In the hydraulics system known also another term that is EGL (energy grade line) and HGL (hydraulic grade line). EGL or energy lines are graphic statement of the energy in each section. While the amount of elevation head and pressure head results in a value of HGL, which showed a rise in water level in a small tube attached to a pipe and open to the atmosphere (Walski, 2002).

Source: Walski, 2002

Figure 2. EGL and HGL

In addition to the revitalization of Intake Penepat, also performed with the technological response Reverse Osmosis (RO) to improve the quality of drinking water. Reverse osmosis is a water purification process that removes 95-99% of most water contaminants including microorganisms, organic compounds, and dissolved inorganic compounds. Reverse osmosis uses a semipermeable membrane and pressure difference (Eckenfelder, 2010). Recovery factor in brackish water treatment by 50%. Response to the RO technology will be applied to science and Pontianak Pontianak North East. Performed the calculation of the amount of drinking water needs in the region. Use of the reverse osmosis unit will be tailored to existing capacity in the reverse osmosis plant specifications and the use of raw water capacity.

4 RESULTS AND DISCUSSION

4.1 ANALYSIS OF POPULATION PROJECTIONS

Average population increase of Pontianak from 2004 to 2008 was 14.064 people/year, with the percentage of the population as much as 2.74% per year. Based on population data in 2008, calculated the actual number of residents per year from 2004 to 2007 by using the arithmetic, geometric and least square. Based on the calculation of standard deviation of the three methods of projection, the smallest standard deviation is calculated by the method of Geometric projection, so as to estimate the number of Pontianak selected Geometric methods. RIP-based periods of SPAM, then in 2030, the population is estimated at 968.915. As for the RIP-SPAM short term, in 2015, residents of Pontianak is estimated at 646.280 inhabitants.

4.2 WATER NEED PROJECTION OF PONTIANAK CITY

By 2030, an estimated Pontianak had a need water to drink as much 2.471,229 liters/sec. For domestic needs of 1.598,530 liters/second, non-domestic needs of 378,454 liters/sec, with a loss rate of 20%. As for the RIP-SPAM short term, the calculation of the needs of domestic, non domestic, and loss of water in Pontianak from 2009 to 2015 can be seen in Table 2. With the rate of water loss by 20%, drinking water needs of the average city of Pontianak in 2015 amounted to 1.716,641 liters/sec.

Table 2. Recapitulation of drinking water need in Pontianak City

Type	2009	2010	2011	2012	2013	2014	2015
Domestic (Liters / sec)	648,442	727,119	805,871	884,623	963,375	1,042,127	1,120,879
1. Household	636,073	714,854	793,605	872,356	951,107	1029,858	1108,609
2. Hydrant	12,257	12,257	12,257	12,257	12,257	12,257	12,257
Non Domestic (Liters / sec)	214,685	220,560	226,595	232,796	239,166	245,710	252,434
1. Education Facility	4,012	4,122	4,235	4,350	4,469	4,592	4,717
2. Religion Facility	10,118	10,395	10,679	10,972	11,272	11,580	11,897
3. Health Facility	7,389	7,591	7,798	8,012	8,231	8,456	8,688
4. Trade Facility	53,671	55,140	56,648	58,199	59,791	61,427	63,108
5. Government Facility	124,864	128,281	131,791	135,398	139,103	142,909	146,820
6. Industry	14,631	15,032	15,443	15,866	16,300	16,746	17,204
Domestic and Non Domestic (L/sec)	863,127	947,678	1,032,466	1,117,418	1,202,541	1,287,837	1,373,313
Water Loss Percentage	34%	30%	25%	20%	20%	20%	20%
Water Loss (L/sec)	444,641	406,148	344,155	279,355	300,635	321,959	343,328
Rate of Water Need (L/sec)	1,307,768	1,353,826	1,376,621	1,396,773	1,503,176	1,609,797	1,716,641
Water Need in Maximum Day (L/sec) (F _m = 1.05)	1,373,157	1,421,518	1,445,452	1,466,612	1,578,335	1,690,287	1,802,473
Water Need in Peak Hour (L/sec) (F _p = 1.5)	1,961,652	2,030,739	2,064,932	2,095,160	2,254,764	2,414,695	2,574,962

4.3 REVITALIZATION PENEPAT

In the existing condition, in the dry season dry years, the pattern of operation of the City PDAM Pontianak will use the backup Penepat intake. The flow capacity of 400 liters/second which can only meet 30% of the drinking water needs of the town of Pontianak. Pipe diameter of 600 mm used with this type of DCIP. In addition, the pipeline leaks often occur when the transmission of water from the Imam Bonjol Penepat IPA due to the unfavorable environment. Transmission pipeline will pass through a very thick peat soils with high soil acidity, which can cause corrosion on the pipe type of DCIP. Therefore, needed to be revitalized Intake Penepat.

