

# SOLID WASTE MANAGEMENT IN MANADO CITY

## *Existing Conditions and Future Plans*

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*Mayor of Manado City*

### **References :**

- ① Book of Manado in Figures (Manado Dalam Angka), *Statistics Central Department of Manado, 2014*
- ② Climate Change Vulnerability Assessment Manado, *Kota Kita Foundation, 2014*
- ③ Detailed Engineering Designs of Solid Waste Facilities for Tangerang, Balikpapan and Manado, *Indonesia Infrastructure Initiative (IndII), 2014*
- ④ W274.01 Feasibility Study for World Bank Solid Waste Improvement Project, *Indonesia Infrastructure Initiative (IndII), 2013*
- ⑤ Middle Term Development Plan (RPJMD) of Manado City 2010-2015, *Manado City Government, 2010*
- ⑥ Strategic Plan of The Sanitation & Parks Agency of Manado City, 2010-2015

# I. CITY OF MANADO OVERVIEW



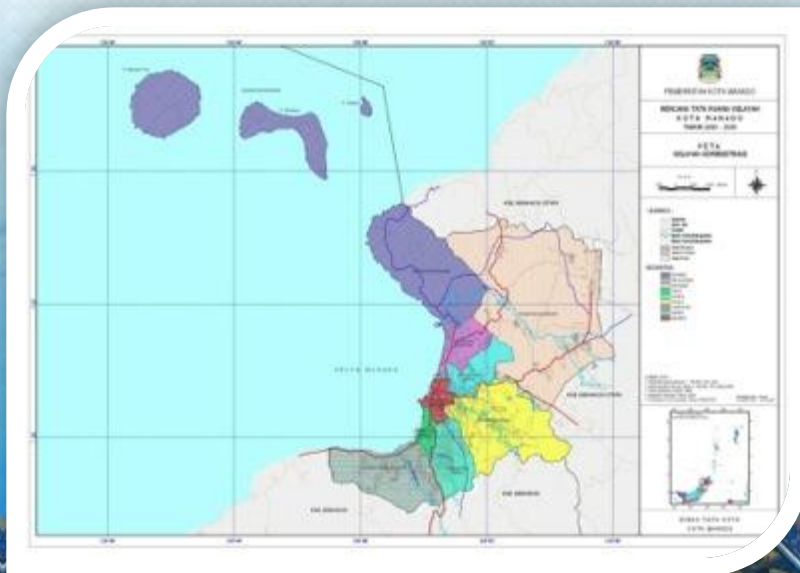
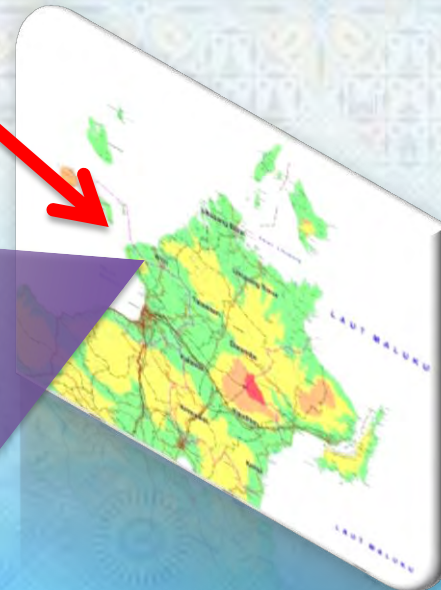
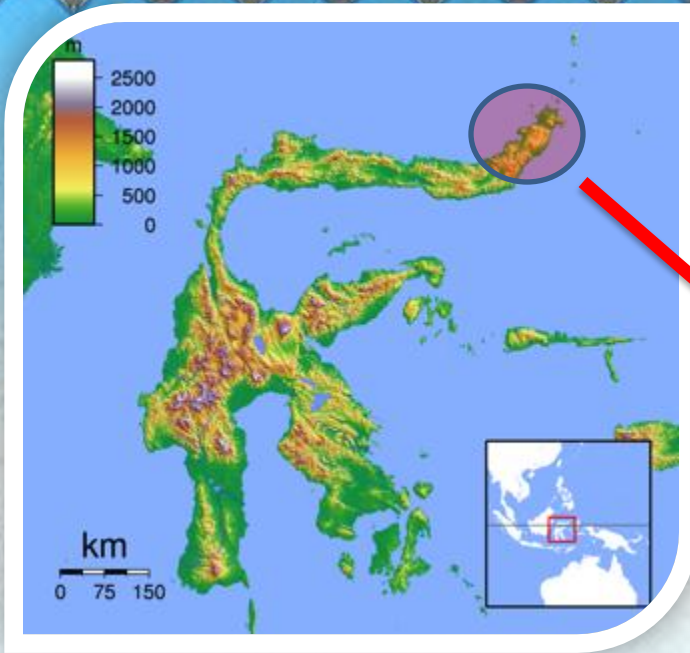
# MANADO IN REGIONAL AREA

