Tables

Table C.2.1 Monthly Mean Temperature at Kayuwatu-Manado

Station : Kayuwatu-Manado 01°30'00"N, 124°54'00", 67m(MSL)
Province : Manado, North Sulawesi

Unit : °C

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	AVERAGE
1985	25.6	25.4	25.6	26.1	25.8	26.3	25.4	25.8	25.5	26.0	25.6	25.8	25.7
1986	25.2	25.2	25.2	25.9	26.4	25.9	25.6	-	26.4	25.9	25.9	25.4	25.7
1987	24.9	24.9	25.1	25.4	25.6	27.1	27.6	27.8	28.0	27.6	26.4	26.3	26.4
1988	26.1	25.5	25.7	25.7	25.9	26.0	25.8	25.9	25.8	26.5	25.8	25.3	25.8
1989	25.1	25.3	25.1	25.5	25.9	25.5	25.2	26.3	25.9	25.8	25.9	25.4	25.6
1990	24.7	25.2	25.1	25.5	26.0	26.6	26.0	26.9	27.1	26.4	26.0	25.4	25.9
1991	25.0	25.1	25.5	25.3	26.5	26.7	26.5	27.4	27.2	25.5	26.1	25.2	26.0
1992	24.9	24.8	25.2	25.4	25.4	26.3	26.2	26.6	25.1	25.7	25.7	25.4	25.6
1993	25.1	25.4	25.5	25.9	25.7	26.5	26.6	27.8	26.6	26.3	26.1	26.6	26.2
1994	25.6	25.5	25.5	25.9	25.3	26.2	27.0	27.0	27.4	26.4	25.6	25.6	26.1
1995	25.2	25.4	25.1	25.6	26.5	26.5	26.0	26.3	26.4	26.1	25.7	26.3	25.9
1996	25.2	25.1	25.8	26.0	26.3	25.8	26.0	26.2	27.1	26.1	25.2	25.6	25.9
1997	25.3	25.7	26.1	25.7	26.8	26.7	27.4	26.4	26.7	27.4	26.7	27.1	26.5
1998	26.4	25.8	25.8	26.9	27.1	26.2	26.2	26.3	27.0	27.3	26.4	26.3	26.5
1999	25.9	26.2	25.8	26.5	25.8	26.3	25.4	27.0	26.9	26.2	26.5	26.4	26.2
MAX	26.4	26.2	26.1	26.9	27.1	27.1	27.6	27.8	28.0	27.6	26.7	27.1	26.5
MIN	24.7	24.8	25.1	25.3	25.3	25.5	25.2	25.8	25.1	25.5	25.2	25.2	25.6
AVERAGE	25.3	25.4	25.5	25.8	26.1	26.3	26.2	26.7	26.6	26.3	26.0	25.9	26.0

Source : Badan Meteorologi dan Geofisika (Meteorological and Geophysical Agency, BMG) Manado

Table C.2.2 Monthly Maximum Temperature at Kayuwatu-Manado

Station : Kayuwatu-Manado 01°30'00"N, 124°54'00", 67m(MSL)
Province : Manado, North Sulawesi

Unit : °C

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	AVERAGE
1985	29.4	29.6	30.4	30.9	31.2	31.2	30.7	30.9	31.2	31.5	30.7	30.5	30.7
1986	29.3	29.5	29.9	30.8	32.2	31.3	31.2	-	32.6	31.5	30.6	30.0	30.8
1987	29.0	29.0	30.3	31.1	31.2	32.1	32.7	33.0	34.3	33.8	31.1	30.4	31.5
1988	30.9	29.8	29.8	31.5	31.1	30.9	30.8	30.9	31.3	31.4	30.5	29.5	30.7
1989	29.3	29.4	29.9	30.3	31.8	30.7	30.7	31.4	31.6	31.2	30.8	30.1	30.6
1990	29.1	30.2	29.7	30.9	31.4	31.5	31.5	32.0	32.3	32.0	30.9	30.4	31.0
1991	29.4	29.7	30.2	30.5	31.2	31.6	31.7	32.9	33.7	32.5	30.3	29.9	31.1
1992	30.2	28.5	30.5	31.7	31.2	31.3	31.1	32.3	32.5	31.4	30.8	29.6	30.9
1993	29.4	30.1	30.5	31.4	31.1	31.6	31.6	32.7	32.9	32.5	31.8	31.2	31.4
1994	30.4	30.6	30.2	31.3	31.5	31.3	31.5	32.5	34.0	33.1	31.6	30.4	31.5
1995	29.9	30.0	30.1	31.2	31.7	31.4	31.1	31.1	31.8	31.7	30.9	30.8	31.0
1996	29.6	28.9	30.4	31.4	31.8	31.1	31.3	31.5	32.9	31.7	31.4	30.1	31.0
1997	31.6	32.4	35.0	33.2	34.3	34.0	33.8	35.3	35.3	35.0	34.8	32.0	33.9
1998	32.8	32.2	33.3	33.2	34.2	32.7	32.9	32.6	33.7	33.8	33.8	32.6	33.2
1999	32.7	32.0	32.6	33.6	32.8	32.7	32.8	33.7	33.2	32.8	32.7	32.8	32.9
MAX	32.8	32.4	35.0	33.6	34.3	34.0	33.8	35.3	35.3	35.0	34.8	32.8	33.9
MIN	29.0	28.5	29.7	30.3	31.1	30.7	30.7	30.9	31.2	31.2	30.3	29.5	30.6
AVERAGE	30.2	30.1	30.9	31.5	31.9	31.7	31.7	32.3	32.9	32.4	31.5	30.7	31.5

Source : Badan Meteorologi dan Geofisika (Meteorological and Geophysical Agency, BMG) Manado

Table C.2.3 Monthly Minimum Temperature at Kayuwatu-Manado

Station : Kayuwatu-Manado 01°30'00"N, 124°54'00", 67m(MSL)
Province : Manado, North Sulawesi

Unit : °C

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	AVERAGE
1985	21.7	21.5	21.2	22.5	22.0	22.3	21.3	21.9	21.1	21.1	21.6	21.8	21.7
1986	22.3	21.9	22.0	21.9	21.8	21.4	21.2	-	20.9	21.3	21.9	21.4	21.6
1987	21.9	21.7	20.7	21.1	21.8	22.4	23.2	24.1	24.9	22.0	22.3	22.7	22.4
1988	22.0	22.2	22.6	21.5	22.2	21.7	21.6	21.4	20.9	21.1	21.1	20.8	21.6
1989	20.9	21.2	21.8	21.9	21.9	21.9	21.4	22.0	21.0	21.1	21.1	20.8	21.4
1990	20.8	20.3	20.9	20.1	21.0	22.2	21.6	22.1	21.8	21.4	21.3	20.9	21.2
1991	21.0	21.6	21.4	21.2	22.4	22.2	21.5	22.3	20.3	19.5	20.1	20.7	21.2
1992	20.1	20.2	19.5	18.8	19.3	22.1	21.2	21.6	20.7	20.9	20.6	20.9	20.5
1993	21.0	20.9	20.5	20.7	20.6	21.5	21.5	20.9	19.8	19.7	20.1	21.0	20.7
1994	20.6	20.6	20.8	20.8	21.0	20.8	21.4	21.0	19.8	18.6	21.0	20.8	20.6
1995	20.6	20.9	20.8	20.3	20.9	21.8	21.5	22.3	21.6	21.1	21.3	22.0	21.3
1996	21.3	21.4	21.6	21.3	21.1	21.0	21.0	21.1	20.7	21.4	20.3	21.2	21.1
1997	17.0	19.6	16.8	17.0	19.2	16.4	18.4	18.0	14.4	17.8	19.0	18.8	17.7
1998	18.2	16.2	16.2	18.0	20.2	19.4	19.2	18.8	18.6	18.4	19.1	19.1	18.5
1999	18.4	18.4	18.6	18.9	18.4	18.0	17.8	16.5	18.2	16.2	18.0	18.7	18.0
MAX	22.3	22.2	22.6	22.5	22.4	22.4	23.2	24.1	24.9	22.0	22.3	22.7	22.4
MIN	17.0	16.2	16.2	17.0	18.4	16.4	17.8	16.5	14.4	16.2	18.0	18.7	17.7
AVERAGE	20.5	20.6	20.4	20.4	20.9	21.0	20.9	21.0	20.3	20.1	20.6	20.8	20.6

Source : Badan Meteorologi dan Geofisika (Meteorological and Geophysical Agency, BMG) Manado

Table C.2.4 Monthly Mean Relative Humidity at Kayuwatu-Manado

Station : Kayuwatu-Manado 01°30'00"N, 124°54'00", 67m(MSL)
Province : Manado, North Sulawesi

Unit : %

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	AVERAGE
1985	88	89	88	87	89	83	83	83	85	86	90	88	87
1986	91	88	89	88	83	85	83	-	76	86	88	89	86
1987	90	89	88	87	88	77	68	65	64	76	88	89	81
1988	87	89	91	89	90	85	84	84	86	86	90	89	88
1989	91	90	90	88	87	88	87	80	82	67	88	89	86
1990	92	88	90	89	88	80	81	72	73	82	88	89	84
1991	89	89	87	90	82	80	75	70	67	76	93	91	82
1992	88	87	86	85	90	83	79	76	81	87	88	90	85
1993	88	88	87	85	88	83	76	65	74	82	88	88	83
1994	88	87	90	88	85	83	68	67	64	78	88	88	81
1995	88	88	88	87	87	85	82	83	82	87	90	88	86
1996	89	90	90	88	86	87	84	81	77	87	88	89	86
1997	87	80	85	83	81	67	71	59	64	75	84	89	77
1998	86	84	88	85	87	89	86	84	83	86	88	88	86
1999	88	86	90	87	87	85	81	76	78	86	88	88	85
MAX	92	90	91	90	90	89	87	84	86	87	93	91	88
MIN	86	80	85	83	81	67	68	59	64	67	84	88	77
AVERAGE	89	87	88	87	87	83	79	75	76	82	88	89	84

Source : Badan Meteorologi dan Geofisika (Meteorological and Geophysical Agency, BMG) Manado

Table C.2.5 Monthly Mean Sunshine Duration at Kayuwatu-Manado

Station : Kayuwatu-Manado 01°30'00"N, 124°54'00", 67m(MSL)
Province : Manado, North Sulawesi

Unit : % (10hrs=100%)

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	AVERAGE
1985	59	47	70	59	67	56	49	64	60	61	62	65	60
1986	42	62	48	67	75	56	66	-	80	68	58	55	62
1987	39	52	66	66	63	84	82	78	87	72	64	65	68
1988	69	43	33	57	46	57	54	70	60	61	43	45	53
1989	29	36	40	62	70	44	55	65	69	59	70	52	54
1990	45	67	43	72	78	66	72	78	65	67	65	67	65
1991	57	40	55	59	65	76	73	85	82	76	75	43	66
1992	67	55	65	79	56	55	64	87	74	57	63	43	64
1993	48	60	68	74	60	75	57	89	79	71	62	67	68
1994	59	62	36	58	63	56	83	86	89	79	59	59	66
1995	53	51	48	69	67	57	66	60	63	56	41	51	57
1996	38	27	45	64	65	48	63	61	68	46	59	50	53
1997	51	30	58	66	78	91	81	98	86	79	63	59	70
1998	63	74	65	43	47	37	57	50	47	45	35	37	50
1999	28	54	33	44	40	44	56	53	59	50	57	37	46
MAX	69	74	70	79	78	91	83	98	89	79	75	67	70
MIN	28	27	33	43	40	37	49	50	47	45	35	37	46
AVERAGE	50	51	52	63	63	60	65	73	71	63	58	53	60

Source : Badan Meteorologi dan Geofisika (Meteorological and Geophysical Agency, BMG) Manado

Table C.2.6 Monthly Mean Wind Speed at Kayuwatu-Manado

Station : Kayuwatu-Manado 01°30'00"N, 124°54'00", 67m(MSL)
Province : Manado, North Sulawesi
Measured Height : 10m

Unit : m/sec

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	AVERAGE
1985	1.5	1.0	1.0	1.0	1.0	1.5	1.5	1.5	1.0	1.0	1.0	1.0	1.2
1986	1.0	1.0	1.0	1.0	1.5	1.0	1.5	-	2.1	2.1	2.1	1.0	1.4
1987	1.0	1.0	1.0	1.0	1.0	2.6	3.6	4.6	3.6	2.1	1.0	1.0	2.0
1988	1.0	1.0	0.5	0.5	0.5	1.0	1.0	1.0	1.0	0.5	0.5	0.5	0.8
1989	0.5	1.0	0.5	0.5	0.5	0.5	0.5	1.0	1.0	0.5	0.5	0.5	0.6
1990	1.0	1.0	1.0	1.0	0.4	1.9	0.8	1.7	1.3	0.4	0.4	0.6	1.0
1991	0.6	0.6	0.7	0.5	1.0	2.0	1.3	1.6	1.3	0.9	0.6	0.9	1.0
1992	2.6	3.1	3.1	2.6	2.1	4.1	2.4	2.1	1.3	1.0	1.1	0.9	2.2
1993	0.7	0.6	0.6	0.6	0.5	0.9	1.4	1.6	1.0	0.7	0.5	0.6	0.8
1994	0.5	0.5	0.4	0.5	0.5	0.8	1.8	2.0	1.6	0.8	0.6	0.5	0.9
1995	0.5	0.5	0.5	0.5	0.5	0.8	0.8	1.0	0.6	0.5	0.4	0.6	0.6
1996	0.5	0.5	0.5	0.5	0.5	0.5	0.6	0.6	0.8	0.5	0.5	0.6	0.6
1997	0.5	0.5	1.0	0.6	0.5	1.5	1.5	2.6	1.5	0.9	0.6	0.5	1.0
1998	0.6	0.6	0.7	0.6	0.5	0.4	0.5	0.6	0.7	0.5	0.6	0.5	0.6
1999	0.5	0.6	1.0	0.4	0.5	0.5	0.9	1.2	0.9	0.5	1.5	0.5	0.7
MAX	2.6	3.1	3.1	2.6	2.1	4.1	3.6	4.6	3.6	2.1	2.1	1.0	2.2
MIN	0.5	0.5	0.4	0.4	0.4	0.4	0.5	0.6	0.6	0.4	0.4	0.5	0.6
AVERAGE	0.9	0.9	0.9	0.8	0.8	1.3	1.4	1.7	1.3	0.9	0.8	0.7	1.0