Revitalization Penepat done to improve drinking water facilities and services. In 2012, WTP Imam Bonjol Pontianak will be adding a capacity of 300 l/sec, so that its capacity to 1.160 liters/sec, which was originally only 860 liters/sec. Sungai Jawi WTP (SJL) with a capacity of 50 liters/sec. Intake Penepat will be increased so that its capacity to 1.210 liters/sec, the transmission pipeline which will be used with 800 mm diameter HDPE type, so that no leakage of the pipe due to corrosive and erosion. Comparison of types of pipe material can be seen in Table 3.

Table 3. Comparison of Types of Pipe Materials

No.	Materials	Standard	Corrosive and Erosion	Strength
1.	<i>Reinforced Concrete</i>	ASTM C76	Not Hold	Strong
2.	Tanah Liat	ASTM 700	Hold	Delicate
3.	Pipa Asbes	AWWAC 400	Not Hold	Strong
4.	<i>Cast Iron</i>	AWWAC 100	Not Hold	Very Strong
5.	Pipa Baja	AWWAC 200	Not Hold	Strong
6.	PVC	ASTMD 302	Hold	Enough
7.	HDPE	ASTM D3212	Hold	Strong

To drain the discharge of 1.210 liters/sec from Intake Penepat to Imam Bonjol IPA with 800 mm diameter pipe, it takes three times the pumping, the pumping of the Intake Penepat, Mandor, Parit Adam. It is based on a previously existing condition and availability of land investment. Energy loss at the raw water transmission shown in Figure 3.

Figure 3. The relationship between the head (EGL and HGL) and the distance intake penepat to IPA Imam Bonjol

4.4 USE OF REVERSE OSMOSIS FOR THE EASTERN ZONE OF PDAM PONTIANAK

Based on the calculations, the drinking water needs of the average for the East Zone of PDAM Pontianak in 2015 was 213.45 liters/sec $\square$ 250 liters/sec. From the existing specifications in the CV X, will use reverse osmosis which has a capacity of 50 m³/hr or 13.899 liters/sec. In the brackish water treatment, recovery factor which is owned by the RO of 50%. So that the unit of raw water needed to produce 250 liters/second is equal to 500 liters/sec. Reverse osmosis machine that required a number of 36 units to meet the needs of drinking water Zone East of PDAM Pontianak until 2015.

4.5 USE OF REVERSE OSMOSIS FOR THE NORTHERN ZONE OF PDAM PONTIANAK

Based on the calculations, the drinking water needs of the average for the North Zone of PDAM Pontianak in 2015 was 322.29 liters/sec $\square$ 325 liters/sec. From the existing specifications in the CV X, will use reverse osmosis which has a capacity of 50 m³/hr or 13.899 liters / sec. In the brackish water treatment, recovery factor which is owned by the RO of 50%. So that the unit of raw water needed to produce 250 liters/second is equal to 650 liters/sec. So it takes a reverse osmosis some 46 units to meet drinking water needs of the North Zone of PDAM Pontianak until 2015.

4.6 DISCUSSIONS WITH REVERSE OSMOSIS TECHNOLOGY RESPONSE

The use of CV X RO based on the capacity of the company's RO in water treatment is large enough compared to other plants. RO units can be seen in Figure 4. But this is an example of the use of the RO from the factory. The use of RO for water treatment needs to be calculated again. RO technology has several features and can be used in large quantities for the separation process. RO process advantages include: the separation can take place continuously, typically low energy requirements, membrane processes can also be combined with other separation processes, does not require extreme conditions (using temperature and room temperature), it is easy to be enlarged (up-scaling), membrane properties are variables that can be set up, requires no addictive ingredients.

Source: CV X, 2012

Figure 4. Machine RO 50 m³/jam

However, the RO should consider several things such as membrane clogging (fouling), the age of low membrane (RO membrane should be replaced every 2-3 years), the procurement of reverse osmosis machines are quite expensive, and required a skilled operator labor for maintenance operation. However, the use of reverse osmosis has been applied in several islands in the Kepulauan Seribu (Jakarta). In other cities in Indonesia will also implement a reverse osmosis system as a water treatment unit, which is in Tanjung Pinang - Riau and Balikpapan. RO is also used in other countries, namely Singapore and Germany.