- Manado is the capital city of North Sulawesi province
- To the north, the region borders the Philippines, Sulawesi Sea and the Pacific Ocean.
- Manado is located at the Bay of Manado, and is surrounded by mountainous regions to the east and south. This mountainous terrain includes many volcanoes, some of which are active.
- Rich volcanic ash makes the land in North Sulawesi very fertile. The highland and lowlands produce rice, corn, coconut, clove, nutmeg, vanilla and a variety of vegetables. The North Sulawesi landscape has many lakes and rivers, most of which are utilized for irrigation of rice fields. The Tondano River is also used to generate electrical power for the Manado and Minahasa region.



# GEOGRAPHICAL SITUATION

- Manado City locates between  $1^{\circ} 30' - 1^{\circ} 40'$  North Latitude and  $124^{\circ} 40' - 126^{\circ} 50'$  East Longitude
- The area of Manado City is 15.726 hectares (157,26  $\text{km}^2$ ). Due to the reclamation on Manado Bay started by 1995, Manado City area was expanded to 67 hectares.



# HOW TO GET TO MANADO CITY



- Manado city is located in the northern part of Sulawesi Island. An island shaped like a K letter in Indonesia
- The city can be reached by Airplane from Fukuoka Airport about 11 hours via Singapore or Jakarta

# CLIMATE SITUATIONS

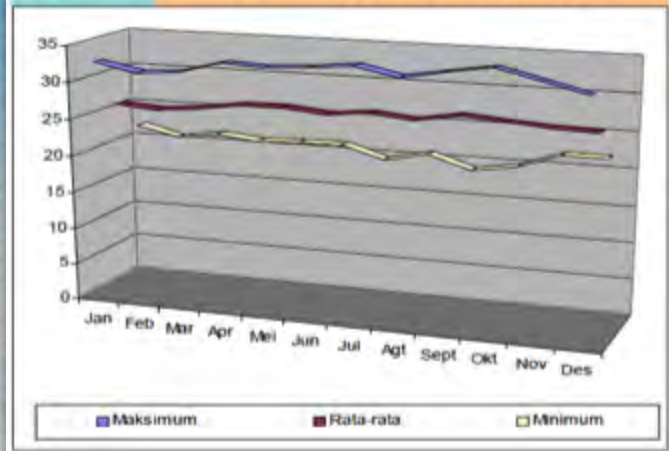
- As the area located in equator line, hence Manado City only recognizes two seasons: rains and drought. Rainfall is determining by climate circumstance, circumstance of orography, and rotation/meeting of air current. Therefore, number of rainfall varied according to month. Based on the observation at Meteorology Station of Manado, mean of rainfall during year 2007 ranging from 67 mm (September) to 574 mm (January).
- Temperature of air is determining by height to sea level and distance from coast. The average temperature of air in the daytime ranged from 31,0°C to 34,9°C, while temperature of air ranged from 19,1°C to 22,0°C..
- Manado City has relatively high humidity ranges from 71 percent in September to 86 percent in Januari-February.
- Mean of wind velocity in Manado City ranges from 2,2 – 5,1 knots.

GAMBAR 1.3.