Source : Badan Meteorologi dan Geofisika (Meteorological and Geophysical Agency, BMG) Manado

Table C.2.7 Monthly Maximum Wind Speed at Kayuwatu-Manado

Station : Kayuwatu-Manado 01°30'00"N, 124°54'00", 67m(MSL)
Province : Manado, North Sulawesi
Measured Height : 10m
Unit : m/sec

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	AVERAGE
1985	5.7	7.7	6.7	6.7	7.7	11.3	11.3	9.3	5.7	11.3	7.7	11.3	8.5
1986	7.7	7.7	9.3	7.7	9.3	11.3	9.3	-	15.4	11.3	7.7	7.7	9.5
1987	7.7	9.8	11.3	8.7	7.7	17.0	20.1	26.8	19.0	11.3	11.3	11.3	13.5
1988	7.7	9.8	5.1	6.2	6.2	7.2	13.9	8.2	6.2	5.1	6.2	8.2	7.5
1989	18.0	10.8	4.6	6.2	8.2	8.2	8.2	8.2	8.2	8.2	8.7	5.1	8.6
1990	7.6	5.7	7.6	7.6	17.1	17.1	6.2	10.3	8.2	2.6	3.3	5.9	8.3
1991	4.1	4.1	-	3.1	6.2	4.1	15.0	14.0	19.0	13.4	8.1	7.8	9.0
1992	6.2	7.7	7.2	5.1	6.7	10.3	22.2	27.3	18.5	14.8	18.5	11.3	13.0
1993	12.0	10.0	10.0	8.0	14.0	10.0	16.2	15.0	14.0	10.0	10.0	8.0	11.4
1994	8.0	6.0	10.0	12.0	14.0	12.0	14.0	14.0	7.0	6.1	3.9	4.1	9.3
1995	8.0	6.0	6.0	8.0	7.0	6.0	2.8	4.0	3.0	4.0	3.0	5.2	5.3
1996	6.0	10.0	10.0	4.5	4.4	4.0	6.0	6.0	8.2	5.0	4.5	11.9	6.7
1997	4.8	4.8	7.0	4.8	6.5	9.0	9.0	10.4	8.5	5.0	2.8	6.0	6.6
1998	6.0	5.5	5.5	5.0	5.0	4.0	4.1	5.0	4.5	4.5	5.9	6.0	5.1
1999	6.4	5.0	5.6	6.4	3.9	3.9	7.5	6.1	8.9	5.0	6.4	5.0	5.8
MAX	18.0	10.8	11.3	12.0	17.1	17.1	22.2	27.3	19.0	14.8	18.5	11.9	13.5
MIN	4.1	4.1	4.6	3.1	3.9	3.9	2.8	4.0	3.0	2.6	2.8	4.1	5.1
AVERAGE	7.7	7.4	7.6	6.7	8.3	9.0	11.0	11.8	10.3	7.8	7.2	7.7	8.5

Source : Badan Meteorologi dan Geofisika (Meteorological and Geophysical Agency, BMG) Manado

Table C.2.8 Monthly Mean Wind Direction at Kayuwatu-Manado

Station : Kayuwatu-Manado 01°30'00"N, 124°54'00", 67m(MSL)
Province : Manado, North Sulawesi
Measured Height : 10m

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1985	NW	NW	NW	NW	NW	SE	SE	SE	NW	NW	NW	NW
1986	NW	NW	NW	NW	NW	NW	NW	-	SE	NW	NW	NW
1987	NW	NW	N	NW	NW	SE	SE	SE	SE	SE	-	NW
1988	NW	NW	NW	-	-	-	-	S	-	NW	N	NW
1989	W	W	N	W	S	N	N	S	S	N	W	N
1990	N	N	N	N	W	S	S	S	S	W	W	N
1991	N	N	N	N	S	S	S	SE	S	S	W	N
1992	NE	N	NE	N	N	S	SE/S	S	W	N	N	N
1993	N	N	N	N	N	S	S	S	S	S	N	N
1994	W	N	N	N	S	S	S	S	S	S	N	N
1995	N	N	N	N	N	S	S	S	S	N	W	W
1996	N	SW	N	N	N	N	S	S	S	N	W	N
1997	W	N	N	W	S	S	S	S	S	S	N	NW
1998	NW	N	N	N	S	S	S	S	S	S	N	N
1999	W	NW	W	NW	N	S	S	S	S	S	NW	NW

Note : N = North, NE = North East, E = East, SE = South East,
S = South, SW = South West, W = West, NW = North West

Source : Badan Meteorologi dan Geofisika (Meteorological and Geophysical Agency, BMG) Manado

Table C.2.9 Monthly Maximum Wind Direction at Kayuwatu-Manado

Station : Kayuwatu-Manado 01°30'00"N, 124°54'00", 67m(MSL)
Province : Manado, North Sulawesi
Measured Height : 10m

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1990	N	N	N	N	W	SE	S	SE	SE	S	N	SW
1991	N	NW		N	E	S	S	S	SE	S	N/NE	N
1992	E	NE	NE	N	S	S	SE/S	S	SW	SE	N	N
1993	NE	N	NE	N	SE	SE	SE	S	S	S	NW	W
1994	W/N	S/N	N	W	E	S	SE	S	S	S	NW	NW
1995	N	W	N	NW	NW	W	S	S	S	S	W	W
1996	NW	W	W	N	S	S	S	S	S	S	W	NW
1997	NW	NW	NW	W	S	S	S	S	NE	NW	W	W
1998	W	NE	N	E	S	S	NW	E	E	S	N	NW
1999	NW	NW	NW	W	S	S	S	S	S	S	NW	NW

Note : N = North, NE = North East, E = East, SE = South East,
S = South, SW = South West, W = West, NW = North West

Source : Badan Meteorologi dan Geofisika (Meteorological and Geophysical Agency, BMG) Manado

Table C.2.10 Monthly Mean Temperature at Tondano

Station : Tondano N01°17'42" - E124°55'30", 704m (MSL)
Province : Tondano, North Sulawesi

Unit : ℃

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	AVERAGE
1992	21.5	21.5	22.4	22.0	22.1	22.5	21.8	22.2	22.2	22.3	22.2	22.0	22.1
1993	21.8	22.1	21.8	22.0	22.0	22.0	21.9	21.5	22.0	22.8	22.4	23.0	22.1
1994	21.9	22.4	22.0	21.6	22.2	22.3	21.8	21.7	21.6	22.1	22.0	22.0	22.0
1995	21.8	22.1	21.9	22.1	22.9	22.7	22.0	22.2	22.4	22.4	22.4	22.7	22.3
1996	21.9	21.8	22.5	22.7	22.8	22.3	22.4	22.3	22.7	22.7	22.3	22.4	22.4
1997	21.5	21.9	22.3	22.5	22.9	23.0	22.4	21.8	22.0	22.1	22.5	22.4	22.3
1998	22.4	22.1	22.3	22.3	23.7	22.6	22.9	22.8	22.8	22.9	22.7	22.6	22.7
1999	22.3	22.2	22.3	22.9	22.2	22.3	22.2	22.3	22.5	22.5	22.8	22.7	22.4
MAX	22.4	22.4	22.5	22.9	23.7	23.0	22.9	22.8	22.8	22.9	22.8	23.0	22.7
MIN	21.5	21.5	21.8	21.6	22.0	22.0	21.8	21.5	21.6	22.1	22.0	22.0	22.0
AVERAGE	21.9	22.0	22.2	22.3	22.6	22.5	22.2	22.1	22.3	22.5	22.4	22.5	22.3

Source : Badan Meteorologi dan Geofisika (Meteorological and Geophysical Agency, BMG) Manado

Table C.2.11 Monthly Maximum Temperature at Tondano

Station : Tondano N01°17'42" - E124°55'30", 704m (MSL)
Province : Tondano, North Sulawesi

Unit : ℃

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	AVERAGE
1992	26.3	26.3	27.5	28.3	27.3	26.2	25.1	26.9	27.7	27.3	27.2	26.3	26.9
1993	26.1	26.5	26.8	27.4	27.3	26.1	26.7	26.4	26.7	28.4	28.7	28.5	27.1
1994	27.9	27.9	27.5	28.2	27.7	27.2	27.0	26.8	27.9	29.0	28.3	27.8	27.8
1995	27.3	27.1	25.5	27.2	27.6	26.5	26.0	25.8	26.8	27.4	27.1	26.7	26.8
1996	25.7	25.0	27.1	27.4	27.4	26.6	26.9	26.4	27.7	27.6	27.0	26.4	26.8
1997	25.8	25.5	26.8	27.5	27.7	28.2	26.6	27.1	28.3	28.6	28.1	27.3	27.3
1998	27.2	27.7	27.8	27.7	27.8	27.2	27.2	27.0	27.5	27.8	27.2	26.8	27.4
1999	26.2	26.6	26.8	27.2	26.8	26.9	26.6	26.3	27.1	27.4	27.3	27.5	26.9
MAX	27.9	27.9	27.8	28.3	27.8	28.2	27.2	27.1	28.3	29.0	28.7	28.5	27.8
MIN	25.7	25.0	25.5	27.2	26.8	26.1	25.1	25.8	26.7	27.3	27.0	26.3	26.8
AVERAGE	26.6	26.6	27.0	27.6	27.5	26.9	26.5	26.6	27.5	27.9	27.6	27.2	27.1

Source : Badan Meteorologi dan Geofisika (Meteorological and Geophysical Agency, BMG) Manado

Table C.2.12 Monthly Minimum Temperature at Tondano

Station : Tondano N01°17'42" - E124°55'30", 704m (MSL)
Province : Tondano, North Sulawesi

Unit : ℃

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	AVERAGE
1992	17.9	18.7	18.9	16.5	19.3	19.9	19.7	19.0	17.7	18.3	18.2	19.6	18.6
1993	19.2	19.1	18.5	18.3	18.1	19.8	19.8	18.1	17.8	18.2	18.6	19.7	18.8
1994	18.8	18.6	19.3	18.9	19.4	19.5	18.5	18.1	16.9	16.1	17.1	18.4	18.3
1995	18.4	18.8	18.5	18.4	19.2	20.0	19.3	19.9	19.3	19.1	19.3	20.1	19.2
1996	19.0	19.8	20.0	19.4	19.5	19.4	19.3	19.4	19.1	19.5	18.9	19.9	19.4
1997	18.6	20.1	19.3	19.1	19.0	17.9	19.9	17.9	16.9	17.2	19.8	19.1	18.7
1998	19.0	18.2	18.2	20.1	21.2	19.9	20.0	19.9	19.5	19.9	20.1	20.3	19.7
1999	19.9	19.7	19.9	20.3	19.4	19.1	19.2	19.8	19.2	19.1	19.5	19.5	19.6
MAX	19.9	20.1	20.0	20.3	21.2	20.0	20.0	19.9	19.5	19.9	20.1	20.3	19.7
MIN	17.9	18.2	18.2	16.5	18.1	17.9	18.5	17.9	16.9	16.1	17.1	18.4	18.3
AVERAGE	18.9	19.1	19.1	18.9	19.4	19.4	19.5	19.0	18.3	18.4	18.9	19.6	19.0

Source : Badan Meteorologi dan Geofisika (Meteorological and Geophysical Agency, BMG) Manado

Table C.2.13 Monthly Mean Relative Humidity at Tondano

Station : Tondano N01°17'42" - E124°55'30", 704m (MSL)
Province : Tondano, North Sulawesi
Measured Height : 10m

Unit : %

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	AVERAGE
1992	89	89	86	87	93	91	91	83	85	90		88	88
1993	90	90	93	92	93	89	90	83	84	88	90	88	89
1994	93	91	94	91	91	90	84	83	80	84	91	89	88
1995	91	91	89	89	90	90	89	90	87	90	91	88	90
1996	90	91	89	90	90	91	89	89	85	89	90	88	89
1997	90	88	87	88	88	80	85	78	81	86	89	90	86
1998	87	87	84	85	89	92	90	88	88	91	90	90	88
1999	90	90	90	88	91	89	87	85	89	90	90	90	89
MAX	93	91	94	92	93	92	91	90	89	91	91	90	90
MIN	87	87	84	85	88	80	84	78	80	84	89	88	86
AVERAGE	90	90	89	89	91	89	88	85	85	89	90	89	89

Source : Badan Meteorologi dan Geofisika (Meteorological and Geophysical Agency, BMG) Manado

Table C.2.14 Monthly Mean Sunshine Duration at Tondano

Station : Tondano N01°17'42" - E124°55'30", 704m (MSL)
Province : Tondano, North Sulawesi

Unit : % (10hrs=100%)