4.7 SCENARIO DEVELOPMENT SPAM PONTIANAK

In 2015, based on the scenario development SPAM Pontianak as shown in Table 4, shows that the level of service in the city of Pontianak reached 92.64%, which is expected to exceed the MDG target population has access to potable water reached 82.5%.

Table 4. Scenario Development SPAM Pontianak

No	Description	Unit	Skenario						
			2009	2010	2011	2012	2013	2014	2015
Inhabitant	Person		549.636	564.676	580.128	596.002	612.311	629.066	646.280
Level of Service	%		65,24%	70,59%	75,61%	80,31%	84,71%	88,82%	92,64%
Level of Service (dry season)	%		33,06%	33,06%	33,06%	80,31%	84,71%	88,82%	92,64%
3	Total of Household Connection	Household	64.655	72.663	80.668	88.672	96.677	104.682	112.687
Level of Leakage	%		34%	30%	25%	20%	20%	20%	20%
Raw Water Need									
Leakage	l/sec		444,637	406,144	344,152	279,352	300,632	321,956	343,325
Rate of Water Need	l/sec		1.308	1.354	1.377	1.397	1.503	1.610	1.717
Water Need in Maximum Day	l/sec		1.373	1.422	1.445	1.467	1.578	1.690	1.802
Water Need in Peak Hour	l/sec		1.962	2.031	2.065	2.095	2.255	2.415	2.575
Source of Raw Water									
A. KAPUAS/LANDAK RIVER									
a. WTP in Imam Bonjol 1, 2, 3, 4	l/sec		860	860	860	1.160	1.160	1.160	1.160
b. WTP in Sungai Jawi Luar	l/sec		50	50	50	50	50	50	50
WTP in Selat Panjang	l/sec		300	300	300	300	300	300	300
WTP in EastPontianak	l/sec		0	0	0	0	300	300	300
B. PENEPAT INTAKE and RO (Dry Season)									
a. WTP Imam Bonjol 1, 2, 3, 4 (Penepat)	l/sec		400	400	400	1.160	1.160	1.160	1.160
b. WTP Sungai Jawi Luar (Penepat)	l/sec		0	0	0	50	50	50	50
WTP Selat Panjang North Pontianak (RO)	l/sec		0	0	0	210	250	300	325
WTP East Pontianak(RO)	l/sec		0	0	0	200	200	200	250
Total of Water in Stock	l/sec		1.210	1.510	1.510	1.510	1.810	1.810	1.810
Total of Water in Stock (Dry Season)	l/sec		400	400	400	1.620	1.660	1.710	1.785
Defisit/surplus	l/sec		-98	-144	-167	113	307	200	93
Defisit/surplus (Dry Season)	l/sec		-908	-954	-977	223	157	100	68

5 CONCLUSION

From the research results can be summarized as follows:

1. Master Plan of SPAM Development is a long-term plan (15-20 years) who are part or the early stages of planning a network of piping and water piping network is not based on the projected water demand in a period that is divided into several stages.
2. Master Plan of SPAM Development (RIP-SPAM) Pontianak is a short-term planning strategies and development of raw water sources SPAM Pontianak is adaptive to the carrying capacity of nature/the environment in coastal areas Kapuas (highly colored raw water during the rainy season in the wet climate and get intrusion in the dry season).
3. Short-term of RIP-SPAM Pontianak is revitalization of Penepat Intake and using reverse osmosis. Short term of RIP-SPAM is to achieve the 2015 MDG target of 82.5% of the population has access to drinking water in the city of Pontianak.
4. Revitalization Penepat will improve services, the discharge flow of 1.210 liter/sec. Transmission pipe 600 mm DCIP will be replaced with 800 mm HDPE, using three times the pumping, which is in Intake Penepat (head 40 m), Mandor (head 75 m) and Parit Adam (head 35 m).
5. Technology Response to the reverse osmosis is expected to improve the quality of drinking water. With the recovery factor by 50% in the brackish water treatment, then in 2015, in the Eastern zone of PDAM Pontianak planned to use 36 unit RO and the northern zone of PDAM Pontianak planned to use 46 unit RO. RO machine that is used comes from CV X with a capacity of 50 m³/hr.
6. Based on the scenario development SPAM, Pontianak be served at 92.64% (exceeding the target MDGs).

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