



# Towards A Low Carbon Solid Waste Management in West Papua

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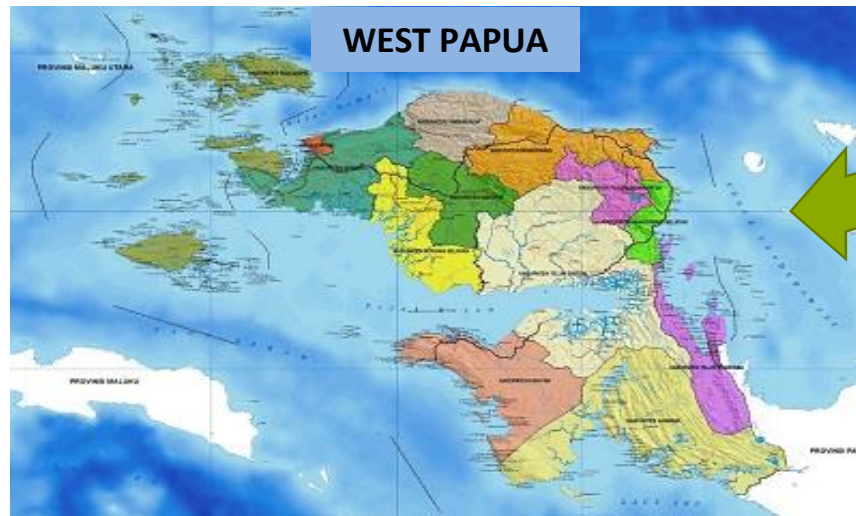
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# INTRODUCTION



The increasing population (a population growth rate in West Papua 2.65% per year) will create unavoidable consequences for increasing waste volume which could give serious impact on the environment if it is not properly managed.

To conserve local and global environment, a proper waste management is deemed pivotal and should be an integral part for public and environment health.





# Waste composition in West Papua

Most of solid waste produced has not been managed properly, due to :

- Lack of awareness in waste management
- Inadequate knowledge and skills

Proper solid waste management is needed as any type of waste has an impact on GHG emissions and pollutants.



1. Waste collection from household, industry, commercial sectors



2. Waste transported to public waste bins at several point areas



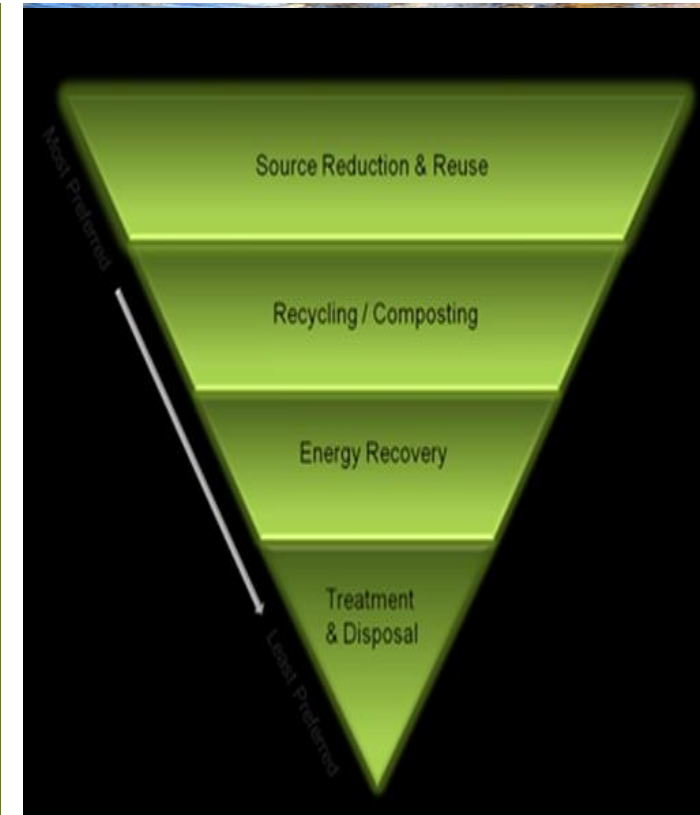
3. Waste from public bins are taken to landfill for disposal

## Waste management system in West Papua

# OBJECTIVES

1. To assess GHG emissions from solid waste generated in West Papua from 2010-2030
2. To propose the minimum portion of waste to be managed in order to maintain GHG emissions at convenient level with the available capacity in West Papua.