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	AVERAGE
1992	68	61	60	71	43	57	54	84	75	52	53	50	61
1993	56	72	62	65	58	71	61	88	85	68	93	58	70
1994	61	66	45	44	52	52	80	72	82	74	53	60	62
1995	59	58	60	65	65	51	59	53	56	55	41	45	56
1996	40	39	72	61	61	50	64	57	71	52	62	53	57
1997	45	28	63	62	71	88	67	95	87	74	63	57	67
1998	71	79	73	55	53	40	61	61	62	56	36	38	57
1999	36	43	34	49	45	43	69	59	65	53	50	35	48
MAX	71	79	73	71	71	88	80	95	87	74	93	60	70
MIN	36	28	34	44	43	40	54	53	56	52	36	35	48
AVERAGE	55	56	59	59	56	57	64	71	73	61	56	50	60

Source : Badan Meteorologi dan Geofisika (Meteorological and Geophysical Agency, BMG) Manado

Table C.2.15 Monthly Mean Wind Speed at Tondano

Station : Tondano N01°17'42" - E124°55'30", 704m (MSL)
Province : Tondano, North Sulawesi

Unit : m/sec

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	AVERAGE
1992	0.8	1.1	0.8	0.6	0.3	0.8	0.8	0.8	0.2	0.6	0.6	0.8	0.7
1993	1.1	1.1	0.8	0.8	0.3	0.8	0.8	1.1	0.8	0.6	0.4	1.1	0.8
1994	0.8	0.8	0.5	0.3	0.5	0.3	0.8	1.4	1.4	0.8	0.4	0.7	0.7
1995	1.2	0.8	0.9	0.6	0.3	0.4	0.5	2.4	1.9	0.8	0.8	3.7	1.2
1996	2.9	4.8	3.0	1.2	0.5	0.3	0.6	0.5	0.2	0.7	1.1	3.6	1.6
1997	0.7	3.6	2.9	1.3	1.2	1.3	2.8	2.2	2.3	1.3	0.9	0.6	1.8
1998	1.8	2.1	2.2	1.5	1.2	0.9	1.2	1.9	2.4	2.3	4.5	4.4	2.2
1999	4.1	4.6	3.3	4.0	2.5	3.0	4.8	5.7	3.3	2.2	0.6	3.0	3.4
MAX	4.1	4.8	3.3	4.0	2.5	3.0	4.8	5.7	3.3	2.3	4.5	4.4	3.4
MIN	0.7	0.8	0.5	0.3	0.3	0.3	0.5	0.0	0.0	0.0	0.0	0.0	0.0
AVERAGE	1.7	2.4	1.8	1.3	0.8	1.0	1.5	1.1	0.8	0.6	0.6	1.2	0.8

Source : Badan Meteorologi dan Geofisika (Meteorological and Geophysical Agency, BMG) Manado

Table C.2.16 Monthly Maximum Wind Speed at Tondano

Station : Tondano N01°17'42" - E124°55'30", 704m (MSL)
Province : Tondano, North Sulawesi

Unit : m/sec

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	AVERAGE
1992	3.9	5.0	3.6	3.0	1.4	3.3	3.3	2.5	2.5	2.8	2.2	2.8	3.0
1993	2.5	2.1	1.4	1.8	1.4	1.6	3.3	4.2	3.0	3.0	1.6	4.2	2.5
1994	2.9	3.3	1.4	2.0	2.5	1.2	2.2	6.6	3.7	3.7	1.6	4.2	2.9
1995	5.4	8.1	5.3	2.9	1.2	7.6	4.7	19.0	9.5	6.2	8.7	10.8	7.5
1996	8.2	12.3	9.8	6.2	5.1	4.6	5.7	5.4	7.0	5.9	14.6	20.5	8.8
1997	7.7	9.7	12.8	4.3	5.4	5.4	7.1	6.5	6.5	4.4	4.2	5.1	6.6
1998	5.1	6.2	6.7	6.7	6.2	5.1	4.6	7.7	10.3	12.9	14.4	11.3	8.1
1999	12.9	12.9	10.3	12.9	7.2	7.2	12.9	10.8	7.2	5.1	1.4	7.7	9.0
MAX	12.9	12.9	12.8	12.9	7.2	7.6	12.9	19.0	10.3	12.9	14.6	20.5	9.0
MIN	2.5	2.1	1.4	1.8	1.2	1.2	2.2	0.0	0.0	0.0	0.0	0.0	0.0
AVERAGE	6.1	7.4	6.4	5.0	3.8	4.5	5.5	4.5	3.3	2.9	3.3	4.4	3.2

Source : Badan Meteorologi dan Geofisika (Meteorological and Geophysical Agency, BMG) Manado

Table C.2.17 Monthly Mean Wind Direction at Tondano

Station : Tondano N01°17'42" - E124°55'30", 704m (MSL)
Province : Tondano, North Sulawesi

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1985	NW	NW	NW	NW	NW	SE	SE	SE	NW	NW	NW	NW
1986	NW	NW	NW	NW	NW	NW	NW	-	SE	NW	NW	NW
1987	NW	NW	N	NW	NW	SE	SE	SE	SE	SE	-	NW
1988	NW	NW	NW	-	-	-	-	S	-	NW	N	NW
1989	W	W	N	W	S	N	N	S	S	N	W	N
1990												
1991												
1992	N	N	NE	NE	N	S	SE	SE	SE	N	NW	NE
1993	S	N	N	N	S	S	S	S	S	S	S	W
1994	N	N	N	N	N	N	S	S	S	S	N	N
1995	N	N	N	N	S	SE/S	S	S	S	S	N	W
1996	N	N	U	S/W	S	S	S	S	S	S	S	W
1997	N	U	W/SE	S	S/SE	S	S	S	S	S	S	N
1998	N	N	N	NE	S	S	S	S	S	S	W	W
1999	W	N	N	W	S	S	W	S	S	S	S	W/N

Note : N = North, NE = North East, E = East, SE = South East,
S = South, SW = South West, W = West, NW = North West

Source : Badan Meteorologi dan Geofisika (Meteorological and Geophysical Agency, BMG) Manado

Table C.2.18 Monthly Maximum Wind Direction at Tondano

Station : Tondano N01°17'42" - E124°55'30", 704m (MSL)
Province : Tondano, North Sulawesi

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1992	N	N	NE	NE	S	S	S	SE	SE	N	N	N
1993	NW	NW	NE	NE	N	S	S	S	S	S	S	N
1994	N	N	N	W	S	N	S	S	S	S	N	N
1995	N	N	N/NW	N	N	S	S	S	S	S	W/NW	W
1996	W/NW	NW	SW	W	N/NW	S	S/NW	S	S	W	W	NW
1997	S	NW	W	E/NW	SW	SW	S	S	S	NW	N	N
1998	N/NE	N/NE	N	NE	SE	S	S/SE	SE	SE	W	W	W
1999	W	W	W	W	S	S	W	S	S	SE	SE	W

Note : N = North, NE = North East, E = East, SE = South East,
S = South, SW = South West, W = West, NW = North West

Source : Badan Meteorologi dan Geofisika (Meteorological and Geophysical Agency, BMG) Manado

Table C.2.19 Monthly Rainfall at Kayuwatu-Manado

Station : Kayuwatu-Manado 01°30'00"N, 124°54'00", 67m(MSL)
Province : Manado, North Sulawesi

Unit : mm

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	TOTAL
1980	416.0	499.0	209.0	402.0	82.0	177.0	15.0	159.0	10.0	122.0	259.0	285.0	2,635.0
1981	-	-	-	-	-	-	-	-	-	-	-	-	0.0
1982	-	-	-	-	-	-	-	-	-	-	-	-	0.0
1983	187.0	34.0	30.0	210.0	-	200.0	155.0	147.0	128.0	181.0	309.0	306.0	1,887.0
1984	287.0	381.0	288.0	375.0	280.0	175.0	156.0	245.0	310.0	162.0	85.0	516.0	3,260.0
1985	295.0	703.0	169.0	275.0	247.0	150.0	85.0	285.0	213.0	100.0	225.0	361.0	3,108.0
1986	510.0	353.0	408.0	245.0	125.0	137.0	106.0	31.0	108.0	269.0	188.0	265.0	2,745.0
1987	509.0	401.0	251.0	121.0	322.0	16.0	22.0	9.0	19.0	84.0	390.0	256.0	2,400.0
1988	198.0	513.0	361.0	298.0	431.0	196.0	185.0	138.0	152.0	299.0	348.0	423.0	3,542.0
1989	546.0	362.0	518.0	460.0	237.0	243.0	337.0	173.0	247.0	304.0	229.0	241.0	3,897.0
1990	470.7	128.0	500.1	125.0	277.1	326.3	148.4	110.5	55.1	176.3	257.8	241.2	2,816.5
1991	273.6	311.7	254.0	201.6	266.1	96.7	99.4	16.9	53.0	180.8	139.3	361.3	2,254.4
1992	173.4	227.3	289.3	83.5	335.7	248.0	93.5	40.9	100.2	442.1	171.8	328.5	2,534.2
1993	270.2	268.7	299.6	94.0	213.5	145.1	34.8	41.5	131.1	127.9	234.6	216.1	2,077.1
1994	339.2	206.7	478.3	99.9	152.8	222.6	51.7	74.8	0.3	62.5	261.4	295.2	2,245.4
1995	505.2	354.9	124.5	153.1	111.4	314.2	110.2	178.2	204.2	221.8	234.4	360.3	2,872.4
1996	482.6	616.1	323.5	142.3	154.4	257.9	164.7	48.3	44.0	391.8	426.0	360.2	3,411.8
1997	252.4	300.7	118.5	102.7	76.6	0.0	158.8	0.0	0.0	31.8	64.0	204.8	1,310.3
1998	151.0	42.0	124.1	265.7	211.2	304.0	145.7	156.5	139.4	347.6	441.8	397.4	2,726.4
1999	539.4	135.3	537.7	295.7	300.9	256.6	144.5	125.5	65.2	210.5	324.3	299.1	3,234.7
MAX	546.0	703.0	537.7	460.0	431.0	326.3	337.0	285.0	310.0	442.1	441.8	516.0	5,335.9
MIN	151.0	34.0	30.0	83.5	76.6	0.0	22.0	0.0	0.0	31.8	64.0	204.8	697.7
AVERAGE	352.3	314.0	298.5	208.7	233.9	193.4	129.3	107.1	115.9	211.3	254.7	319.5	2,738.6

Source : Badan Meteorologi dan Geofisika (Meteorological and Geophysical Agency, BMG) Manado

Table C.2.20 Monthly Rainfall at Airmadidi

Station : Airmadidi
Province : Airmadidi, North Sulawesi

Unit : mm

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	TOTAL
1990	390.0	76.0	246.0	332.0	96.0	73.0	132.0	43.0	65.0	181.0	171.0	185.0	1,990.0
1991	351.0	214.0	127.0	173.0	150.0	99.0	53.0	24.0	0.0	0.0	144.0	467.0	1,802.0
1992	117.0	154.0	150.0	34.0	354.0	185.0	202.0	95.0	132.0	401.0	221.0	401.0	2,446.0
1993	307.0	191.0	97.0	89.0	243.0	99.0	96.0	127.0	7.0	131.0	232.0	367.0	1,986.0
1994	273.0	130.0	396.0	178.0	186.0	98.0	16.0	0.0	2.0	77.0	270.0	142.0	1,768.0
1995	175.0	192.0	255.0	159.0	257.0	112.0	132.0	197.0	182.0	307.0	385.0	282.0	2,635.0
1996	344.0	855.0	387.0	275.0	292.0	285.0	171.0	69.0	127.0	333.0	332.0	578.0	4,048.0
1997	242.0	263.0	221.0	131.0	31.0	0.0	86.0	0.0	4.0	149.0	29.0	356.0	1,512.0
1998	114.0	26.0	63.0	186.0	269.0	216.0	206.0	87.0	95.0	430.0	479.0	357.0	2,528.0
1999	462.0	148.0	460.0	278.0	485.0	463.0	114.0	-	-	-	-	-	2,410.0
MAX	462.0	855.0	460.0	332.0	485.0	463.0	206.0	197.0	182.0	430.0	479.0	578.0	5,129.0
MIN	114.0	26.0	63.0	34.0	31.0	0.0	16.0	0.0	0.0	0.0	29.0	142.0	455.0
AVERAGE	277.5	224.9	240.2	183.5	236.3	163.0	120.8	71.3	68.2	223.2	251.4	348.3	2,408.8

Source : Badan Meteorologi dan Geofisika (Meteorological and Geophysical Agency, BMG) Manado

Table C.2.21 Monthly Rainfall at Tondano

Station : Tondano N01°17'42" - E124°55'30", 704m (MSL)
Province : Tondano, North Sulawesi

