

5. Solid Waste Situation

Approximately 150 ton per day of municipal solid waste were collected and disposed of by the Samui Municipality. At present, the Municipality of Samui Island is growing rapidly and the amount of solid waste produced is expected to more than double in the next 20 years. The collection and disposal of this ever increasing waste stream is a very difficult and expensive problem and requires careful planning so that the current level of sanitation is to be maintained and improved.

This study included both short-term and long-term recommendations. In addition, in this plan, there are some recommended improvements which have been implemented already by the Samui Municipality.

Solid waste quantities and characteristics

1. Background

Determination of the quantities and characteristics of solid waste in Samui Municipality, as well as their special distribution by municipality, set the stage for solid waste management planning. The tonnage generated and their densities in various types of equipment, as they are handled along the path from point source to ultimate point of disposal, provide the basis for determining the capacities of the collection fleet, transfer facilities, disposal sites and treatment works.

The waste characteristics provide the basis for determining such issues as the extent to which compaction could be conducted in collection trucks and in stationary containers. Materials recovery could be performed through either mechanized or manual sorting; while waste reduction could be accomplished through either incineration or biodegradation. In this regards, biodegradation could take place naturally in a landfill or via the

mechanized enhancement in a composting facility or in a biogas plant.

As an urban area develops economically, the quantities of solid waste produced through consumer activities, trade, services and tourism industry increases in parallel. The waste quantity generated per capita is highest in the urban zones, where the amount of commercial and tourist activity is highest. This was considered relatively to the number of residents in those areas though. On the contrary, the wastes generated per capita are lowest in the rural residential zones, particularly those of low income levels and comparatively low consumption patterns. Samui is a rapidly growing area, every district of which has a unique blend of residential, commercial, tourist, institutional and other activities- all of which generate solid waste. The following sections of this report present available data on waste quantities and characteristics, forecast the future trends and develop projections upon which the solid waste management alternatives are to be based.

2. Waste quantities

2.1 Current solid waste generation and disposal rates

The estimation of the solid waste amount generated in Samui Municipality area is very difficult to conduct because of the amount of scavenging and recycling that occurs between the points of waste generation and the disposal sites. In addition, there is little reliable information is available regarding the quantity of material removed from the waste stream by separation at source or recycling at homes and commercial establishments.

Material separation at source, especially from the scavenging and recycling, happen once the wastes are put out for collection. The garbage collection crews will sort through the waste at the curb or on the trucks and then separate paper, plastics, metals and other salvageable items for sale to small scale recycling businesses which are located along the truck routes or near the disposal sites.

Nowadays, approximately 80 percent of generated solid waste is collected daily and then transferred for disposal at the solid waste incineration plant. The existing necessary tasks for solid waste collection are shown in the following table. In doing so, each garbage truck usually runs 2-3 trips a day.

Table Manpower and waste collection

No.	Sub-district	Manpower			note
		truck (unit)	staff (man)	Street sweeper (man)	
1	Ang-Thong	2	8	19	
2	Lipa Noi	2	5	2	Cooperate truck with Bo Phut but non-cooperate staff
3	Taling Nham	1	5	5	Cooperate truck
4	Nah Muang			2	
5	Mah ret	2	8	12	
6	Bo Phut	11	44	24	
7	Maenam	1	5	6	
8	Dump and spare	2	9	-	
	Total	21	84	70	

Sources: Samui Municipality planning, September 2005

The primary data sources on solid waste quantities in Samui municipality are the truck scale records from the disposal site. A record of waste tonnages arriving at the disposal site has been kept by the municipality and is believed to be reasonably accurate. Records of solid waste disposal were kept by the municipality of Public Health Division.

In estimating the current waste quantities, an initial attempt was

made to determine the quantities generated by various sources; e.g households, factories, commercial sectors, markets, institutions, hotels, street sweeping etc. However, it soon became evident that, excluding hospital waste, planning for the future collection or disposal, would be of no use. To a certain extent, the hospital waste constitutes a potential health hazard and should be disposed of separately from other wastes.

2.2 Seasonal variation

The seasonal variation of waste quantities has a strong impact on the design and budget requirements for the solid waste management system. In some cities, seasonal variations in waste quantities are as much as 40 percent above or below the annual average. To evaluate the existing and future trends of seasonal variations in Samui municipality, monthly tonnages have from August 2002 to May 2005 have been compared with one another.