This study emphasizes system dynamic model to estimate waste generation and GHG emission in accordance with NDC target of emission from waste.



# METHODS

- Data consisted of total population, GDRP, annual income per capita and solid waste components (independent variables) to obtain the solid waste emission.
- All data is formulated using System Dynamics Model to simulate the GHG emission and its intervention for mitigation action.
- Variables relations of the solid waste emission was simulated using *Powersim Studio Academic 2010*.

- To obtain the best scenario of low C emission from solid waste, this study provides 2 system models to depict the existing/ BAU waste generation and proposed model to reduce GHG emission from waste.
- The validation process is using AME (Absolute Mean Error) method.

**Table 1. General variables for solid waste dynamic model simulation**

No	Variable Name	Unit	Source/Estimation Method
1	GRDP West Papua	billion	BPS Report West Papua 2010-2018 [9]
2	Total Population	number	
3	Solid Waste	ton	National Enviromental Quality Index Report 2010-2018 [13]
4	Landfill Capacity		

**Table 2. GRDP, population number and solid waste generated in West Papua from 2010 to 2018**

	GRDP (in Billion)	Population Number	Solid Waste (Ton) *	Landfill Capacity (Ton) **
2010	41,361.7	760,422	62,623.0	2,000,000
2011	42,867.2	785,979	64,186.9	2,060,000
2012	44,423.3	806,995	79,284.7	2,121,800
2013	47,694.2	828,293	87,223.9	2,185,454
2014	50,259.9	849,809	89,535.3	2,251,017
2015	52,346.5	871,510	91,908.6	2,318,548
2016	54,711.3	893,362	94,343.5	2,388,104
2017	56,906.8	915,361	96,843.7	2,459,747
2018	60,453.6	937,458	99,410.0	2,533,540