Unit : mm

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	TOTAL
1990	208.0	84.0	177.0	103.0	161.0	146.5	58.0	39.0	168.0	174.0	270.0	125.6	1,714.1
1991	194.0	161.0	153.0	229.0	287.0	81.0	239.0	75.0	5.0	167.0	154.0	125.6	1,870.6
1992	58.8	53.0	29.9	44.5	281.9	104.7	115.5	22.0	84.2	206.0	312.5	182.1	1,495.1
1993	103.4	34.6	106.7	90.3	245.7	79.4	66.7	61.5	52.6	181.1	339.5	116.9	1,478.4
1994	131.1	104.9	416.7	150.4	227.3	106.3	54.9	2.1	0.0	53.5	225.5	107.2	1,579.9
1995	210.6	147.1	95.4	131.0	261.1	166.9	110.8	280.3	179.9	288.9	243.3	177.8	2,293.1
1996	176.6	269.7	209.1	194.7	309.3	197.7	168.9	226.3	129.7	279.8	195.3	225.2	2,582.3
1997	151.6	160.9	80.3	229.3	116.0	2.3	150.3	0.0	7.7	138.3	147.0	78.0	1,261.7
1998	36.7	26.0	50.0	135.5	167.2	430.3	194.1	148.8	62.8	238.3	261.4	202.8	1,953.9
1999	169.2	169.2	360.7	135.8	302.9	229.1	62.0	113.2	202.2	196.6	116.7	132.4	2,190.0
MAX	210.6	269.7	416.7	229.3	309.3	430.3	239.0	280.3	202.2	288.9	339.5	225.2	3,441.0
MIN	36.7	26.0	29.9	44.5	116.0	2.3	54.9	0.0	0.0	53.5	116.7	78.0	558.5
AVERAGE	144.0	121.0	167.9	144.4	235.9	154.4	122.0	96.8	89.2	192.4	226.5	147.4	1,841.9

Source : Badan Meteorologi dan Geofisika (Meteorological and Geophysical Agency, BMG) Manado

Table C.2.22 Monthly Rainfall at Kakas

Station : Kakas
Province : Kakas, North Sulawesi

Unit : mm

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	TOTAL
1992	188.0	141.0	86.0	56.0	301.0	117.0	113.0	14.0	150.0	97.0	205.0	168.0	1,636.0
1993	191.0	63.0	165.0	60.0	225.0	178.0	167.0	0.0	25.0	14.0	90.0	41.0	1,219.0
1994	-	114.0	417.0	180.0	283.0	142.0	-	-	0.0	52.0	-	-	1,188.0
1995	241.0	224.0	140.0	89.0	88.0	179.0	124.0	-	-	-	-	-	1,085.0
1996	70.0	74.0	89.0	75.0	212.0	161.0	64.0	-	-	-	-	-	745.0
1997	-	-	-	-	-	-	-	-	-	-	-	-	0.0
1998	-	-	-	-	-	-	-	-	-	-	-	-	0.0
1999	-	-	-	-	-	-	-	-	-	-	-	-	0.0
MAX	241.0	224.0	417.0	180.0	301.0	179.0	167.0	14.0	150.0	97.0	205.0	168.0	2,343.0
MIN	70.0	63.0	86.0	56.0	88.0	117.0	64.0	0.0	0.0	14.0	90.0	41.0	689.0
AVERAGE	172.5	123.2	179.4	92.0	221.8	155.4	117.0	7.0	58.3	54.3	147.5	104.5	1,433.0

Source : Badan Meteorologi dan Geofisika (Meteorological and Geophysical Agency, BMG) Manado

Table C.2.23 Monthly Rainfall at Luaan

Station : Luaan
Province : Tondano, North Sulawesi

Unit : mm

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	TOTAL
1993	108.5	26.7	137.0	44.5	55.8	66.1	122.1	0.0	30.0	57.0	258.5	12.0	918.2
1994	145.2	137.0	332.3	175.8	221.2	40.6	72.9	0.5	0.0	48.8	155.1	196.9	1,526.3
1995	230.0	118.1	125.3	77.0	362.0	200.0	128.5	223.0	269.0	308.0	245.5	99.5	2,385.9
1996	227.0	296.4	94.0	103.0	209.5	276.7	189.5	73.2	45.2	133.0	228.8	331.3	2,207.6
1997	134.3	152.0	101.9	82.0	104.7	0.0	132.6	0.0	25.0	151.0	86.0	78.8	1,048.3
1998	47.9	45.7	68.6	112.0	188.5	490.5	181.0	216.9	80.0	286.6	315.8	168.4	2,201.9
1999	266.6	142.5	211.3	157.8	279.1	191.7	74.5	73.4	90.6	128.3	85.4	114.3	1,815.4
MAX	266.6	296.4	332.3	175.8	362.0	490.5	189.5	223.0	269.0	308.0	315.8	331.3	3,560.2
MIN	47.9	26.7	68.6	44.5	55.8	0.0	72.9	0.0	0.0	48.8	85.4	12.0	462.5
AVERAGE	165.6	131.2	152.9	107.4	203.0	180.8	128.7	83.9	77.1	159.0	196.4	143.0	1,729.1

Source : PT. PLN

Table C.2.24 Monthly Rainfall at Remboken

Station : Remboken
Province : Remboken, North Sulawesi

Unit : mm

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	TOTAL
1993	92.4	71.5	282.5	43.6	277.5	186.3	163.0	0.0	28.8	54.5	297.0	52.0	1,549.1
1994	235.1	91.3	222.5	315.3	260.8	65.6	122.7	19.3	0.0	66.6	194.0	118.5	1,711.7
1995	173.5	91.8	99.7	75.0	125.9	33.0	55.6	119.8	218.0	154.9	124.0	201.0	1,472.2
1996	190.5	50.0	30.0	197.0	176.8	290.0	112.5	46.0	72.5	110.5	239.5	300.0	1,815.3
1997	95.2	143.5	107.2	56.0	77.9	0.0	26.0	0.0	0.0	140.1	62.2	111.0	819.1
1998	11.8	6.0	7.8	33.3	63.5	379.5	59.0	128.0	43.0	56.0	198.5	225.0	1,211.4
1999	90.2	86.0	221.6	188.7	171.7	203.0	53.0	34.0	39.5	160.0	160.5	109.5	1,517.7
MAX	235.1	143.5	282.5	315.3	277.5	379.5	163.0	128.0	218.0	160.0	297.0	300.0	2,899.4
MIN	11.8	6.0	7.8	33.3	63.5	0.0	26.0	0.0	0.0	54.5	62.2	52.0	317.1
AVERAGE	127.0	77.2	138.8	129.8	164.9	165.3	84.5	49.6	57.4	106.1	182.2	159.6	1,442.4

Source : PT. PLN

Table C.2.25 Monthly Rainfall at Telap

Station : Telap
Province : Eris, North Sulawesi

Unit : mm

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	TOTAL
1993	165.0	37.0	111.5	83.5	232.5	145.4	115.5	0.0	19.0	4.0	212.5	38.7	1,164.6
1994	161.0	63.1	289.0	291.0	146.5	74.8	152.0	6.7	0.0	63.3	355.1	216.1	1,818.6
1995	190.9	36.3	146.8	85.5	230.0	184.6	181.7	378.5	134.5	247.5	204.0	91.0	2,111.3
1996	219.6	159.0	63.0	227.9	167.0	244.0	131.0	126.0	120.0	188.0	118.0	222.0	1,985.5
1997	117.0	141.0	98.0	161.0	61.0	10.0	94.0	0.0	0.0	24.0	92.0	234.0	1,032.0
1998	19.0	32.0	17.0	70.0	263.0	492.0	159.0	156.0	57.0	191.0	239.0	167.0	1,862.0
1999	175.0	117.0	321.0	174.0	311.0	164.0	80.0	113.0	53.0	237.0	184.0	137.0	2,066.0
MAX	219.6	159.0	321.0	291.0	311.0	492.0	181.7	378.5	134.5	247.5	355.1	234.0	3,324.9
MIN	19.0	32.0	17.0	70.0	61.0	10.0	80.0	0.0	0.0	4.0	92.0	38.7	423.7
AVERAGE	149.6	83.6	149.5	156.1	201.6	187.8	130.5	111.5	54.8	136.4	200.7	158.0	1,720.0

Source : PT. PLN

Table C.2.26 Monthly Rainfall at Noongan

Station : Noongan
Province : Langowan, North Sulawesi

Unit : mm

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	TOTAL
1993	161.5	34.5	200.7	45.5	180.5	141.0	158.0	4.0	19.5	40.0	318.5	49.5	1,353.2
1994	227.5	161.0	180.8	281.5	137.8	153.5	217.5	98.3	0.0	18.2	335.8	216.8	2,028.7
1995	378.3	185.2	327.5	150.5	256.4	198.0	401.4	558.5	238.0	462.0	430.0	92.6	3,678.4
1996	160.0	359.0	93.1	355.5	349.3	389.0	169.5	138.5	190.5	219.0	174.3	376.1	2,973.8
1997	110.3	183.0	285.5	202.5	56.3	20.0	145.5	0.0	0.0	26.4	152.4	318.5	1,500.4
1998	76.0	52.0	48.5	116.2	253.8	611.0	327.2	168.0	129.5	347.0	298.0	133.5	2,560.7
1999	165.3	128.0	433.1	179.3	256.0	215.5	129.0	148.2	175.6	186.9	240.0	195.2	2,452.1
MAX	378.3	359.0	433.1	355.5	349.3	611.0	401.4	558.5	238.0	462.0	430.0	376.1	4,952.2
MIN	76.0	34.5	48.5	45.5	56.3	20.0	129.0	0.0	0.0	18.2	152.4	49.5	629.9
AVERAGE	182.7	157.5	224.2	190.1	212.9	246.9	221.2	159.4	107.6	185.6	278.4	197.5	2,363.9

Source : PT. PLN

Table C.2.27 Daily Rainfall at Manado (1980)

Station : Kayuwatu-Manado 01°30'00"N, 124°54'00", 67m(MSL)
Province : Manado, North Sulawesi
Year 1980 Unit : mm

Day	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	TOTAL
1	2.0	0.0	0.0	4.0	30.0	4.0	0.0	1.0	0.0	0.0	0.0	50.0	91.0
2	9.0	0.0	0.0	0.0	12.0	15.0	3.0	0.0	2.0	0.0	0.0	10.0	51.0
3	1.0	15.0	0.0	0.0	1.0	8.0	0.0	0.0	0.0	0.0	0.0	2.0	27.0
4	14.0	0.0	12.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0	27.0
5	42.0	35.0	15.0	7.0	5.0	55.0	0.0	2.0	0.0	0.0	0.0	5.0	166.0
6	181.0	12.0	0.0	19.0	18.0	0.0	0.0	6.0	0.0	0.0	0.0	0.0	236.0
7	8.0	131.0	0.0	19.0	0.0	15.0	0.0	28.0	0.0	3.0	3.0	1.0	208.0
8	5.0	8.0	0.0	6.0	0.0	2.0	0.0	2.0	4.0	2.0	0.0	0.0	29.0
9	12.0	6.0	0.0	0.0	0.0	0.0	0.0	15.0	0.0	0.0	2.0	3.0	38.0
10	13.0	0.0	5.0	47.0	0.0	16.0	0.0	0.0	0.0	0.0	0.0	3.0	84.0
11	0.0	6.0	2.0	48.0	0.0	23.0	0.0	0.0	0.0	15.0	0.0	5.0	99.0
12	9.0	23.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	4.0	0.0	36.0
13	0.0	13.0	0.0	48.0	0.0	7.0	0.0	0.0	0.0	0.0	0.0	41.0	109.0
14	0.0	26.0	0.0	112.0	0.0	0.0	1.0	0.0	0.0	1.0	29.0	12.0	181.0
15	2.0	0.0	57.0	4.0	0.0	0.0	0.0	0.0	0.0	1.0	39.0	1.0	104.0
16	1.0	1.0	62.0	7.0	0.0	3.0	0.0	0.0	0.0	0.0	0.0	16.0	90.0
17	0.0	4.0	1.0	29.0	7.0	0.0	0.0	0.0	0.0	19.0	0.0	0.0	60.0
18	11.0	14.0	1.0	2.0	2.0	6.0	0.0	0.0	0.0	2.0	0.0	8.0	46.0
19	15.0	36.0	0.0	0.0	0.0	3.0	0.0	0.0	0.0	20.0	0.0	3.0	77.0
20	15.0	12.0	20.0	15.0	0.0	5.0	0.0	1.0	0.0	1.0	0.0	6.0	75.0
21	0.0	1.0	0.0	25.0	0.0	4.0	0.0	4.0	0.0	0.0	59.0	5.0	98.0
22	7.0	7.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	39.0	24.0	49.0	126.0
23	0.0	132.0	0.0	0.0	0.0	0.0	1.0	26.0	0.0	0.0	0.0	0.0	159.0
24	1.0	6.0	0.0	0.0	0.0	0.0	0.0	8.0	0.0	0.0	0.0	0.0	15.0
25	1.0	0.0	8.0	0.0	0.0	0.0	0.0	42.0	4.0	0.0	7.0	0.0	62.0
26	43.0	0.0	0.0	0.0	0.0	0.0	1.0	0.0	0.0	0.0	13.0	21.0	78.0
27	0.0	0.0	4.0	4.0	0.0	0.0	0.0	0.0	0.0	10.0	25.0	1.0	44.0
28	2.0	7.0	0.0	0.0	3.0	0.0	0.0	0.0	0.0	9.0	0.0	8.0	29.0
29	18.0	4.0	22.0	6.0	1.0	11.0	2.0	3.0	0.0	0.0	54.0	2.0	123.0
30	0.0	-	0.0	0.0	3.0	0.0	7.0	21.0	0.0	0.0	0.0	16.0	47.0
31	4.0	-	0.0	-	0.0	-	0.0	0.0	-	0.0	-	16.0	20.0
Rainfall Days	23	23	12	18	10	16	6	13	4	12	12	24	173
MAX	181.0	132.0	62.0	112.0	30.0	55.0	7.0	42.0	4.0	39.0	59.0	50.0	773.0
TOTAL	416.0	499.0	209.0	402.0	82.0	177.0	15.0	159.0	10.0	122.0	259.0	285.0	2,635.0

Source : Badan Meteorologi dan Geofisika (Meteorological and Geophysical Agency, BMG) Manado