Subu Udara Maksimum Dan Minimum Tahun 2007  
(Dalam Derajat Celsius)

Figure 1.3

Maximum and minimum temperature by month (Celsius degrees), 2007



GAMBAR 1.4.

Kelembaban Nisbi Menurut Bulan Pada Pengukuran Stasiun  
Geofisika Manado

Figure 1.4

Relative humidity by month at measurement of Meteorology Station



# MANADO FACTS

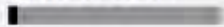
415,114

POPULATION



6.4%

%HH IN POVERTY



## LAND

Total Land Area	15,726 ha
# of Districts	9 → 11
# of Neighborhoods	87
% Residential	24.2 %
Population Density	26 people / ha
% Open Space	71.7 %
Open Space per 1,000 persons	11.3 ha

## ECONOMY

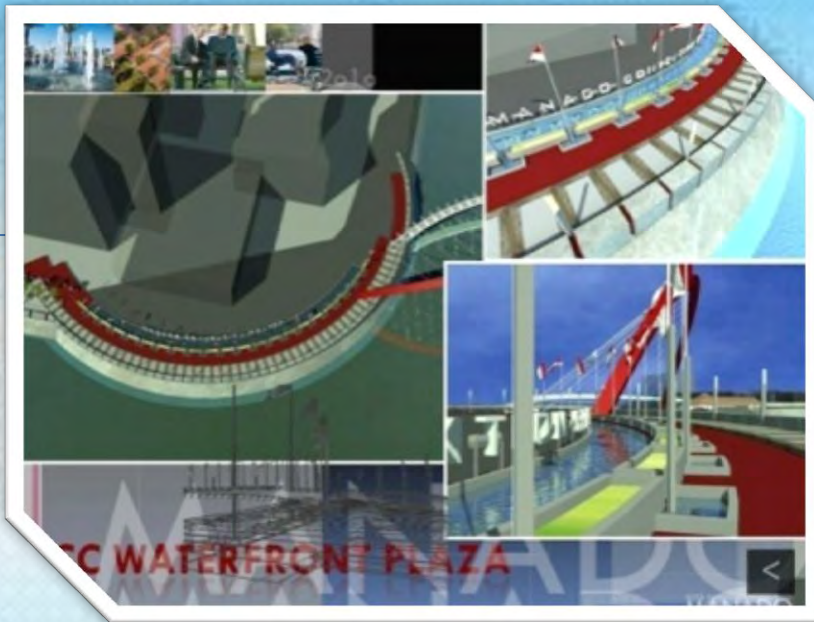
Economic Sectors (% of GDP in 2011)

Agriculture	1.7%
Manufacturing	5.5%
Utilities	0.6%
Construction	15.5%
Trade, Hotel, Restaurant	27.8%
Transportation and Communication	16.9%
Finance & Business Services	9.0%
Other Services	23.0%

Figure 8: Manado city profile figures and regional road network map  
Source: Manado In Figures, 2013

- Manado has a population of just under 500,000 inhabitants. Though Manado is not a large city, it plays an important role in the region due to its growing economy and position as the provincial capital of North Sulawesi.
- Given that it has an international airport, seaports, hosts national and international conferences and hotel infrastructure of a city twice its size, it has characteristics of a much larger city.
- There are a number of ambitious projects that our city is undertaking that reflect its regional importance, including: the extension of the airport runway, a new regional bus terminal, a new port for cruise liners, a ring road, and coastal reclamation projects to promote commercial and real estate development projects.

# VISION



Vision has become a declaration seems so brief but interesting or really challenging that makes it easy to remember but substantially would be able to figure out what goal to reach related to the programs offered by the city mayor when he was still a condidate as we have known that the middle term development to Manado city 2011-2015 is as follows”