3. Solid Waste Characteristics

In general, when dividing solid waste proportion by weight, plastics make up the second largest portion of the waste, comprising about 30 percent. The overall combustible content determined by physical analysis was high, ranging about 75.49 percent of wet weight. The data for each category of source, as shown in Table

Table Solid Waste Composition

No.	Description	Percentage
1	vegetable, wet food and fruit peel	25.96
2	paper	10.71
3	rubber and leather	1.78
4	plastic	28.37
5	textile	6.02
6	wood and grass	2.65
	non-combustible; glass, stone and ceramic,	
7	metal	21.16
8	other	3.35

Sources: Incinerator plant of Samui Municipality, May 2006

According to the table of food waste, it is clear that households waste loads with very high putrefied organics content (about 26 percent by wet weight). To yield the high quality compost or biogas, selective processing of loads from households and hotels is advisable.

As regards the source, average moisture content showed little variation by about 42 percent.

During the time period of this study, Samui Municipality operated two incinerators to dispose of solid wastes in Samui Island. The incinerators were located at Moo 5, Pangwah village, Mahret Sub-district, Koh Samui District and consisted of two 70 tons incinerator. The incineration plant currently receives about 115 tons per day and the plant is owned by the Municipality of Samui Island. The plant operation was outsourced on a 3 years contract with CUB Co.,ltd.

4. Solid waste quantities forecast for Samui Island (Time series analysis)

4.1 Introduction

Samui is the second largest island located in the Gulf of Thailand, and it is a very popular destination for tourists from around the world. Taking less than one hour's flying time from Bangkok, the island has a lot of beautiful beaches, waterfalls, forests, and the potential to remain one of the world's most popular destinations for vacations. It is expected that the island will enjoy unprecedented growth in the next decade, which seems to be good news in terms of increased wealth and greater employment for the island and the entire country. However, the major problem challenging Samui Island, at present, is whether it could

maintain this position continuously or not due to its limited natural resources and infrastructures.

The fast development and the higher living standards put Samui Island in danger of becoming a proper place for waste disposal. At present, Samui Island generates about 95 tons of garbage per day, whereas the island's incinerator is designed to burn around 140 tons a day. Samui's solid waste incinerator was designed by the Japanese and it was built in 1997 with the budget of 501 million baht and now is located at Moo5 Ban Pangwha, Tambon Mahret, Koh Samui, Thailand. Due to the rapid economic growth, the solid waste quantity will consequently exceed the incineration capacity in 2008. Presently, Samui Municipality has planned recycling of solid waste and promoted household sorting.

The objective of this section is to forecast the solid waste quantity in the next 20 years (2006 – 2025). The quantity forecast will be useful for the authorities in the Samui Municipality and also for the policy makers to make a proper decision and prepare a long-term plan. In this analysis, a time series technique will be used to derive a quantity forecast model.

4.2 Historical Data

Historical data of waste quantity retrieved from the Samui Municipality during the previous four years is shown in Table-1. Note that the solid waste quantity figures shown in the table represent the average ton per day, in each month, that was brought into the

incinerator. In fact, the solid waste has not adequate collection system. Generally, this portion accounts for approximately 80% of the solid waste generation. Due to the rapid growth in the numbers of tourists, solid waste quantity on the island has increased dramatically during the last years. According to Table-1 and Table-2, the peak load of solid waste in February 2006 is 116.4 ton/ day.

Table 1 Historical waste quantity Data

Year	Waste Quantity (ton/day)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
2002	na	na	na	na	na	na	na	63.01	57.10	56.02	55.64	67.97	299.74
2003	66.76	64.25	64.88	63.42	59.71	58.81	65.03	67.24	64.46	65.16	64.49	69.15	773.36
2004	75.73	75.09	73.21	73.81	73.83	72.39	76.70	83.89	83.51	80.60	78.73	85.53	933.02
2005	93.42	93.38	93.09	90.74	84.39	85.61	92.33	96.30	90.07	92.41	97.57	105.44	1,114.75
2006	114.52	116.4	112.24	107.59	107.98	na	na	na	na	na	na	na	558.73

Note: Historical data retrieved from Municipality of Samui Island.

4.3 Forecast methodology

A time series is a collection of data recorded over a period of time- in this fashion -monthly. In general, there are four components in a time series: 1) the secular trend, 2) the cyclical variation, 3) the seasonal variation, and 4) the irregular variation. To identify a long-term trend, it is necessary to remove all the variations in a time series by various smoothing techniques. Once the secular trend is identified, the future values of the time series can be easily obtained by extending the period of time. In this analysis, a moving average method will be used in smoothing out a time series so that a typical monthly index can be identified. Then, the historical data will be de-seasonalized before performing a linear regression analysis. As a result, the linear regression for the trend line of the peak demand can be described by the following equations.