# RESULTS

## 1. Existing/BAU Scenario (2010-2018)

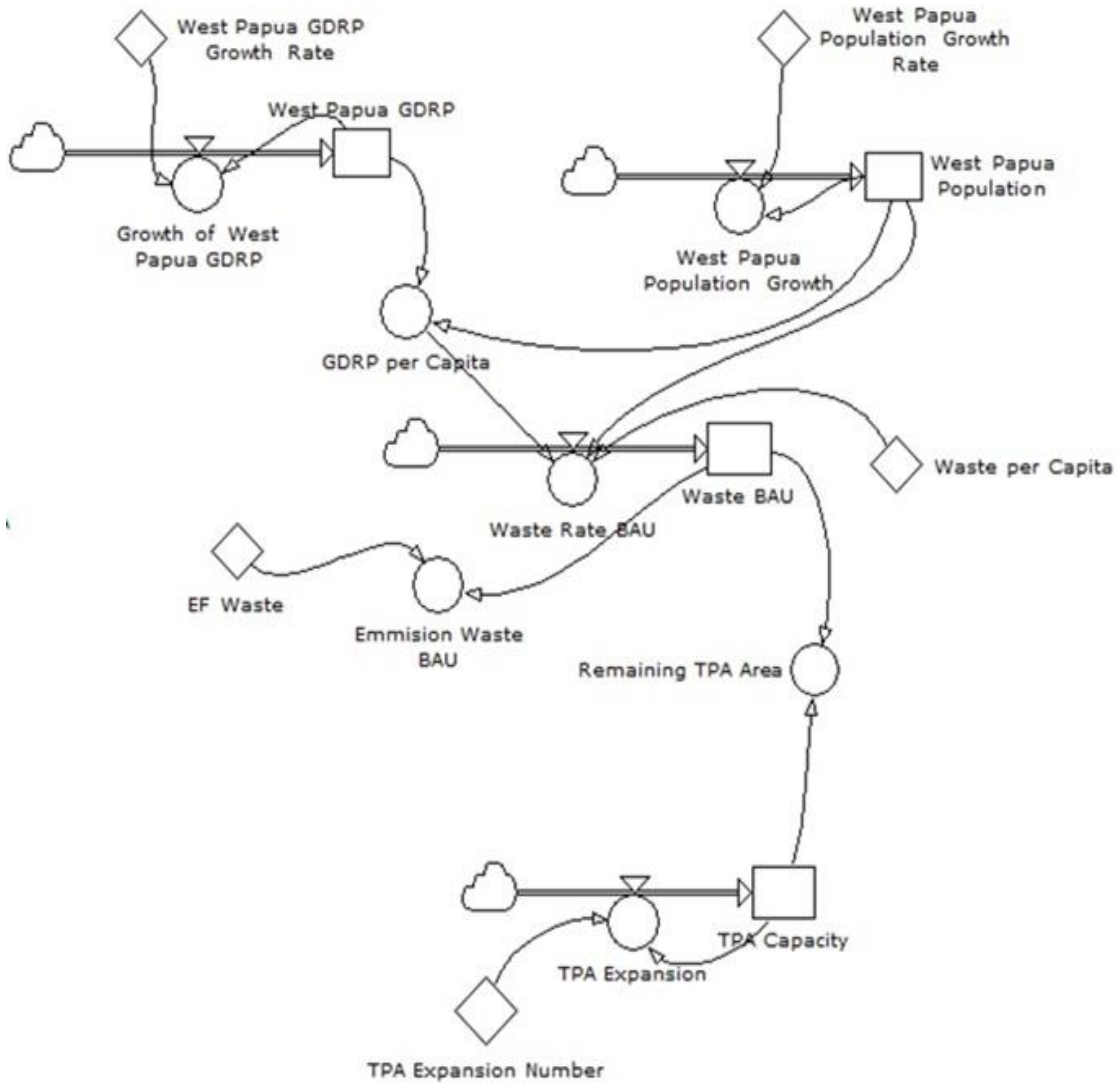
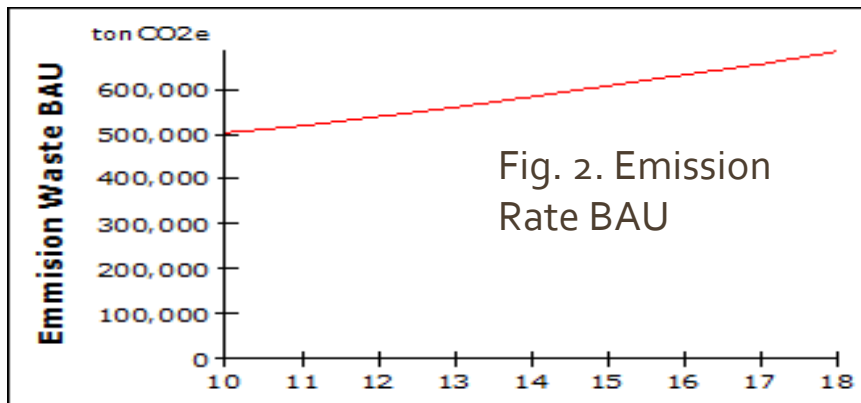