Table C.2.28 Daily Rainfall at Manado (1983)

Station : Kayuwatu-Manado 01°30'00"N, 124°54'00", 67m(MSL)
Province : Manado, North Sulawesi
Year 1983 Unit : mm

Day	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	TOTAL
1	7.0	0.0	3.0	0.0	-	0.0	0.0	40.0	0.0	0.0	0.0	0.0	50.0
2	3.0	0.0	0.0	0.0	-	0.0	0.0	0.0	1.0	0.0	0.0	0.0	4.0
3	5.0	0.0	0.0	0.0	-	0.0	6.0	0.0	0.0	16.0	0.0	0.0	27.0
4	14.0	12.0	0.0	0.0	-	0.0	0.0	0.0	0.0	3.0	0.0	32.0	61.0
5	20.0	0.0	0.0	41.0	-	0.0	0.0	0.0	0.0	42.0	17.0	65.0	185.0
6	3.0	0.0	0.0	0.0	-	0.0	0.0	4.0	2.0	1.0	2.0	8.0	20.0
7	0.0	0.0	0.0	0.0	-	16.0	5.0	0.0	0.0	0.0	22.0	0.0	43.0
8	0.0	1.0	0.0	0.0	-	0.0	1.0	1.0	0.0	0.0	29.0	0.0	32.0
9	0.0	12.0	0.0	0.0	-	11.0	0.0	0.0	0.0	0.0	14.0	0.0	37.0
10	0.0	0.0	0.0	0.0	-	25.0	0.0	0.0	1.0	0.0	12.0	0.0	38.0
11	31.0	0.0	0.0	0.0	-	1.0	0.0	0.0	1.0	0.0	30.0	0.0	63.0
12	23.0	0.0	1.0	2.0	-	0.0	0.0	0.0	14.0	0.0	9.0	5.0	54.0
13	3.0	0.0	0.0	0.0	-	5.0	20.0	7.0	0.0	0.0	19.0	9.0	63.0
14	0.0	0.0	0.0	0.0	-	0.0	0.0	0.0	49.0	0.0	11.0	6.0	66.0
15	0.0	0.0	0.0	0.0	-	0.0	9.0	0.0	3.0	0.0	7.0	17.0	36.0
16	11.0	1.0	0.0	0.0	-	1.0	52.0	31.0	0.0	0.0	2.0	1.0	99.0
17	36.0	0.0	0.0	0.0	-	7.0	1.0	0.0	5.0	0.0	37.0	1.0	87.0
18	2.0	0.0	0.0	0.0	-	3.0	0.0	0.0	20.0	1.0	11.0	0.0	37.0
19	0.0	0.0	0.0	0.0	-	51.0	34.0	16.0	0.0	64.0	32.0	1.0	198.0
20	0.0	0.0	0.0	10.0	-	27.0	0.0	0.0	0.0	1.0	0.0	1.0	39.0
21	22.0	0.0	2.0	0.0	-	23.0	0.0	0.0	0.0	4.0	0.0	0.0	51.0
22	0.0	0.0	0.0	9.0	-	20.0	0.0	0.0	0.0	6.0	2.0	1.0	38.0
23	1.0	1.0	1.0	6.0	-	0.0	1.0	0.0	0.0	1.0	0.0	3.0	14.0
24	0.0	0.0	0.0	7.0	-	0.0	4.0	1.0	0.0	18.0	0.0	2.0	32.0
25	0.0	0.0	0.0	21.0	-	7.0	3.0	0.0	0.0	0.0	0.0	9.0	40.0
26	0.0	2.0	0.0	0.0	-	0.0	2.0	44.0	0.0	0.0	0.0	2.0	50.0
27	0.0	4.0	0.0	65.0	-	1.0	15.0	0.0	14.0	1.0	0.0	13.0	113.0
28	0.0	1.0	0.0	17.0	-	0.0	1.0	1.0	2.0	0.0	26.0	1.0	49.0
29	4.0		6.0	32.0	-	2.0	0.0	2.0	5.0	3.0	0.0	49.0	103.0
30	2.0		4.0	0.0	-	0.0	0.0	0.0	11.0	20.0	27.0	5.0	69.0
31	0.0		13.0		-		1.0	0.0		0.0		75.0	89.0
Rainfall Day	16	8	7	10	31	15	15	10	13	14	18	21	178
MAX	36.0	12.0	13.0	65.0	0.0	51.0	52.0	44.0	49.0	64.0	37.0	75.0	498.0
MIN	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TOTAL	187.0	34.0	30.0	210.0	0.0	200.0	155.0	147.0	128.0	181.0	309.0	306.0	1,887.0

Source : Badan Meteorologi dan Geofisika (Meteorological and Geophysical Agency, BMG) Manado

Table C.2.29 Daily Rainfall at Manado (1984)

Station : Kayuwatu-Manado 01°30'00"N, 124°54'00", 67m(MSL)
Province : Manado, North Sulawesi
Year 1984 Unit : mm

Day	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	TOTAL
1	5.0	18.0	12.0	9.0	17.0	3.0	1.0	0.0	0.0	18.0	0.0	0.0	83.0
2	5.0	12.0	14.0	32.0	6.0	1.0	3.0	0.0	0.0	0.0	20.0	0.0	93.0
3	3.0	1.0	15.0	4.0	0.0	3.0	0.0	2.0	6.0	9.0	0.0	0.0	43.0
4	4.0	2.0	0.0	1.0	21.0	1.0	2.0	0.0	3.0	0.0	1.0	0.0	35.0
5	0.0	31.0	4.0	3.0	0.0	2.0	0.0	0.0	0.0	5.0	7.0	2.0	54.0
6	0.0	14.0	0.0	14.0	15.0	0.0	0.0	35.0	22.0	14.0	0.0	0.0	114.0
7	10.0	47.0	1.0	44.0	0.0	1.0	0.0	7.0	0.0	0.0	4.0	9.0	123.0
8	0.0	7.0	2.0	1.0	4.0	0.0	0.0	129.0	14.0	0.0	0.0	27.0	184.0
9	6.0	26.0	0.0	10.0	2.0	5.0	2.0	0.0	13.0	0.0	0.0	8.0	72.0
10	0.0	12.0	6.0	10.0	0.0	6.0	5.0	67.0	1.0	0.0	0.0	3.0	110.0
11	0.0	16.0	0.0	53.0	7.0	3.0	27.0	0.0	11.0	0.0	0.0	89.0	206.0
12	0.0	8.0	6.0	3.0	2.0	18.0	0.0	5.0	0.0	0.0	0.0	15.0	57.0
13	0.0	3.0	8.0	19.0	11.0	4.0	0.0	0.0	69.0	0.0	0.0	30.0	144.0
14	0.0	1.0	4.0	2.0	1.0	51.0	9.0	0.0	31.0	35.0	1.0	0.0	135.0
15	1.0	10.0	2.0	9.0	11.0	0.0	14.0	0.0	41.0	18.0	0.0	6.0	112.0
16	15.0	0.0	39.0	4.0	2.0	10.0	0.0	0.0	1.0	0.0	0.0	0.0	71.0
17	1.0	26.0	1.0	0.0	10.0	39.0	4.0	0.0	2.0	5.0	0.0	7.0	95.0
18	0.0	27.0	20.0	17.0	0.0	15.0	2.0	0.0	3.0	0.0	0.0	63.0	147.0
19	2.0	16.0	19.0	3.0	7.0	8.0	0.0	0.0	0.0	34.0	1.0	24.0	114.0
20	16.0	20.0	0.0	20.0	0.0	0.0	2.0	0.0	2.0	0.0	0.0	0.0	60.0
21	0.0	31.0	0.0	4.0	6.0	0.0	0.0	0.0	0.0	14.0	10.0	0.0	65.0
22	3.0	0.0	9.0	51.0	12.0	2.0	65.0	0.0	41.0	0.0	25.0	16.0	224.0
23	9.0	14.0	5.0	8.0	0.0	0.0	6.0	0.0	0.0	0.0	0.0	0.0	42.0
24	43.0	8.0	20.0	0.0	24.0	0.0	7.0	0.0	0.0	0.0	0.0	8.0	110.0
25	33.0	1.0	30.0	1.0	0.0	0.0	1.0	0.0	0.0	5.0	0.0	30.0	101.0
26	10.0	0.0	21.0	0.0	3.0	0.0	0.0	0.0	0.0	0.0	3.0	16.0	53.0
27	2.0	2.0	17.0	1.0	0.0	2.0	0.0	0.0	50.0	0.0	1.0	8.0	83.0
28	47.0	0.0	0.0	18.0	5.0	0.0	0.0	0.0	0.0	0.0	0.0	49.0	119.0
29	8.0	28.0	0.0	33.0	14.0	1.0	4.0	0.0	0.0	0.0	0.0	0.0	88.0
30	50.0		33.0	1.0	3.0	0.0	2.0	0.0	0.0	0.0	12.0	19.0	120.0
31	14.0		0.0		97.0		0.0	0.0		5.0		87.0	203.0
Rainfall Day	21	25	22	27	22	19	17	6	16	11	11	20	217
MAX	50.0	47.0	39.0	53.0	97.0	51.0	65.0	129.0	69.0	35.0	25.0	89.0	749.0
MIN	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TOTAL	287.0	381.0	288.0	375.0	280.0	175.0	156.0	245.0	310.0	162.0	85.0	516.0	3,260.0

Source : Badan Meteorologi dan Geofisika (Meteorological and Geophysical Agency, BMG) Manado

Table C.2.30 Daily Rainfall at Manado (1985)

Station : Kayuwatu-Manado 01°30'00"N, 124°54'00", 67m(MSL)
Province : Manado, North Sulawesi
Year 1985 Unit : mm

Day	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	TOTAL
1	15.0	7.0	3.0	38.0	0.0	0.0	6.0	14.0	0.0	2.0	3.0	16.0	104.0
2	11.0	0.0	0.0	3.0	27.0	2.0	0.0	41.0	15.0	0.0	3.0	6.0	108.0
3	3.0	35.0	1.0	46.0	28.0	0.0	0.0	0.0	0.0	1.0	7.0	32.0	153.0
4	10.0	10.0	0.0	12.0	0.0	11.0	0.0	2.0	0.0	25.0	1.0	0.0	71.0
5	21.0	30.0	1.0	2.0	0.0	9.0	5.0	6.0	0.0	27.0	4.0	0.0	105.0
6	9.0	37.0	20.0	0.0	0.0	49.0	12.0	9.0	0.0	6.0	13.0	0.0	155.0
7	0.0	6.0	0.0	0.0	3.0	21.0	0.0	15.0	5.0	0.0	59.0	0.0	109.0
8	4.0	2.0	0.0	5.0	15.0	0.0	2.0	5.0	45.0	0.0	17.0	0.0	95.0
9	9.0	1.0	3.0	4.0	2.0	0.0	14.0	0.0	0.0	0.0	5.0	17.0	55.0
10	84.0	99.0	6.0	0.0	0.0	4.0	0.0	22.0	0.0	0.0	0.0	0.0	215.0
11	6.0	2.0	0.0	0.0	14.0	24.0	8.0	0.0	0.0	0.0	2.0	0.0	56.0
12	21.0	19.0	16.0	0.0	6.0	0.0	12.0	0.0	5.0	2.0	1.0	11.0	93.0
13	5.0	121.0	3.0	0.0	2.0	0.0	0.0	0.0	1.0	3.0	28.0	0.0	163.0
14	3.0	106.0	48.0	8.0	1.0	0.0	15.0	0.0	0.0	0.0	5.0	0.0	186.0
15	5.0	103.0	20.0	0.0	23.0	3.0	2.0	46.0	0.0	0.0	0.0	6.0	208.0
16	0.0	89.0	26.0	39.0	13.0	6.0	0.0	1.0	0.0	0.0	2.0	0.0	176.0
17	0.0	5.0	0.0	64.0	0.0	0.0	0.0	4.0	0.0	0.0	7.0	3.0	83.0
18	0.0	0.0	0.0	29.0	2.0	7.0	1.0	2.0	11.0	0.0	6.0	0.0	58.0
19	0.0	5.0	1.0	17.0	0.0	4.0	0.0	1.0	7.0	0.0	0.0	8.0	43.0
20	3.0	0.0	0.0	0.0	55.0	0.0	0.0	4.0	3.0	0.0	0.0	58.0	123.0
21	1.0	1.0	0.0	0.0	39.0	0.0	0.0	0.0	12.0	0.0	15.0	52.0	120.0
22	7.0	0.0	1.0	1.0	0.0	0.0	0.0	23.0	45.0	0.0	21.0	79.0	177.0
23	0.0	0.0	0.0	0.0	1.0	0.0	1.0	48.0	0.0	0.0	12.0	53.0	115.0
24	0.0	0.0	5.0	0.0	0.0	0.0	4.0	0.0	0.0	0.0	0.0	1.0	10.0
25	8.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	8.0
26	11.0	1.0	9.0	1.0	0.0	0.0	1.0	0.0	20.0	1.0	0.0	0.0	44.0
27	21.0	8.0	1.0	3.0	2.0	0.0	2.0	2.0	5.0	1.0	9.0	3.0	57.0
28	2.0	16.0	0.0	0.0	0.0	0.0	0.0	11.0	7.0	0.0	5.0	5.0	46.0
29	5.0		0.0	1.0	5.0	0.0	0.0	15.0	8.0	25.0	0.0	0.0	59.0
30	0.0		1.0	2.0	7.0	10.0	0.0	0.0	24.0	0.0	0.0	10.0	54.0
31	31.0		4.0		2.0		0.0	14.0		7.0		1.0	59.0
Rainfall Days	23	21	18	17	19	12	14	20	15	11	21	17	208
MAX	84.0	121.0	48.0	64.0	55.0	49.0	15.0	48.0	45.0	27.0	59.0	79.0	694.0
MIN	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TOTAL	295.0	703.0	169.0	275.0	247.0	150.0	85.0	285.0	213.0	100.0	225.0	361.0	3,108.0