***Vision:  
“Manado Model City For  
Ecotourism”***

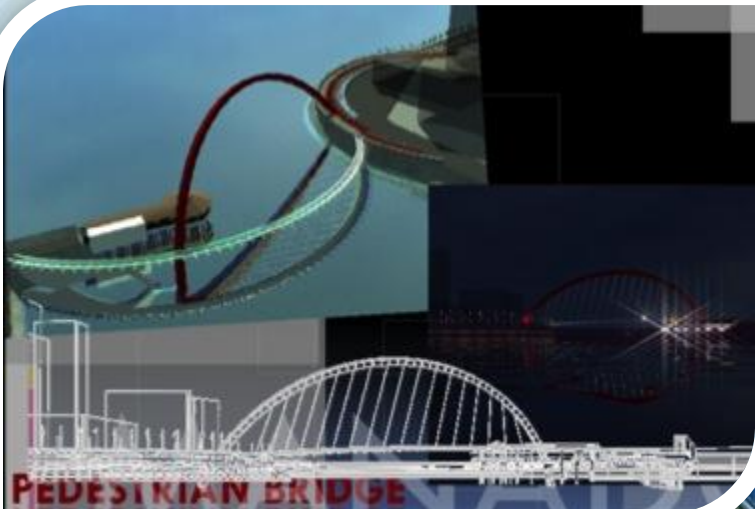


# MISSION

In order to make the mission easy to remember by all stakeholders that how the vision will be implemented, then the mission was formulated in a simple but meaningful sentence, that is;

**Mission:**

***“To make Manado a city of happiness”***



PEDESTRIAN BRIDGE

# GRAND STRATEGIES



In order to spelling out mission and clarifying the five years ahead, grand strategy goals for the development of Manado City has determined as follows:

1. Creating qualified living society, harmonious and peace.
2. Creating healthy environment of city.
3. Developing identity and image of city as a world ecotourism model.
4. Promoting role of Manado City in the development of regional economic.
5. Implementing good governance management.



# *For Interreligious Harmony, People of Manado has a Life Slogan of "We Are All Brothers"*

- **The existence of the understanding/high tolerance among different communities and live in peace in Manado**
- **Visit each other and congratulating on every religious holidays has become a culture from generation to generation in the city of Manado.**
- **In fact, every year, it was a customary for Muslims to guard churches when the congregations were worshiping at the feast of Christmas and new year. The same is also done by Christians in worship feast of Eid al-Fitr.**

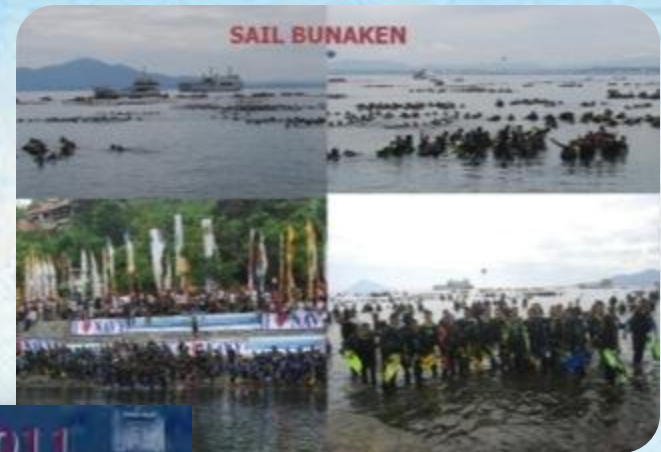


**The condition of Interreligious harmony has become a harmony model in Indonesia and the people can maintain a sustainable safe and comfort of the city. The results are:**

- 1. A stable city that attracts migrants from nearby islands and localities where internal conflicts and ethnic strife have made daily life difficult. It is seen as a receptor city for those wishing to flee and seek refuge. These migrants often settle in peripheral,**
- 2. Many investors are investing in the city of Manado. So that many business centers and malls were built and changed rapidly the face of the city to the metropolis.**



### 3. The city has become one of the important MICE (Meetings, Incentives, Conferences, and Exhibitions) destination city in Indonesia



4. Bunaken marine park and other tourist locations in the city of Manado has become increasingly popular and visited by many foreign and domestic tourists.