De-seasonalized of solid waste quantity (ton/day) = $51.4286 + 1.2207(t)(g)$

Where, t = period of time, daily
 g = growth factor

According to the regression analysis, the R^2 values of the solid waste quantity was 0.9215. The high R^2 values demonstrate that the linear regression equation is a very good explanation of the previous quantity. By using the linear equations to predict the future values, the subtle assumption is that the trend of future demand will be in the same line as that of the past. However, this might not always be viable in some circumstances, for instance, when there is a major

change in economy or the society. In actuality, after the tsunami tragedy on December 26, 2004, it has been expected that investors will be more diversified and shift some of their investments from Andaman Coastal region to the Gulf of Thailand. Thus, according to the equations above, the growth factor (g) has already been added to reflect an expected growth in economic development when comparing with the past. In this analysis, growth factors for normal-, low-, and high-growth economy are 1.00, 0.80, and 1.20, respectively. Lastly, the monthly forecast demand can be obtained by multiplying the predicted de-seasonalized data with the monthly typical index in order to yield the seasonal variation.

4.4 Forecast summary

Note that the solid waste quantity obtained from the previous section represents just only the quantity of the Municipality's collection. Therefore, to determine the total solid waste quantity generated, an additional 20% of the solid waste quantity must be included. In Table-2, the solid waste quantity in Samui Municipality is provided. According to Chart-1, daily solid waste quantity for Samui Island for normal-growth is expected to reach the capacity of 140 ton per day by the end of July, 2008. Unlike the former, for high-growth economy, the solid waste quantity is expected to reach the capacity of 375 ton per day by the end of 2025. In conclusion, the incinerator could support growth just only for the next two years. To avoid this case, an immediate solution is required.

ENERGY DEMAND FORECAST FOR SAMUI ISLAND (2006 - 2025)

Year	Month	t	Typical Index	Deseasonalized Solid Waste Quantity (ton/day)			Solid Waste Quantity (ton/day)		
				Low Growth	Normal Growth	High Growth	Low Growth	Normal Growth	High Growth
2006	Jun'06	47	0.9727	96.74	107.96	119.17	94.10	105.01	115.91
	Jul'06	48	1.0075	97.70	109.15	120.60	98.43	109.97	121.50
	Aug'06	49	1.0323	98.65	110.34	122.03	101.84	113.90	125.97
	Sep'06	50	0.9848	99.61	111.53	123.46	98.10	109.84	121.59
	Oct'06	51	0.9984	100.56	112.73	124.89	100.40	112.55	124.69
	Nov'06	52	0.9657	101.52	113.92	126.32	98.03	110.01	121.99
	Dec'06	53	1.0148	102.47	115.11	127.75	103.98	116.81	129.64
2007	Jan'06	54	1.0238	103.42	116.30	129.18	105.88	119.07	132.25
	Feb'07	55	1.0033	104.38	117.50	130.62	104.72	117.88	131.04
	Mar'07	56	1.0034	105.33	118.69	132.05	105.69	119.09	132.50
	Apr'07	57	1.0048	106.29	119.88	133.48	106.80	120.46	134.12
	May'07	58	0.9886	107.24	121.07	134.91	106.02	119.70	133.37
	Jun'07	59	0.9727	108.19	122.27	136.34	105.24	118.93	132.62
	Jul'07	60	1.0075	109.15	123.46	137.77	109.97	124.38	138.80
	Aug'07	61	1.0323	110.10	124.65	139.20	113.66	128.68	143.70
	Sep'07	62	0.9848	111.06	125.84	140.63	109.37	123.94	138.50
	Oct'07	63	0.9984	112.01	127.04	142.06	111.83	126.83	141.84
	Nov'07	64	0.9657	112.96	128.23	143.50	109.09	123.83	138.57
	Dec'07	65	1.0148	113.92	129.42	144.93	115.60	131.33	147.07
2008	Jan'08	66	1.0238	114.87	130.62	146.36	117.60	133.72	149.83
	Feb'08	67	1.0033	115.83	131.81	147.79	116.20	132.24	148.27
	Mar'08	68	1.0034	116.78	133.00	149.22	117.18	133.45	149.73
	Apr'08	69	1.0048	117.73	134.19	150.65	118.30	134.84	151.37
	May'08	70	0.9886	118.69	135.39	152.08	117.34	133.85	150.35
	Jun'08	71	0.9727	119.64	136.58	153.51	116.38	132.85	149.32