Source : Badan Meteorologi dan Geofisika (Meteorological and Geophysical Agency, BMG) Manado

Table C.2.31 Daily Rainfall at Manado (1986)

Station : Kayuwatu-Manado 01°30'00"N, 124°54'00", 67m(MSL)
Province : Manado, North Sulawesi
Year 1986 Unit : mm

Day	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	TOTAL
1	2.0	23.0	0.0	6.0	0.0	0.0	0.0	1.0	2.0	0.0	27.0	0.0	61.0
2	33.0	2.0	1.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0	1.0	39.0
3	5.0	0.0	0.0	12.0	0.0	0.0	2.0	0.0	0.0	0.0	0.0	0.0	19.0
4	11.0	0.0	6.0	0.0	0.0	0.0	10.0	2.0	0.0	3.0	15.0	11.0	58.0
5	65.0	0.0	7.0	0.0	2.0	0.0	0.0	0.0	0.0	7.0	0.0	33.0	114.0
6	1.0	18.0	26.0	4.0	35.0	10.0	0.0	0.0	0.0	26.0	8.0	55.0	183.0
7	26.0	0.0	11.0	24.0	33.0	0.0	0.0	0.0	0.0	1.0	0.0	0.0	95.0
8	2.0	4.0	5.0	1.0	0.0	1.0	4.0	0.0	0.0	1.0	2.0	7.0	27.0
9	4.0	1.0	19.0	0.0	2.0	0.0	0.0	0.0	0.0	0.0	2.0	11.0	39.0
10	0.0	13.0	116.0	2.0	3.0	5.0	0.0	16.0	0.0	1.0	0.0	31.0	187.0
11	2.0	98.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	18.0	0.0	118.0
12	4.0	13.0	58.0	25.0	46.0	1.0	0.0	0.0	17.0	0.0	0.0	0.0	164.0
13	15.0	0.0	4.0	0.0	0.0	21.0	0.0	0.0	31.0	0.0	46.0	0.0	117.0
14	82.0	10.0	0.0	100.0	0.0	12.0	0.0	0.0	0.0	13.0	5.0	18.0	240.0
15	3.0	19.0	32.0	0.0	0.0	0.0	3.0	3.0	0.0	0.0	24.0	3.0	87.0
16	29.0	28.0	0.0	0.0	0.0	0.0	1.0	0.0	0.0	0.0	3.0	15.0	76.0
17	17.0	15.0	2.0	2.0	1.0	0.0	27.0	0.0	0.0	0.0	0.0	0.0	64.0
18	1.0	1.0	10.0	0.0	0.0	4.0	44.0	0.0	0.0	19.0	1.0	1.0	81.0
19	1.0	0.0	24.0	0.0	0.0	41.0	0.0	0.0	0.0	1.0	0.0	3.0	70.0
20	14.0	0.0	1.0	0.0	0.0	14.0	0.0	0.0	0.0	0.0	0.0	0.0	29.0
21	2.0	8.0	0.0	0.0	0.0	21.0	0.0	0.0	0.0	0.0	2.0	0.0	33.0
22	12.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	25.0	1.0	16.0	55.0
23	26.0	11.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0	4.0	9.0	0.0	51.0
24	27.0	69.0	0.0	16.0	0.0	7.0	0.0	4.0	0.0	11.0	2.0	0.0	136.0
25	0.0	0.0	0.0	1.0	0.0	0.0	5.0	0.0	23.0	19.0	0.0	0.0	48.0
26	21.0	0.0	35.0	28.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.0	86.0
27	8.0	0.0	46.0	0.0	0.0	0.0	1.0	0.0	0.0	0.0	7.0	21.0	83.0
28	0.0	20.0	4.0	3.0	0.0	0.0	2.0	0.0	0.0	34.0	0.0	1.0	64.0
29	56.0		0.0	19.0	0.0	0.0	0.0	0.0	22.0	3.0	0.0	15.0	115.0
30	1.0		0.0	0.0	2.0	0.0	6.0	0.0	13.0	44.0	15.0	0.0	81.0
31	40.0		0.0		1.0		1.0	5.0		57.0		21.0	125.0
Rainfall Day	28	17	19	16	9	11	12	6	6	17	18	18	177
MAX	82.0	98.0	116.0	100.0	46.0	41.0	44.0	16.0	31.0	57.0	46.0	55.0	732.0
MIN	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TOTAL	510.0	353.0	408.0	245.0	125.0	137.0	106.0	31.0	108.0	269.0	188.0	265.0	2,745.0

Source : Badan Meteorologi dan Geofisika (Meteorological and Geophysical Agency, BMG) Manado

Table C.2.32 Daily Rainfall at Manado (1987)

Station : Kayuwatu-Manado 01°30'00"N, 124°54'00", 67m(MSL)
Province : Manado, North Sulawesi
Year 1987 Unit : mm

Day	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	TOTAL
1	0.0	26.0	0.0	1.0	0.0	0.0	0.0	5.0	0.0	0.0	23.0	0.0	55.0
2	0.0	5.0	0.0	13.0	23.0	3.0	0.0	0.0	0.0	0.0	24.0	1.0	69.0
3	0.0	21.0	0.0	1.0	6.0	2.0	0.0	0.0	0.0	0.0	0.0	0.0	30.0
4	8.0	42.0	1.0	1.0	20.0	1.0	0.0	0.0	0.0	0.0	54.0	8.0	135.0
5	4.0	13.0	0.0	5.0	0.0	8.0	1.0	0.0	0.0	0.0	10.0	2.0	43.0
6	1.0	11.0	1.0	2.0	15.0	1.0	0.0	0.0	0.0	1.0	0.0	5.0	37.0
7	11.0	7.0	3.0	0.0	12.0	1.0	0.0	0.0	0.0	0.0	4.0	0.0	38.0
8	5.0	105.0	0.0	0.0	30.0	0.0	0.0	0.0	0.0	0.0	10.0	9.0	159.0
9	2.0	19.0	0.0	0.0	0.0	0.0	5.0	0.0	0.0	0.0	2.0	1.0	29.0
10	3.0	19.0	0.0	0.0	0.0	0.0	16.0	0.0	0.0	0.0	35.0	7.0	80.0
11	48.0	4.0	0.0	0.0	27.0	0.0	0.0	0.0	0.0	0.0	32.0	0.0	111.0
12	3.0	3.0	5.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	12.0
13	3.0	0.0	18.0	0.0	26.0	0.0	0.0	0.0	0.0	0.0	15.0	0.0	62.0
14	7.0	0.0	4.0	0.0	40.0	0.0	0.0	0.0	0.0	3.0	35.0	0.0	89.0
15	26.0	0.0	0.0	15.0	14.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	55.0
16	5.0	1.0	81.0	18.0	0.0	0.0	0.0	0.0	0.0	1.0	59.0	1.0	166.0
17	179.0	1.0	79.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	21.0	59.0	340.0
18	0.0	0.0	27.0	0.0	0.0	0.0	0.0	4.0	0.0	4.0	1.0	17.0	53.0
19	13.0	2.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	20.0	15.0	51.0
20	1.0	0.0	0.0	6.0	38.0	0.0	0.0	0.0	0.0	4.0	6.0	0.0	55.0
21	39.0	0.0	5.0	14.0	0.0	0.0	0.0	0.0	0.0	13.0	11.0	12.0	94.0
22	51.0	26.0	0.0	0.0	7.0	0.0	0.0	0.0	0.0	0.0	0.0	32.0	116.0
23	2.0	5.0	0.0	1.0	44.0	0.0	0.0	0.0	0.0	0.0	18.0	1.0	71.0
24	0.0	82.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	83.0
25	0.0	3.0	0.0	0.0	0.0	0.0	0.0	0.0	3.0	0.0	0.0	0.0	6.0
26	0.0	0.0	0.0	6.0	0.0	0.0	0.0	0.0	0.0	43.0	0.0	23.0	72.0
27	0.0	0.0	2.0	0.0	0.0	0.0	0.0	0.0	0.0	7.0	0.0	61.0	70.0
28	9.0	6.0	6.0	2.0	3.0	0.0	0.0	0.0	3.0	7.0	0.0	0.0	36.0
29	11.0		9.0	29.0	15.0	0.0	0.0	0.0	13.0	1.0	7.0	2.0	87.0
30	34.0		5.0	5.0	1.0	0.0	0.0	0.0	0.0	0.0	3.0	0.0	48.0
31	44.0		4.0				0.0	0.0		0.0		0.0	48.0
Rainfall Day	23	20	16	17	17	6	3	2	3	10	20	17	154
MAX	179.0	105.0	81.0	29.0	44.0	8.0	16.0	5.0	13.0	43.0	59.0	61.0	643.0
MIN	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TOTAL	509.0	401.0	251.0	121.0	322.0	16.0	22.0	9.0	19.0	84.0	390.0	256.0	2,400.0

Source : Badan Meteorologi dan Geofisika (Meteorological and Geophysical Agency, BMG) Manado

Table C.2.33 Daily Rainfall at Manado (1988)

Station : Kayuwatu-Manado 01°30'00"N, 124°54'00", 67m(MSL)
Province : Manado, North Sulawesi
Year 1988 Unit : mm

Day	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	TOTAL
1	8.0	85.0	10.0	0.0	33.0	2.0	1.0	37.0	1.0	0.0	1.0	22.0	200.0
2	0.0	5.0	42.0	0.0	81.0	0.0	7.0	1.0	0.0	5.0	4.0	23.0	168.0
3	4.0	2.0	0.0	2.0	24.0	12.0	1.0	0.0	0.0	0.0	99.0	0.0	144.0
4	0.0	1.0	4.0	4.0	0.0	0.0	2.0	7.0	1.0	0.0	0.0	1.0	20.0
5	14.0	13.0	10.0	0.0	0.0	29.0	0.0	3.0	6.0	34.0	0.0	2.0	111.0
6	0.0	3.0	25.0	2.0	0.0	0.0	0.0	7.0	0.0	47.0	0.0	10.0	94.0
7	0.0	52.0	1.0	1.0	0.0	18.0	0.0	2.0	0.0	0.0	7.0	0.0	81.0
8	24.0	3.0	4.0	54.0	43.0	12.0	4.0	0.0	4.0	0.0	0.0	29.0	177.0
9	0.0	0.0	6.0	11.0	28.0	1.0	0.0	0.0	6.0	17.0	0.0	2.0	71.0
10	60.0	0.0	0.0	11.0	0.0	12.0	2.0	2.0	0.0	13.0	1.0	24.0	125.0
11	0.0	21.0	2.0	0.0	0.0	0.0	0.0	1.0	0.0	75.0	1.0	30.0	130.0
12	10.0	19.0	7.0	0.0	8.0	0.0	3.0	0.0	6.0	1.0	17.0	32.0	103.0
13	4.0	45.0	2.0	1.0	24.0	8.0	0.0	2.0	0.0	0.0	52.0	21.0	159.0
14	1.0	40.0	0.0	5.0	3.0	1.0	4.0	0.0	15.0	0.0	9.0	16.0	94.0
15	1.0	7.0	7.0	0.0	3.0	65.0	2.0	38.0	18.0	0.0	0.0	0.0	141.0
16	0.0	26.0	16.0	0.0	11.0	7.0	9.0	4.0	36.0	5.0	14.0	0.0	128.0
17	0.0	117.0	3.0	30.0	45.0	0.0	0.0	9.0	5.0	26.0	44.0	22.0	301.0
18	1.0	6.0	7.0	0.0	0.0	0.0	0.0	0.0	0.0	69.0	4.0	0.0	87.0
19	0.0	0.0	1.0	0.0	50.0	0.0	10.0	0.0	0.0	0.0	8.0	0.0	69.0
20	1.0	35.0	33.0	0.0	22.0	5.0	53.0	0.0	1.0	0.0	1.0	0.0	151.0
21	1.0	1.0	2.0	0.0	3.0	0.0	10.0	3.0	0.0	0.0	22.0	0.0	42.0
22	6.0	5.0	107.0	0.0	37.0	0.0	0.0	11.0	0.0	0.0	14.0	2.0	182.0
23	0.0	0.0	4.0	1.0	0.0	0.0	0.0	0.0	0.0	7.0	5.0	32.0	49.0
24	3.0	0.0	34.0	49.0	0.0	0.0	0.0	4.0	3.0	0.0	5.0	31.0	129.0
25	0.0	0.0	12.0	7.0	0.0	17.0	0.0	0.0	39.0	0.0	30.0	19.0	124.0
26	5.0	4.0	13.0	46.0	0.0	5.0	11.0	1.0	10.0	0.0	1.0	32.0	128.0
27	37.0	1.0	7.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	3.0	19.0	67.0
28	7.0	21.0	2.0	25.0	0.0	2.0	3.0	0.0	1.0	0.0	5.0	0.0	66.0
29	0.0	1.0	0.0	31.0	0.0	0.0	59.0	5.0	0.0	0.0	0.0	0.0	96.0
30	11.0		0.0	18.0	16.0	0.0	1.0	1.0	0.0	0.0	1.0	4.0	52.0
31	0.0		0.0		0.0		3.0	0.0		0.0		50.0	53.0
Rainfall Day	18	23	25	17	16	15	18	18	15	11	23	21	220
MAX	60.0	117.0	107.0	54.0	81.0	65.0	59.0	38.0	39.0	75.0	99.0	50.0	844.0
MIN	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TOTAL	198.0	513.0	361.0	298.0	431.0	196.0	185.0	138.0	152.0	299.0	348.0	423.0	3,542.0