**Bunaken Marine Park**



**Culinary location at night in Manado Boulevard**

# II. CITY OF MANADO SOLID WASTE MANAGEMENT

## KETERANGAN GAMBAR :

- A. Pintu Masuk / Keluar TPA
- B. Pos Jaga/Pencatatan Retasi
- C. Blok Pembibitan
- D. Tempat Cuci Mobil
- E. Kantor / Hanggar Alat Berat / Armada Sampah
- F. Blok Pengomposan I
- G. Tempat Parkir Kendaraan
- H. Blok Penghijauan
- I. Taman
- J. Blok Pemulihan
- K1, K2, K3. Taman Penghijauan
- L. Jalan Penghubung
- M. Blok Pemilahan
- N. Jalan masuk Blok Sanitari Control Landfill
- O. Blok Sanitari Control Landfill
- P. Blok Pengomposan II
- Q. Jalan Menuju IPAL Lindi
- R. IPAL Lindi
- S1, S2 Sumur Pantau
- Jalan
- Batas TPA
- Pohon / Penghijauan



# THE EXISTING SOLID WASTE MANAGEMENT SYSTEM IN MANADO

## SUMOMPO LANDFILL (EXISTING LANDFILL IN MANADO)

Since 1967, waste collection system in Manado City is served by the Sumompo Landfill as an existing waste disposal facility. It is located approximately 5 km northeast of the Manado city centre; 2.1 km inland east of the Bay of Manado & the Celebes Sea, and 7.2 km southwest of the Sam Ratulangi International Airport. The landfill site is centred at approximately Latitude  $1^{\circ} 31' 10.6''$  S, Longitude  $124^{\circ} 51' 28.9''$  E





# THE EXISTING SOLID WASTE MANAGEMENT SYSTEM IN MANADO



- Sumompo Landfill currently has about 7 ha in plan area
- The landfill consists of an open dump constructed on the side of a steeply sloping valley
- Prior to 2009, waste was placed without containment or collections systems. An engineered waste disposal cell/ leachate treatment plant (LTP) was constructed
- From late 2009. From 2010 waste was been placed in and above the sanitary cell area, and subsequently across much the entire site area, in some areas with very steep slopes (less than 1:1 slopes on the northern side) with little/ no cover soil.

# THE EXISTING SOLID WASTE MANAGEMENT SYSTEM IN MANADO



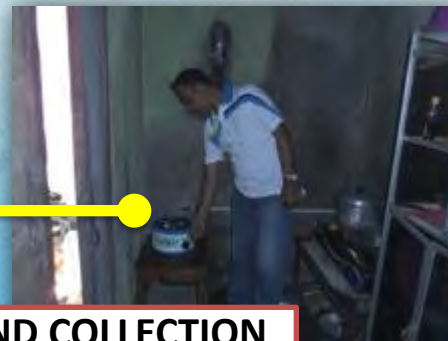
GATE



INCINERATOR



LANDFILL GAS EXTRACTION AND COLLECTION



WASTE THRASHER

# THE EXISTING SOLID WASTE MANAGEMENT SYSTEM IN MANADO

## PROBLEMS OF SUMOMPO LANDFILL



**The Waste Mountain in Sumompo Landfill**

- The landfill is near saturation with no working leachate treatment system, resulting in pollution of local water courses.




## THE EXISTING SOLID WASTE MANAGEMENT SYSTEM IN MANADO

### The current status of the waste collection and street cleansing system:

**1)The household waste collection system** for Manado is managed by the Sanitation & Parks Agency and to have a coverage efficiency of approximately 75% of the city. City Government will achieve the requirement to improve the efficiency to 80% by 2014.

**2)Service Area/Population:** The Sumompo Landfill serves the City of Manado which comprises 11 districts covering an area of 157 km<sup>2</sup> except the Bunaken Islands. Some 86,000 tonnes (235 tpd) were collected in 2013. Population in 2010 was reported at 410,000 and had increased at about 1% per year over the prior decade.

**3)Collection & Transport:** Waste is delivered to the Landfill by a fleet of 20 dump trucks, 20 arm roll trucks and 10 pick-ups.