Year	Month	t	Typical Index	Deseasonalized Solid Waste Quantity (ton/day)			Solid Waste Quantity (ton/day)		
				Low Growth	Normal Growth	High Growth	Low Growth	Normal Growth	High Growth
	Jul'08	72	1.0075	120.60	137.77	154.94	121.50	138.80	156.10
	Aug'08	73	1.0323	121.55	138.96	156.38	125.48	143.45	161.43
	Sep'08	74	0.9848	122.51	140.16	157.81	120.65	138.03	155.41
	Oct'08	75	0.9984	123.46	141.35	159.24	123.26	141.12	158.98
	Nov'08	76	0.9657	124.41	142.54	160.67	120.14	137.65	155.15
	Dec'08	77	1.0148	125.37	143.73	162.10	127.22	145.85	164.49
2009	Jan'09	78	1.0238	126.32	144.93	163.53	129.32	148.37	167.42
	Feb'09	79	1.0033	127.28	146.12	164.96	127.69	146.60	165.50
	Mar'09	80	1.0034	128.23	147.31	166.39	128.67	147.81	166.96
	Apr'09	81	1.0048	129.18	148.50	167.82	129.80	149.22	168.63
	May'09	82	0.9886	130.14	149.70	169.26	128.66	148.00	167.33
	Jun'09	83	0.9727	131.09	150.89	170.69	127.51	146.77	166.03
	Jul'09	84	1.0075	132.05	152.08	172.12	133.03	153.22	173.41
	Aug'09	85	1.0323	133.00	153.27	173.55	137.30	158.22	179.15
	Sep'09	86	0.9848	133.95	154.47	174.98	131.92	152.12	172.33
	Oct'09	87	0.9984	134.91	155.66	176.41	134.69	155.41	176.13
	Nov'09	88	0.9657	135.86	156.85	177.84	131.20	151.47	171.74
	Dec'09	89	1.0148	136.82	158.05	179.27	138.84	160.38	181.92
2010	Jan'10	90	1.0238	137.77	159.24	180.71	141.04	163.02	185.00
	Feb'10	91	1.0033	138.72	160.43	182.14	139.18	160.95	182.73
	Mar'10	92	1.0034	139.68	161.62	183.57	140.15	162.17	184.19
	Apr'10	93	1.0048	140.63	162.82	185.00	141.31	163.60	185.89
	May'10	94	0.9886	141.59	164.01	186.43	139.98	162.14	184.31
	Jun'10	95	0.9727	142.54	165.20	187.86	138.65	160.69	182.73
	Jul'10	96	1.0075	143.50	166.39	189.29	144.57	167.64	190.71
	Aug'10	97	1.0323	144.45	167.59	190.72	149.11	173.00	196.88
	Sep'10	98	0.9848	145.40	168.78	192.15	143.20	166.22	189.24