Source : Badan Meteorologi dan Geofisika (Meteorological and Geophysical Agency, BMG) Manado

Table C.2.34 Daily Rainfall at Manado (1989)

Station : Kayuwatu-Manado 01°30'00"N, 124°54'00", 67m(MSL)
Province : Manado, North Sulawesi
Year 1989 Unit : mm

Day	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	TOTAL
1	0.0	5.0	84.0	2.0	0.0	0.0	1.0	0.0	9.0	10.0	0.0	0.0	111.0
2	1.0	20.0	7.0	11.0	0.0	3.0	0.0	0.0	0.0	0.0	1.0	2.0	45.0
3	5.0	2.0	60.0	41.0	0.0	0.0	0.0	0.0	0.0	0.0	9.0	0.0	117.0
4	86.0	10.0	12.0	2.0	10.0	5.0	84.0	0.0	0.0	1.0	0.0	3.0	213.0
5	18.0	6.0	46.0	2.0	0.0	5.0	0.0	23.0	0.0	0.0	0.0	1.0	101.0
6	1.0	2.0	14.0	40.0	0.0	1.0	2.0	25.0	1.0	0.0	0.0	0.0	86.0
7	19.0	0.0	10.0	4.0	0.0	16.0	0.0	4.0	56.0	0.0	0.0	15.0	124.0
8	1.0	0.0	4.0	8.0	0.0	0.0	0.0	4.0	0.0	0.0	1.0	2.0	20.0
9	35.0	10.0	51.0	2.0	0.0	59.0	7.0	3.0	0.0	1.0	0.0	2.0	170.0
10	32.0	1.0	15.0	137.0	0.0	0.0	12.0	2.0	0.0	0.0	0.0	4.0	203.0
11	17.0	3.0	54.0	15.0	62.0	4.0	8.0	0.0	0.0	0.0	0.0	0.0	163.0
12	54.0	39.0	0.0	2.0	8.0	0.0	9.0	2.0	0.0	19.0	28.0	1.0	162.0
13	27.0	0.0	0.0	3.0	5.0	0.0	0.0	29.0	0.0	6.0	0.0	4.0	74.0
14	40.0	0.0	14.0	17.0	5.0	3.0	16.0	10.0	0.0	1.0	0.0	0.0	106.0
15	32.0	1.0	8.0	113.0	15.0	0.0	2.0	18.0	0.0	11.0	2.0	0.0	202.0
16	13.0	0.0	0.0	18.0	15.0	0.0	20.0	0.0	7.0	0.0	0.0	0.0	73.0
17	5.0	68.0	0.0	14.0	2.0	1.0	9.0	0.0	0.0	18.0	3.0	1.0	121.0
18	34.0	14.0	23.0	16.0	95.0	58.0	23.0	0.0	0.0	18.0	41.0	3.0	325.0
19	0.0	8.0	1.0	2.0	1.0	2.0	61.0	25.0	0.0	59.0	17.0	0.0	176.0
20	0.0	0.0	0.0	11.0	1.0	0.0	0.0	1.0	0.0	0.0	44.0	0.0	57.0
21	27.0	21.0	66.0	0.0	0.0	4.0	8.0	1.0	5.0	0.0	43.0	1.0	176.0
22	8.0	9.0	0.0	0.0	0.0	20.0	0.0	0.0	5.0	0.0	0.0	94.0	136.0
23	3.0	115.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	17.0	24.0	6.0	165.0
24	0.0	19.0	16.0	0.0	0.0	0.0	0.0	0.0	0.0	2.0	1.0	7.0	45.0
25	3.0	9.0	16.0	0.0	0.0	5.0	0.0	0.0	58.0	7.0	0.0	4.0	102.0
26	44.0	0.0	1.0	0.0	17.0	3.0	9.0	0.0	9.0	3.0	0.0	19.0	105.0
27	12.0	0.0	0.0	0.0	1.0	0.0	8.0	0.0	24.0	19.0	0.0	4.0	68.0
28	6.0	0.0	0.0	0.0	0.0	6.0	56.0	7.0	24.0	9.0	0.0	28.0	136.0
29	2.0		13.0	0.0	0.0	0.0	2.0	0.0	35.0	27.0	15.0	5.0	99.0
30	21.0		2.0	0.0	0.0	48.0	0.0	7.0	14.0	0.0	0.0	34.0	126.0
31	0.0		1.0		0.0		0.0	12.0		76.0		1.0	90.0
Rainfall Day	26	19	22	20	13	17	18	16	12	18	13	22	216
MAX	86.0	115.0	84.0	137.0	95.0	59.0	84.0	29.0	58.0	76.0	44.0	94.0	961.0
MIN	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TOTAL	546.0	362.0	518.0	460.0	237.0	243.0	337.0	173.0	247.0	304.0	229.0	241.0	3,897.0

Source : Badan Meteorologi dan Geofisika (Meteorological and Geophysical Agency, BMG) Manado

Table C.2.35 Daily Rainfall at Manado (1990)

Station : Kayuwatu-Manado 01°30'00"N, 124°54'00", 67m(MSL)
Province : Manado, North Sulawesi
Year 1990 Unit : mm

Day	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	TOTAL
1	2.1	0.0	90.7	33.5	39.4	0.0	0.0	9.6	0.0	5.2	0.0	9.9	190.4
2	0.0	0.0	16.4	9.9	9.6	89.4	0.0	17.3	0.0	0.0	2.1	5.0	149.7
3	0.0	0.0	0.0	0.0	3.5	0.0	4.9	34.1	0.0	4.9	20.0	0.0	67.4
4	0.0	23.5	0.3	0.0	0.2	0.0	0.0	1.2	0.0	0.0	3.0	0.0	28.2
5	0.0	6.8	0.0	0.0	12.6	0.0	0.0	0.3	0.2	13.2	1.1	0.0	34.2
6	27.2	1.6	0.0	5.9	49.8	0.0	2.4	29.7	0.0	14.3	1.5	5.3	137.7
7	39.9	0.0	10.5	3.3	16.6	0.0	18.4	5.9	0.0	0.0	20.0	1.5	116.1
8	9.8	0.0	39.8	0.0	6.5	4.7	0.0	2.3	0.0	0.0	1.9	4.5	69.5
9	10.6	4.4	30.7	0.0	8.0	0.0	0.0	0.0	0.0	0.0	10.9	2.4	67.0
10	30.8	1.2	39.5	14.3	0.0	26.6	0.0	0.0	7.6	0.0	13.0	0.0	133.0
11	12.7	1.2	1.5	0.8	10.6	4.2	0.8	0.0	0.0	0.0	16.4	20.0	68.2
12	5.4	9.2	10.8	0.0	0.0	62.0	0.0	10.1	0.0	0.0	9.9	13.5	120.9
13	29.7	7.7	18.7	0.2	0.0	5.6	15.3	0.0	0.0	0.0	30.0	0.0	107.2
14	9.6	1.5	0.2	32.6	48.0	0.0	3.7	0.0	0.0	2.9	0.0	39.1	137.6
15	5.6	0.2	59.4	0.2	50.0	99.7	15.0	0.0	0.0	1.0	0.0	29.7	260.8
16	19.9	13.5	1.5	0.0	0.0	0.0	4.8	0.0	0.0	2.9	0.0	7.4	50.0
17	17.7	6.4	24.3	0.0	4.6	0.0	0.7	0.0	0.0	0.6	0.0	0.3	54.6
18	67.4	0.7	22.3	0.0	4.5	0.0	0.0	0.0	0.0	29.3	0.0	1.1	125.3
19	11.4	0.0	0.0	0.0	1.6	0.0	53.1	0.0	0.0	0.0	5.9	53.5	125.5
20	0.0	5.7	0.4	0.0	6.5	0.0	0.0	0.0	0.0	0.4	0.0	0.5	13.5
21	2.9	0.0	1.0	0.0	0.0	20.0	0.0	0.0	0.0	0.0	0.0	0.0	23.9
22	1.6	34.5	3.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	39.6
23	0.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.4
24	0.0	0.0	2.6	0.0	0.2	0.0	0.4	0.0	8.2	10.0	9.9	0.0	31.3
25	18.2	0.3	14.7	0.0	0.0	0.0	9.7	0.0	4.9	22.7	0.0	0.0	70.5
26	52.7	0.0	9.0	0.0	2.0	0.0	0.5	0.0	5.9	39.6	0.0	0.0	109.7
27	14.0	7.9	0.0	1.8	2.9	0.0	0.0	0.0	28.3	6.5	0.8	31.9	94.1
28	31.6	1.7	63.9	9.7	0.0	0.0	0.0	0.0	0.0	0.0	35.0	15.6	157.5
29	8.7	-	28.3	12.8	0.0	14.1	0.0	0.0	0.0	20.4	39.7	0.0	124.0
30	40.8	-	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.4	36.7	0.0	79.9
31	0.0	-	10.1	-	0.0	-	18.7	0.0	-	0.0	-	0.0	28.8
Rainfall Day	24	21	24	13	19	10	14	9	7	16	19	17	193
MAX	67.4	34.5	90.7	33.5	50.0	99.7	53.1	34.1	28.3	39.6	39.7	53.5	624.1
MIN	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TOTAL	470.7	128.0	500.1	125.0	277.1	326.3	148.4	110.5	55.1	176.3	257.8	241.2	2,816.5

Source : Badan Meteorologi dan Geofisika (Meteorological and Geophysical Agency, BMG) Manado

Table C.2.36 Daily Rainfall at Manado (1991)

Station : Kayuwatu-Manado 01°30'00"N, 124°54'00", 67m(MSL)
Province : Manado, North Sulawesi
Year 1991 Unit : mm

Day	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	TOTAL
1	2.1	0.0	3.0	16.0	5.9	10.2	0.0	0.0	0.0	0.0	8.7	0.0	45.9
2	0.2	17.2	18.0	15.5	44.2	0.0	3.1	0.0	0.0	0.0	0.0	10.8	109.0
3	16.6	0.0	0.0	2.1	21.0	18.4	17.5	0.0	0.0	0.0	0.0	4.5	80.1
4	17.7	0.0	0.0	4.5	5.3	0.3	1.9	0.0	0.0	0.0	0.0	1.3	31.0
5	17.0	0.0	2.0	2.9	0.0	9.1	0.0	0.0	0.0	0.0	1.1	0.3	32.4
6	0.0	0.0	3.0	1.3	1.5	2.0	0.0	0.0	0.0	0.0	0.0	0.3	8.1
7	0.0	24.1	0.0	0.0	0.0	1.0	33.5	0.0	0.0	0.0	1.1	0.0	59.7
8	0.0	22.7	18.0	0.0	0.0	0.8	1.5	0.0	0.0	0.0	0.4	32.8	76.2
9	0.0	0.9	0.0	0.0	56.2	14.9	0.0	7.3	0.0	0.0	0.0	19.8	99.1
10	0.0	15.8	5.0	0.0	18.4	11.6	0.0	0.7	0.0	0.0	1.6	25.7	78.8
11	0.0	2.3	0.0	0.0	0.0	25.8	0.0	0.0	0.0	0.0	10.6	3.0	41.7
12	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.4	23.5	23.9
13	0.0	9.7	0.0	24.0	0.0	0.0	6.0	0.0	0.0	0.0	19.7	8.4	67.8
14	0.0	29.1	0.0	1.2	22.2	0.0	2.7	8.5	0.0	18.4	0.0	0.3	82.4
15	0.0	78.7	0.0	0.3	0.0	0.0	33.2	0.2	0.0	19.4	0.0	0.0	131.8
16	0.0	77.6	1.0	0.7	0.0	0.0	0.0	0.0	0.0	9.5	0.0	16.0	104.8
17	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	4.3	4.3
18	0.0	0.0	0.0	4.7	0.0	0.0	0.0	0.0	0.0	30.0	19.8	16.5	71.0
19	0.0	0.0	0.0	0.9	0.5	0.0	0.0	0.0	0.0	0.0	1.0	58.6	61.0
20	0.0	0.6	0.0	0.0	9.7	0.0	0.0	0.0	0.0	0.0	0.0	4.1	14.4
21	0.0	5.2	0.0	0.0	6.0	0.0	0.0	0.0	0.0	0.0	30.4	15.5	57.1
22	41.8	7.0	0.0	0.0	0.7	0.0	0.0	0.0	0.0	5.9	0.0	0.0	55.4
23	87.7	1.7	0.0	46.3	2.6	0.0	0.0	0.0	36.0	73.4	20.2	7.9	275.8
24	4.9	12.9	2.0	63.2	13.7	0.0	0.0	0.0	0.0	0.0	0.9	1.7	99.3
25	78.0	0.6	3.0	0.0	1.1	0.0	0.0	0.0	0.0	21.5	0.0	81.2	185.4
26	0.5	0.5	0.0	0.0	40.9	2.6	0.0	0.0	15.0	0.0	3.2	17.4	80.1
27	3.3	0.0	35.0	6.9	0.0	0.0	0.0	0.0	2.0	0.0	0.0	0.0	47.2
28	0.0	5.1	49.0	0.5	0.0	0.0	0.0	0.0	0.0	0.0	20.2	0.0	74.8
29	1.7	-	39.0	6.7	0.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	48.0
30	0.0	-	34.0	3.9	11.5	0.0	0.0	0.2	0.0	0.0	0.0	7.4	57.0
31	2.1	-	42.0	-	4.1	-	0.0	0.0	0.0	2.7	-	0.0	50.9
Rainfall Day	13	21	14	19	19	12	8	5	3	8	16	23	161
MAX	87.7	78.7	49.0	63.2	56.2	25.8	33.5	8.5	36.0	73.4	30.4	81.2	623.6
MIN	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TOTAL	273.6	311.7	254.0	201.6	266.1	96.7	99.4	16.9	53.0	180.8	139.3	361.3	2,254.4