Fig. 1. Existing/BAU Simulation Model

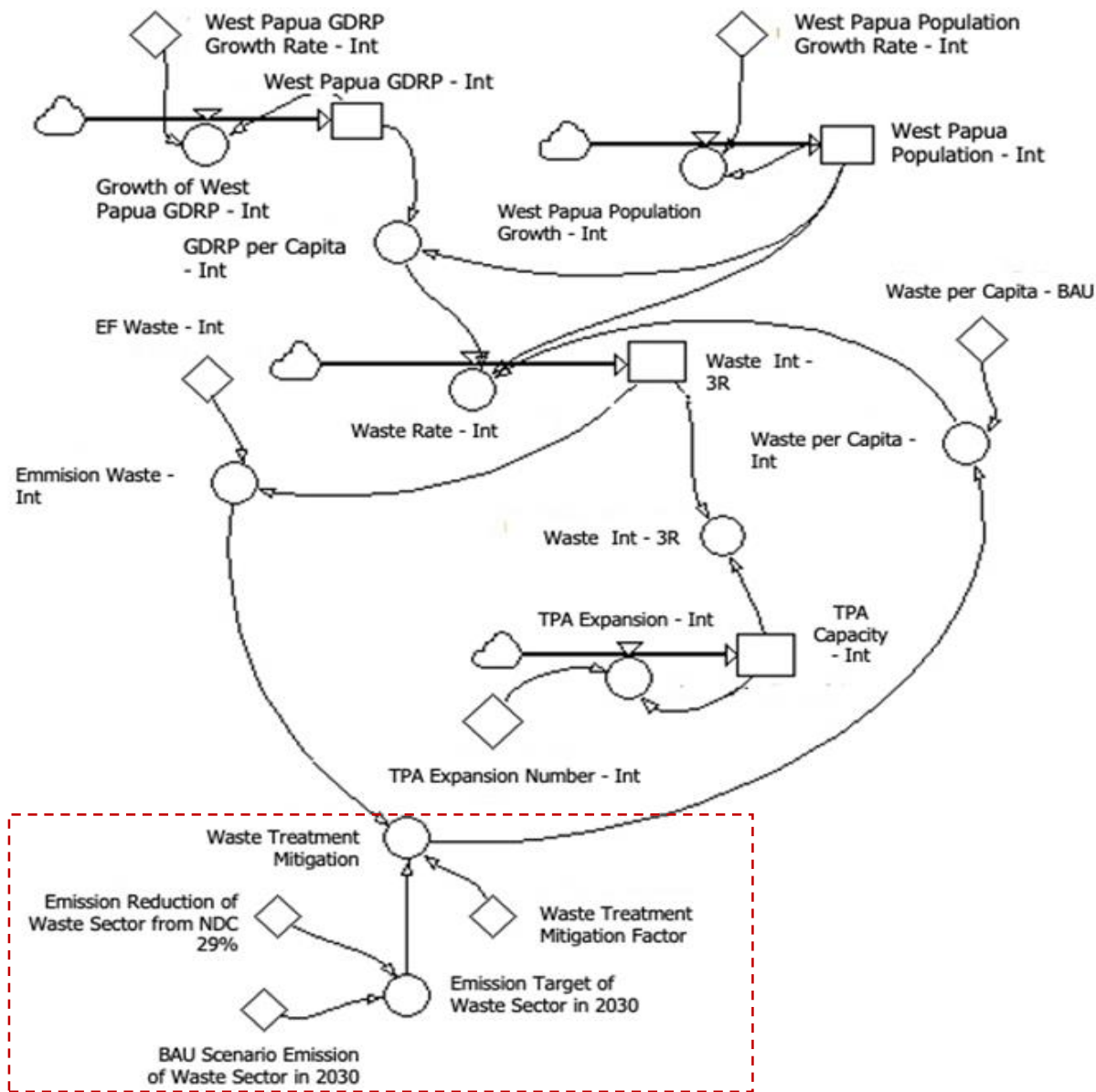
Table 3. Validation of BAU model

Year	Total GRDP (Billion)		Total Population (People)	
	Data Collection	Simulation	Data Collection	Simulation
2010	41,362	41,362	760,422	760,422
2011	42,867	43,512	785,979	780,573
2012	44,423	45,775	806,995	801,258
2013	47,694	48,155	828,293	822,492
2014	50,260	50,660	849,809	844,288
2015	52,346	53,294	871,510	866,661
2016	54,711	56,065	893,362	889,628
2017	56,907	58,980	915,361	913,203
2018	60,454	62,047	937,458	937,403
<b>Average</b>	50,114	51,095	849,910	846,214
<b>AME</b>	<b>1.96%</b>		<b>0.43%</b>	





• 2. Proposed Scenario (2021-20130)