Year	Month	t	Typical Index	Deseasonalized Solid Waste Quantity (ton/day)			Solid Waste Quantity (ton/day)		
				Low Growth	Normal Growth	High Growth	Low Growth	Normal Growth	High Growth
	Oct'10	99	0.9984	146.36	169.97	193.59	146.12	169.70	193.27
	Nov'10	100	0.9657	147.31	171.16	195.02	142.26	165.29	188.32
	Dec'10	101	1.0148	148.27	172.36	196.45	150.45	174.90	199.35
2011	Jan'11	102	1.0238	149.22	173.55	197.88	152.77	177.67	202.58
	Feb'11	103	1.0033	150.17	174.74	199.31	150.66	175.31	199.96
	Mar'11	104	1.0034	151.13	175.93	200.74	151.64	176.53	201.42
	Apr'11	105	1.0048	152.08	177.13	202.17	152.81	177.98	203.14
	May'11	106	0.9886	153.04	178.32	203.60	151.30	176.29	201.29
	Jun'11	107	0.9727	153.99	179.51	205.03	149.79	174.61	199.44
	Jul'11	108	1.0075	154.94	180.71	206.47	156.10	182.06	208.01
	Aug'11	109	1.0323	155.90	181.90	207.90	160.93	187.77	214.61
	Sep'11	110	0.9848	156.85	183.09	209.33	154.47	180.31	206.15
	Oct'11	111	0.9984	157.81	184.28	210.76	157.55	183.99	210.42
	Nov'11	112	0.9657	158.76	185.48	212.19	153.31	179.11	204.91
	Dec'11	113	1.0148	159.71	186.67	213.62	162.07	189.42	216.77
2012	Jan'12	114	1.0238	160.67	187.86	215.05	164.49	192.32	220.16
	Feb'12	115	1.0033	161.62	189.05	216.48	162.15	189.67	217.19
	Mar'12	116	1.0034	162.58	190.25	217.91	163.13	190.89	218.66
	Apr'12	117	1.0048	163.53	191.44	219.35	164.32	192.36	220.40
	May'12	118	0.9886	164.49	192.63	220.78	162.62	190.44	218.27
	Jun'12	119	0.9727	165.44	193.82	222.21	160.92	188.53	216.14
	Jul'12	120	1.0075	166.39	195.02	223.64	167.64	196.48	225.31
	Aug'12	121	1.0323	167.35	196.21	225.07	172.75	202.54	232.34
	Sep'12	122	0.9848	168.30	197.40	226.50	165.75	194.41	223.07
	Oct'12	123	0.9984	169.26	198.59	227.93	168.98	198.28	227.57
	Nov'12	124	0.9657	170.21	199.79	229.36	164.37	192.93	221.49
	Dec'12	125	1.0148	171.16	200.98	230.79	173.69	203.95	234.20

Year	Month	t	Typical Index	Deseasonalized Solid Waste Quantity (ton/day)			Solid Waste Quantity (ton/day)		
				Low Growth	Normal Growth	High Growth	Low Growth	Normal Growth	High Growth
2013	Jan'13	126	1.0238	172.12	202.17	232.23	176.21	206.98	237.74
	Feb'13	127	1.0033	173.07	203.36	233.66	173.64	204.03	234.42
	Mar'13	128	1.0034	174.03	204.56	235.09	174.62	205.25	235.89
	Apr'13	129	1.0048	174.98	205.75	236.52	175.82	206.74	237.65
	May'13	130	0.9886	175.93	206.94	237.95	173.93	204.59	235.25
	Jun'13	131	0.9727	176.89	208.14	239.38	172.06	202.45	232.85
	Jul'13	132	1.0075	177.84	209.33	240.81	179.17	210.89	242.62
	Aug'13	133	1.0323	178.80	210.52	242.24	184.57	217.32	250.07
	Sep'13	134	0.9848	179.75	211.71	243.68	177.02	208.50	239.98
	Oct'13	135	0.9984	180.71	212.91	245.11	180.42	212.56	244.71
	Nov'13	136	0.9657	181.66	214.10	246.54	175.42	206.75	238.08
	Dec'13	137	1.0148	182.61	215.29	247.97	185.31	218.47	251.63
2014	Jan'14	138	1.0238	183.57	216.48	249.40	187.93	221.63	255.33
	Feb'14	139	1.0033	184.52	217.68	250.83	185.12	218.39	251.65
	Mar'14	140	1.0034	185.48	218.87	252.26	186.11	219.61	253.12
	Apr'14	141	1.0048	186.43	220.06	253.69	187.32	221.12	254.91
	May'14	142	0.9886	187.38	221.25	255.12	185.25	218.74	252.22
	Jun'14	143	0.9727	188.34	222.45	256.56	183.20	216.38	249.55
	Jul'14	144	1.0075	189.29	223.64	257.99	190.71	225.31	259.92
	Aug'14	145	1.0323	190.25	224.83	259.42	196.39	232.09	267.79
	Sep'14	146	0.9848	191.20	226.02	260.85	188.30	222.60	256.89
	Oct'14	147	0.9984	192.15	227.22	262.28	191.85	226.85	261.86
	Nov'14	148	0.9657	193.11	228.41	263.71	186.48	220.57	254.66
	Dec'14	149	1.0148	194.06	229.60	265.14	196.93	232.99	269.05
2015	Jan'15	150	1.0238	195.02	230.79	266.57	199.65	236.28	272.91
	Feb'15	151	1.0033	195.97	231.99	268.00	196.61	232.74	268.88
	Mar'15	152	1.0034	196.92	233.18	269.44	197.60	233.97	270.35