## THE EXISTING SOLID WASTE MANAGEMENT SYSTEM IN MANADO

### **The current status of the waste collection and street cleansing system:**

- 4) Results of Capacity analysis:** Currently 1 Refuse Collection Vehicle (RCV) per 6,125 inhabitants, which would mean that a daily amount of 15.7 m<sup>3</sup> needs to be collected, assuming a generation rate of 2.56 lt/capita/day. This volume of waste can be collected by each average 8 m<sup>3</sup> RCV, assuming daily collection, 2 rounds per day.
- 5) Institutional Arrangements:** Dinas Kebersihan dan Pertamanan (the Sanitation & Parks Agency) in 2009 developed a SWM Master Plan and a DED for Somompo landfill. A City Sanitation Strategy (SSK) is being finalized. The City has received 7<sup>th</sup> times of Adipura environmental awards, as the highest award for the cleanest city (well managed of SW system) in Indonesia.


# CAPACITY BUILDING IN THE COMMUNITY BY APPLYING 3R (REDUCE, REUSE, RECYCLE) METHOD

- The 3R's of Reduce, Reuse, Recycle has been already partially implemented informally. Although not yet entrenched, but some people are already doing 3R.
- Re-use and recycling in Manado occurs at numerous levels through door-to-door collections, waste picking at TPS, direct sales to local collectors or recovery at landfill by local waste pickers.





# Government Efforts

- In 2009, the City Government reportedly developed a SWM Master Plan and a DED for Somompo landfill. On that time, the Master Plan and the DED can not be realized because of limited funds and the difficulty of land acquisition is done,
  - Preparing A City Sanitation Strategy (SSK),
  - With the existing resources and capabilities, Manado City Government and the people always striving to maintain the cleanliness of the city. The City has recently received an Adipura environmental award,
  - The Government of Indonesia is requesting funding to finance its Solid Waste Management Improvement Project for Regional and Metropolitan Cities. As part of this proposed World Bank-funded project, the Feasibility Studies and Detailed Engineering Designs (DEDs) for the improvement of Manado existing solid waste management (SWM) facilities has been carried out by the Indonesia Infrastructure Initiative (IndII) through Mott MacDonald consulting and EnviroSolutions & Consulting Limited (ESC) in association with Arkonin Engineering MP (Arkonin),
  - Exploring other funding partnership for the development of solid waste management work in Manado.
- 

# FUTURE PLANS AND DEVELOPMENT STRATEGY

- **LANDFILL EXPANSION AND OPTIMIZATION**  
The landfill is nearing capacity with estimated space for less than a year's waste under the current conditions. The city plans to purchase a 2-3 ha block of land in 2014, and for a longer term plan to purchase up to 20 ha of land. The expanded landfill can be applied the method of semi-aerobic sanitary landfill system was developed jointly by Fukuoka City and Fukuoka University. This system is known as a standard for municipal disposal sites in Japan. For developing countries, the Fukuoka Method is probably a good application system since it is fit local conditions and relatively low cost to operate.
- **DEVELOP THE MECHANICAL BIOLOGICAL TREATMENT (MBT)**  
The MBT facility is one technology that is thought to be developed in Manado. It will be provided working space an area of land of approximately 12,000 m<sup>2</sup>.



*MBT is an appropriate technology for producing Refuse Derived Fuel*



# FUTURE PLANS AND DEVELOPMENT STRATEGY

- **IMPROVEMENT OF LEACHATE TREATMENT FACILITY (LTF)**

The existing facility is ineffective. It may be possible to achieve some degree of improvement by converting anaerobic ponds and facultative ponds to aerated ponds.

- **DEVELOP COMPOSTING FACILITIES AND SOCIALIZING COMPOSTING TECHNIQUES FOR MANAGING HOME SOLID WASTE**

A 21,500 tons per annum (tpa) green waste composting facility is required. This does not have to be constructed at the landfill site, but if it is then this will have to be placed on top of the landfill, as no other land is available

- **OBLIGE PEOPLE TO BE MORE DISCIPLINED IN TAKING OUT THE TRASH IN A WAY OF 3R**



# TERIMA KASIH ⇔ ARIGATOU GOZAIMASU