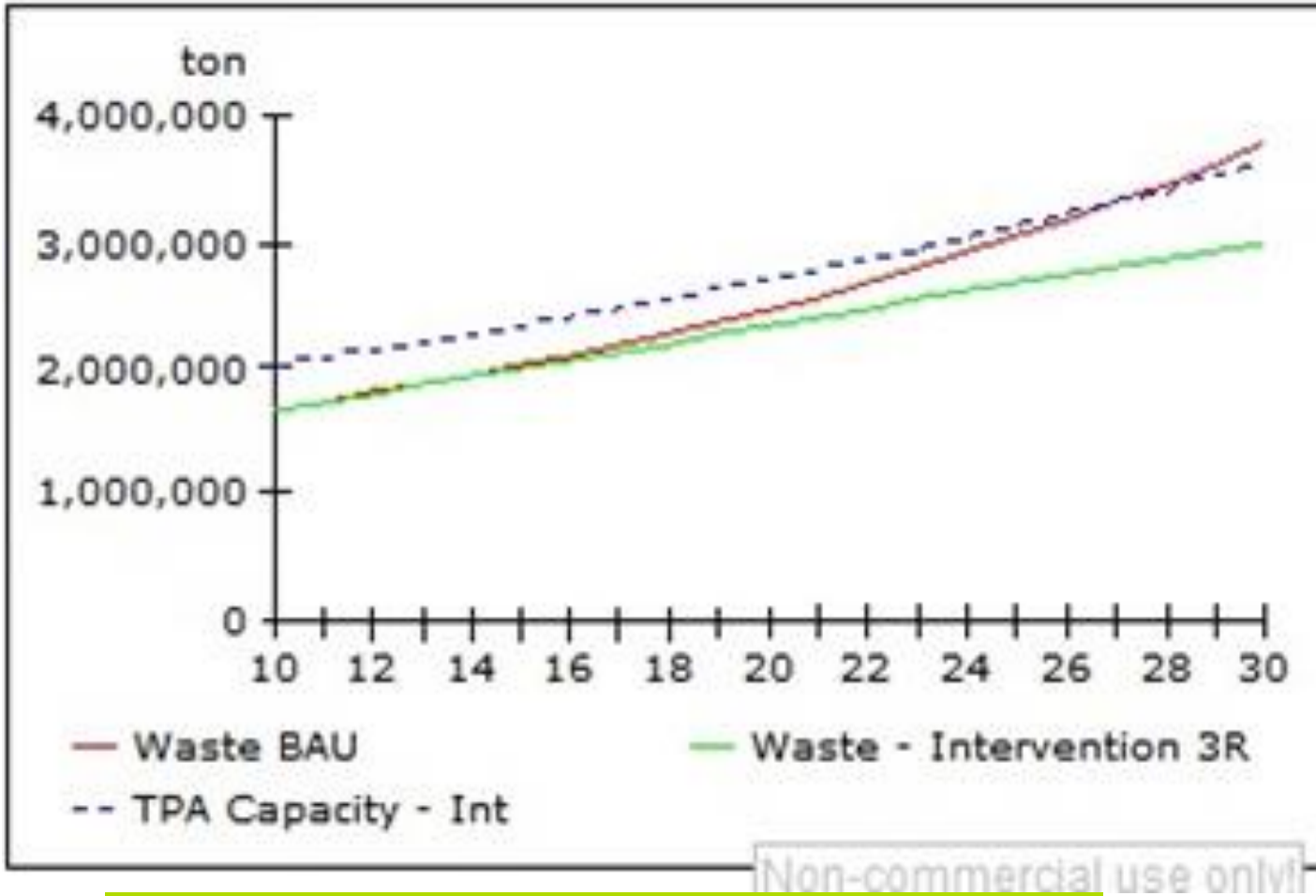
Intervention to mitigate the increasing waste rate is added by having waste processing and/or treatment (Fig 3). The amount of intervention is aligned with 29% NDC target reduction from waste emission (Table 4).

Table 4. Emission reduction target

Sector	2030 GHG Emission Rate (MtonCO <sub>2</sub> e)		GHG Emission Reduction	
	BAU	CM1	(MtonCO <sub>2</sub> e)	% of BAU
<b>Waste</b>	296	285	11	0.38%

Fig. 3. Proposed scenario with waste treatment intervention





**Fig. 4. Waste BAU vs Waste Treatment Intervention vs Landfill Capacity**

- By exercising the proposed model, total waste generated will reduce to 2,991,409 ton compared to the existing/BAU model that will produce 3,785,257 ton in 2030.
- Total emission from waste also will reduce up to 897,422 tonCO<sub>2</sub>e or equivalent with 27% emission reduction which close to NDC target of 29% emission reduction.
- Not only waste intervention, this model also proposes extension of landfill capacity at 3% per annum to cater the rapid increment of solid waste generation.
- The 3% per annum capacity extension would cater the need of waste landfill up to 2030 if the waste treatment was implemented





## CONCLUSIONS

- The aforementioned proposed models are able to estimate total solid waste produced and its GHG emission in West Papua. **By 2030**, West Papua will produce abundance of solid waste about **3.785.257 million ton** and produce GHG emission up to **1.135.577 tonCO<sub>2</sub>e** if the **BAU** waste management remains.
- As part of the NDC target to reduce GHG emission, new scenario is proposed by applying intervention on the BAU model with proper solid waste treatment.
- By exercising the proposed scenario, **West Papua is obliged to process their waste up to 118.297 ton/year** to maintain the **GHG emission at 897.422 ton CO<sub>2</sub>e in 2030** and meet the NDC 29% emission reduction target.
- **Landfill capacity** should be increased by at least **3% per annum** to cater the upcoming solid waste capacity as the population and GRDP keep increasing.



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# Thank You