Year	Month	t	Typical Index	Deseasonalized Solid Waste Quantity (ton/day)			Solid Waste Quantity (ton/day)		
				Low Growth	Normal Growth	High Growth	Low Growth	Normal Growth	High Growth
	Apr'15	153	1.0048	197.88	234.37	270.87	198.83	235.50	272.17
	May'15	154	0.9886	198.83	235.57	272.30	196.57	232.89	269.20
	Jun'15	155	0.9727	199.79	236.76	273.73	194.33	230.30	266.26
	Jul'15	156	1.0075	200.74	237.95	275.16	202.24	239.73	277.22
	Aug'15	157	1.0323	201.70	239.14	276.59	208.21	246.87	285.52
	Sep'15	158	0.9848	202.65	240.34	278.02	199.57	236.69	273.80
	Oct'15	159	0.9984	203.60	241.53	279.45	203.28	241.14	279.01
	Nov'15	160	0.9657	204.56	242.72	280.88	197.54	234.39	271.24
	Dec'15	161	1.0148	205.51	243.91	282.32	208.54	247.51	286.48
2016	Jan'16	162	1.0238	206.47	245.11	283.75	211.37	250.93	290.49
	Feb'16	163	1.0033	207.42	246.30	285.18	208.10	247.10	286.11
	Mar'16	164	1.0034	208.37	247.49	286.61	209.08	248.33	287.59
	Apr'16	165	1.0048	209.33	248.68	288.04	210.33	249.88	289.42
	May'16	166	0.9886	210.28	249.88	289.47	207.89	247.04	286.18
	Jun'16	167	0.9727	211.24	251.07	290.90	205.47	244.22	282.96
	Jul'16	168	1.0075	212.19	252.26	292.33	213.78	254.15	294.52
	Aug'16	169	1.0323	213.14	253.45	293.77	220.03	261.64	303.25
	Sep'16	170	0.9848	214.10	254.65	295.20	210.85	250.78	290.72
	Oct'16	171	0.9984	215.05	255.84	296.63	214.71	255.43	296.15
	Nov'16	172	0.9657	216.01	257.03	298.06	208.59	248.21	287.83
	Dec'16	173	1.0148	216.96	258.23	299.49	220.16	262.04	303.91
2017	Jan'17	174	1.0238	217.91	259.42	300.92	223.09	265.58	308.07
	Feb'17	175	1.0033	218.87	260.61	302.35	219.58	261.46	303.34
	Mar'17	176	1.0034	219.82	261.80	303.78	220.57	262.70	304.82
	Apr'17	177	1.0048	220.78	263.00	305.21	221.84	264.26	306.68
	May'17	178	0.9886	221.73	264.19	306.65	219.21	261.18	303.16
	Jun'17	179	0.9727	222.69	265.38	308.08	216.61	258.14	299.67

Year	Month	t	Typical Index	Deseasonalized Solid Waste Quantity (ton/day)			Solid Waste Quantity (ton/day)		
				Low Growth	Normal Growth	High Growth	Low Growth	Normal Growth	High Growth
	Jul'17	180	1.0075	223.64	266.57	309.51	225.31	268.57	311.82
	Aug'17	181	1.0323	224.59	267.77	310.94	231.85	276.41	320.98
	Sep'17	182	0.9848	225.55	268.96	312.37	222.13	264.88	307.63
	Oct'17	183	0.9984	226.50	270.15	313.80	226.14	269.72	313.30
	Nov'17	184	0.9657	227.46	271.34	315.23	219.65	262.03	304.41
	Dec'17	185	1.0148	228.41	272.54	316.66	231.78	276.56	321.34
2018	Jan'18	186	1.0238	229.36	273.73	318.09	234.81	280.23	325.65
	Feb'18	187	1.0033	230.32	274.92	319.53	231.07	275.82	320.57
	Mar'18	188	1.0034	231.27	276.11	320.96	232.06	277.06	322.05
	Apr'18	189	1.0048	232.23	277.31	322.39	233.34	278.64	323.93
	May'18	190	0.9886	233.18	278.50	323.82	230.53	275.33	320.14
	Jun'18	191	0.9727	234.13	279.69	325.25	227.74	272.06	316.37
	Jul'18	192	1.0075	235.09	280.88	326.68	236.85	282.99	329.13
	Aug'18	193	1.0323	236.04	282.08	328.11	243.66	291.19	338.71
	Sep'18	194	0.9848	237.00	283.27	329.54	233.40	278.97	324.54
	Oct'18	195	0.9984	237.95	284.46	330.97	237.57	284.01	330.44
	Nov'18	196	0.9657	238.90	285.66	332.41	230.71	275.85	321.00
	Dec'18	197	1.0148	239.86	286.85	333.84	243.40	291.08	338.76
2019	Jan'19	198	1.0238	240.81	288.04	335.27	246.53	294.88	343.23
	Feb'19	199	1.0033	241.77	289.23	336.70	242.56	290.18	337.80
	Mar'19	200	1.0034	242.72	290.43	338.13	243.55	291.42	339.28
	Apr'19	201	1.0048	243.68	291.62	339.56	244.84	293.02	341.19
	May'19	202	0.9886	244.63	292.81	340.99	241.85	289.48	337.12
	Jun'19	203	0.9727	245.58	294.00	342.42	238.88	285.98	333.08
	Jul'19	204	1.0075	246.54	295.20	343.86	248.38	297.41	346.43
	Aug'19	205	1.0323	247.49	296.39	345.29	255.48	305.96	356.44
	Sep'19	206	0.9848	248.45	297.58	346.72	244.68	293.07	341.46

Year	Month	t	Typical Index	Deseasonalized Solid Waste Quantity (ton/day)			Solid Waste Quantity (ton/day)		
				Low Growth	Normal Growth	High Growth	Low Growth	Normal Growth	High Growth
	Oct'19	207	0.9984	249.40	298.77	348.15	249.00	298.29	347.59
	Nov'19	208	0.9657	250.35	299.97	349.58	241.76	289.67	337.58
	Dec'19	209	1.0148	251.31	301.16	351.01	255.02	305.60	356.19
2020	Jan'20	210	1.0238	252.26	302.35	352.44	258.26	309.54	360.82
	Feb'20	211	1.0033	253.22	303.54	353.87	254.04	304.54	355.03
	Mar'20	212	1.0034	254.17	304.74	355.30	255.04	305.78	356.51
	Apr'20	213	1.0048	255.12	305.93	356.74	256.35	307.40	358.45
	May'20	214	0.9886	256.08	307.12	358.17	253.17	303.63	354.09
	Jun'20	215	0.9727	257.03	308.32	359.60	250.02	299.90	349.78
	Jul'20	216	1.0075	257.99	309.51	361.03	259.92	311.82	363.73
	Aug'20	217	1.0323	258.94	310.70	362.46	267.30	320.73	374.16
	Sep'20	218	0.9848	259.89	311.89	363.89	255.95	307.16	358.37
	Oct'20	219	0.9984	260.85	313.09	365.32	260.43	312.58	364.74
	Nov'20	220	0.9657	261.80	314.28	366.75	252.82	303.49	354.17
	Dec'20	221	1.0148	262.76	315.47	368.18	266.63	320.13	373.62
2021	Jan'21	222	1.0238	263.71	316.66	369.62	269.98	324.19	378.40
	Feb'21	223	1.0033	264.67	317.86	371.05	265.53	318.89	372.26
	Mar'21	224	1.0034	265.62	319.05	372.48	266.52	320.14	373.75
	Apr'21	225	1.0048	266.57	320.24	373.91	267.85	321.78	375.70
	May'21	226	0.9886	267.53	321.43	375.34	264.49	317.78	371.07
	Jun'21	227	0.9727	268.48	322.63	376.77	261.15	313.82	366.49
	Jul'21	228	1.0075	269.44	323.82	378.20	271.45	326.24	381.03
	Aug'21	229	1.0323	270.39	325.01	379.63	279.12	335.51	391.89
	Sep'21	230	0.9848	271.34	326.20	381.06	267.23	321.26	375.28
	Oct'21	231	0.9984	272.30	327.40	382.50	271.86	326.87	381.88
	Nov'21	232	0.9657	273.25	328.59	383.93	263.87	317.31	370.75
	Dec'21	233	1.0148	274.21	329.78	385.36	78.25	334.65	391.04

Year	Month	t	Typical Index	Deseasonalized Solid Waste Quantity (ton/day)			Solid Waste Quantity (ton/day)		
				Low Growth	Normal Growth	High Growth	Low Growth	Normal Growth	High Growth
2022	Jan'22	234	1.0238	275.16	330.97	386.79	281.70	338.84	395.98
	Feb'22	235	1.0033	276.11	332.17	388.22	277.02	333.25	389.49
	Mar'22	236	1.0034	277.07	333.36	389.65	278.01	334.50	390.98
	Apr'22	237	1.0048	278.02	334.55	391.08	279.36	336.16	392.96
	May'22	238	0.9886	278.98	335.75	392.51	275.80	331.93	388.05
	Jun'22	239	0.9727	279.93	336.94	393.95	272.29	327.74	383.19
	Jul'22	240	1.0075	280.88	338.13	395.38	282.99	340.66	398.34
	Aug'22	241	1.0323	281.84	339.32	396.81	290.94	350.28	409.62
	Sep'22	242	0.9848	282.79	340.52	398.24	278.50	335.35	392.20
	Oct'22	243	0.9984	283.75	341.71	399.67	283.29	341.16	399.03
	Nov'22	244	0.9657	284.70	342.90	401.10	274.93	331.13	387.33
	Dec'22	245	1.0148	285.66	344.09	402.53	289.87	349.17	408.47
2023	Jan'23	246	1.0238	286.61	345.29	403.96	293.42	353.49	413.56
	Feb'23	247	1.0033	287.56	346.48	405.39	288.50	347.61	406.72
	Mar'23	248	1.0034	288.52	347.67	406.83	289.50	348.86	408.21
	Apr'23	249	1.0048	289.47	348.86	408.26	290.86	350.54	410.22
	May'23	250	0.9886	290.43	350.06	409.69	287.12	346.08	405.03
	Jun'23	251	0.9727	291.38	351.25	411.12	283.43	341.66	399.90
	Jul'23	252	1.0075	292.33	352.44	412.55	294.52	355.08	415.64
	Aug'23	253	1.0323	293.29	353.63	413.98	302.76	365.05	427.35
	Sep'23	254	0.9848	294.24	354.83	415.41	289.78	349.44	409.11
	Oct'23	255	0.9984	295.20	356.02	416.84	294.72	355.45	416.17
	Nov'23	256	0.9657	296.15	357.21	418.27	285.99	344.95	403.92
	Dec'23	257	1.0148	297.10	358.41	419.71	301.49	363.69	425.90
2024	Jan'24	258	1.0238	298.06	359.60	421.14	305.14	368.14	431.14
	Feb'24	259	1.0033	299.01	360.79	422.57	299.99	361.97	423.95
	Mar'24	260	1.0034	299.97	361.98	424.00	300.99	363.22	425.44

Year	Month	t	Typical Index	Deseasonalized Solid Waste Quantity (ton/day)			Solid Waste Quantity (ton/day)		
				Low Growth	Normal Growth	High Growth	Low Growth	Normal Growth	High Growth
	Apr'24	261	1.0048	300.92	363.18	425.43	302.36	364.92	427.47
	May'24	262	0.9886	301.87	364.37	426.86	298.44	360.23	422.01
	Jun'24	263	0.9727	302.83	365.56	428.29	294.56	355.58	416.60
	Jul'24	264	1.0075	303.78	366.75	429.72	306.06	369.50	432.94
	Aug'24	265	1.0323	304.74	367.95	431.15	314.58	379.83	445.08
	Sep'24	266	0.9848	305.69	369.14	432.59	301.05	363.54	426.02
	Oct'24	267	0.9984	306.65	370.33	434.02	306.15	369.74	433.32
	Nov'24	268	0.9657	307.60	371.52	435.45	297.04	358.77	420.50
	Dec'24	269	1.0148	308.55	372.72	436.88	313.11	378.22	443.33
2025	Jan'25	270	1.0238	309.51	373.91	438.31	316.86	382.79	448.72
	Feb'25	271	1.0033	310.46	375.10	439.74	311.47	376.33	441.18
	Mar'25	272	1.0034	311.42	376.29	441.17	312.48	377.58	442.68
	Apr'25	273	1.0048	312.37	377.49	442.60	313.87	379.30	444.73
	May'25	274	0.9886	313.32	378.68	444.03	309.76	374.37	438.99
	Jun'25	275	0.9727	314.28	379.87	445.47	305.70	369.50	433.31
	Jul'25	276	1.0075	315.23	381.06	446.90	317.59	383.92	450.24
	Aug'25	277	1.0323	316.19	382.26	448.33	326.40	394.60	462.81
	Sep'25	278	0.9848	317.14	383.45	449.76	312.33	377.63	442.94
	Oct'25	279	0.9984	318.09	384.64	451.19	317.58	384.03	450.47
	Nov'25	280	0.9657	319.05	385.84	452.62	308.10	372.59	437.09
	Dec'25	281	1.0148	320.00	387.03	454.05	324.72	392.74	460.75

Daily solid waste quantity forecast for samui island (2006 - 2025)