Source : Badan Meteorologi dan Geofisika (Meteorological and Geophysical Agency, BMG) Manado

Table C.2.37 Daily Rainfall at Manado (1992)

Station : Kayuwatu-Manado 01°30'00"N, 124°54'00", 67m(MSL)
Province : Manado, North Sulawesi
Year 1992 Unit : mm

Day	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	TOTAL
1	7.7	28.8	32.8	32.6	0.4	0.0	0.0	0.1	0.0	0.0	21.1	0.0	123.5
2	0.5	0.0	11.6	10.7	6.1	1.0	0.0	24.5	0.0	0.2	0.0	10.0	64.6
3	11.4	10.4	0.0	0.0	20.8	26.8	0.0	0.0	0.0	16.4	10.0	0.0	95.8
4	8.8	54.2	0.0	0.0	29.9	0.0	0.0	0.8	0.0	3.2	0.0	23.1	120.0
5	13.3	25.7	0.0	0.0	9.3	0.6	0.0	0.0	0.0	0.1	0.0	3.5	52.5
6	6.7	1.0	0.0	0.0	23.3	18.8	0.0	0.0	0.0	47.0	6.9	14.8	118.5
7	1.4	0.0	0.0	0.0	5.3	1.2	0.3	0.0	0.3	6.8	0.0	2.8	18.1
8	4.1	0.0	0.2	0.0	14.7	62.4	0.0	0.0	0.0	9.5	16.6	0.8	108.3
9	0.0	0.0	0.0	0.0	43.7	13.1	0.0	0.0	0.0	15.6	32.0	4.6	109.0
10	0.0	0.0	66.8	0.0	0.0	3.3	0.0	0.0	4.3	0.5	2.8	0.6	78.3
11	0.0	0.0	0.0	0.0	0.0	4.4	0.0	0.0	11.3	91.7	0.0	8.5	115.9
12	0.0	0.0	0.0	0.0	0.0	0.1	1.0	0.0	0.0	43.7	0.0	4.5	49.3
13	0.0	11.0	2.0	0.0	14.5	6.6	0.0	0.0	30.8	17.6	11.6	11.7	105.8
14	0.0	14.2	0.4	0.0	75.8	35.9	1.8	0.0	4.9	5.4	6.4	5.7	150.5
15	24.7	8.9	20.0	0.0	8.0	31.1	19.6	0.0	3.8	3.4	0.0	0.0	119.5
16	22.8	0.0	3.6	30.0	0.0	10.0	3.0	0.0	0.0	0.0	21.4	0.6	91.4
17	35.7	0.0	0.4	0.0	13.6	18.8	0.0	0.0	0.0	4.0	0.8	2.7	76.0
18	0.0	0.0	4.6	10.2	0.1	0.0	0.0	0.0	0.0	0.0	9.5	0.0	24.4
19	2.9	0.0	0.1	0.0	0.0	2.9	0.0	0.0	1.8	0.0	3.2	41.0	51.9
20	0.0	0.0	0.0	0.0	0.0	0.0	0.0	9.5	10.3	0.0	0.0	0.0	19.8
21	0.0	0.2	0.0	0.0	0.0	0.1	0.0	0.0	11.0	0.0	0.0	14.1	25.4
22	0.0	19.1	51.3	0.0	0.0	10.6	11.4	3.1	0.3	0.0	0.0	0.6	96.4
23	0.0	0.0	44.8	0.0	0.0	0.1	21.1	0.4	0.0	0.0	0.0	10.4	76.8
24	0.0	11.2	0.0	0.0	0.0	0.1	0.0	0.0	10.5	0.0	6.3	31.5	59.6
25	0.0	6.8	0.1	0.0	3.4	0.0	14.2	0.0	0.0	0.0	3.6	56.9	85.0
26	0.0	17.3	0.0	0.0	16.2	0.0	0.0	0.0	10.9	22.0	17.3	36.3	120.0
27	2.4	18.2	0.0	0.0	22.7	0.0	0.0	2.5	0.0	0.1	1.2	1.9	49.0
28	0.0	0.0	0.0	0.0	12.5	0.0	0.0	0.0	0.0	0.4	0.0	15.3	28.2
29	30.6	0.3	0.0	0.0	0.0	0.0	5.6	0.0	0.0	13.2	0.3	0.6	50.6
30	0.0	-	27.1	0.0	13.5	0.1	13.4	0.0	0.0	35.4	0.8	23.3	113.6
31	0.4	-	23.5	-	1.9	-	2.1	0.0	-	105.9	-	2.7	136.5
Rainfall Day	15	17	16	5	20	22	11	7	13	21	19	26	192
MAX	35.7	54.2	66.8	32.6	75.8	62.4	21.1	24.5	30.8	105.9	32.0	56.9	598.7
MIN	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TOTAL	173.4	227.3	289.3	83.5	335.7	248.0	93.5	40.9	100.2	442.1	171.8	328.5	2,534.2

Source : Badan Meteorologi dan Geofisika (Meteorological and Geophysical Agency, BMG) Manado

Table C.2.38 Daily Rainfall at Manado (1993)

Station : Kayuwatu-Manado 01°30'00"N, 124°54'00", 67m(MSL)
Province : Manado, North Sulawesi
Year 1993 Unit : mm

Day	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	TOTAL
1	2.3	0.0	0.0	0.0	0.0	12.3	0.0	20.5	0.0	0.0	0.0	0.0	35.1
2	3.0	0.0	0.6	3.9	1.9	22.1	1.8	0.0	0.0	2.8	0.0	11.8	47.9
3	7.4	0.0	0.0	1.4	7.7	0.0	0.0	0.0	0.0	0.0	0.5	0.0	17.0
4	1.8	1.8	0.2	0.0	18.7	1.0	17.0	0.0	0.0	0.0	0.0	0.0	40.5
5	0.0	26.1	0.0	0.0	5.4	12.6	6.7	0.0	0.0	0.0	0.0	0.0	50.8
6	0.8	29.3	24.6	32.5	0.0	0.0	2.1	0.0	0.0	0.0	0.2	0.0	89.5
7	2.3	0.4	0.0	10.3	40.0	20.7	0.0	0.0	0.0	0.0	0.0	0.0	73.7
8	0.4	0.0	0.0	21.4	11.7	18.4	0.9	0.0	0.0	0.8	0.0	0.0	53.6
9	0.0	0.0	4.7	0.0	0.0	37.4	1.2	0.0	0.0	15.2	15.1	0.0	73.6
10	0.8	0.2	15.7	0.0	0.0	1.2	0.0	0.0	0.0	0.0	6.1	0.0	24.0
11	8.0	2.7	10.0	5.7	3.2	0.0	2.6	0.0	0.0	0.0	5.8	27.9	65.9
12	0.0	0.6	0.0	0.0	3.2	9.9	2.5	0.0	7.8	0.0	8.8	0.8	33.6
13	1.1	0.0	0.0	0.0	36.0	1.0	0.0	0.0	0.2	41.3	4.9	1.0	85.5
14	22.2	9.6	0.0	0.0	20.0	0.0	0.0	0.0	27.0	4.0	1.7	4.5	89.0
15	23.7	20.6	72.9	0.0	5.9	0.0	0.0	0.0	0.0	12.8	21.9	2.2	160.0
16	56.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	4.3	8.8	69.9
17	3.8	7.5	0.0	0.0	0.0	0.0	0.0	0.0	73.0	0.0	50.0	0.0	134.3
18	78.9	0.0	0.3	16.0	0.0	0.0	0.0	0.0	2.1	1.7	4.9	0.0	103.9
19	4.6	92.0	1.3	2.8	0.0	8.5	0.0	0.0	0.0	9.5	5.6	9.2	133.5
20	17.3	0.0	0.0	0.0	14.1	0.0	0.0	0.0	21.0	0.0	2.0	0.2	54.6
21	10.0	0.0	0.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.4	10.8
22	5.9	5.0	0.9	0.0	18.8	0.0	0.0	0.0	0.0	0.0	0.0	22.6	53.2
23	1.8	0.0	5.3	0.0	4.0	0.0	0.0	0.0	0.0	0.0	66.3	0.3	77.7
24	4.5	4.1	144.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	26.4	179.6
25	0.0	22.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	11.0	33.9
26	9.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	16.1	0.0	25.8
27	3.1	7.9	4.3	0.0	4.5	0.0	0.0	0.0	0.0	0.0	16.3	13.8	49.9
28	0.0	38.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	40.8	78.8
29	0.0	-	0.0	0.0	0.2	0.0	0.0	0.0	0.0	39.0	4.1	2.3	45.6
30	0.0	-	2.9	0.0	16.2	0.0	0.0	20.8	0.0	0.0	0.0	0.0	39.9
31	0.0	-	10.9	-	2.0	-	0.0	0.2	-	0.8	-	32.1	46.0
Rainfall Day	23	19	16	9	18	12	8	3	7	10	19	18	162
MAX	78.9	92.0	144.6	32.5	40.0	37.4	17.0	20.8	73.0	41.3	66.3	40.8	684.6
MIN	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TOTAL	270.2	268.7	299.6	94.0	213.5	145.1	34.8	41.5	131.1	127.9	234.6	216.1	2,077.1

Source : Badan Meteorologi dan Geofisika (Meteorological and Geophysical Agency, BMG) Manado

Table C.2.39 Daily Rainfall at Manado (1994)

Station : Kayuwatu-Manado 01°30'00"N, 124°54'00", 67m(MSL)
Province : Manado, North Sulawesi
Year 1994 Unit : mm

Day	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	TOTAL
1	26.6	1.6	0.0	0.0	2.6	0.0	0.0	0.0	0.0	5.0	0.8	8.8	45.4
2	24.9	0.2	2.0	9.0	10.7	0.0	21.5	0.0	0.0	0.0	30.1	21.0	119.4
3	9.0	0.0	64.0	0.9	0.0	0.0	0.0	0.0	0.0	0.0	3.5	6.5	83.9
4	2.2	11.7	0.0	27.0	7.0	2.8	8.5	0.0	0.0	0.0	0.0	5.5	64.7
5	2.4	1.4	0.5	0.0	2.3	26.7	21.7	0.0	0.0	0.8	14.9	22.4	93.1
6	1.3	2.8	38.0	1.0	0.0	2.0	0.0	0.0	0.0	2.2	13.0	0.0	60.3
7	0.0	5.0	53.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	17.5	0.0	75.5
8	0.0	33.0	16.0	0.0	0.0	11.5	0.0	0.0	0.0	0.0	0.0	0.8	61.3
9	13.6	26.5	15.4	0.0	2.5	10.0	0.0	0.0	0.0	0.0	1.0	8.8	77.8
10	11.3	18.9	3.5	0.0	2.0	0.0	0.0	0.0	0.0	0.0	26.8	33.2	95.7
11	40.8	17.7	10.0	0.0	23.8	48.5	0.0	0.0	0.0	0.0	0.0	39.5	180.3
12	8.6	3.6	7.1	0.0	24.4	2.0	0.0	0.0	0.0	3.6	18.0	27.8	95.1
13	0.0	38.1	1.5	0.4	10.0	5.0	0.0	0.0	0.0	0.0	0.0	35.2	90.2
14	0.0	6.4	18.7	1.0	0.0	0.0	0.0	0.0	0.0	0.0	2.0	0.0	28.1
15	0.2	7.0	16.5	0.0	0.0	6.5	0.0	0.0	0.0	0.0	0.0	0.0	30.2
16	0.0	0.0	23.0	0.3	0.0	0.0	0.0	0.0	0.0	7.0	0.0	0.0	30.3
17	2.0	3.1	99.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	15.0	119.3
18	31.6	11.1	0.3	0.0	0.0	7.0	0.0	0.0	0.0	0.0	0.0	21.5	71.5
19	28.7	0.0	12.0	5.0	0.0	0.5	0.0	0.0	0.0	0.0	0.0	3.0	49.2
20	0.6	0.0	6.2	0.0	3.5	0.0	0.0	0.0	0.0	0.0	0.0	15.4	25.7
21	0.0	0.0	11.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0	10.3	22.3
22	0.0	17.3	39.5	5.7	47.0	0.0	0.0	0.0	0.0	0.0	8.1	12.0	129.6
23	6.2	0.2	9.0	0.0	0.0	9.3	0.0	0.0	0.0	0.0	0.0	0.0	24.7
24	0.0	0.0	1.0	11.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	12.1
25	48.2	0.0	2.0	0.0	0.0	3.5	0.0	0.0	0.0	11.0	0.0	0.0	64.7
26	15.5	1.1	23.5	26.0	0.0	21.7	0.0	0.0	0.0	2.8	13.9	0.0	104.5
27	0.0	0.0	1.0	2.5	0.0	27.4	0.0	0.0	0.0	5.0	0.0	0.0	35.9
28	47.6	0.0	1.0	6.5	1.8	15.3	0.0	0.3	0.3	0.0	26.3	2.5	101.6
29	16.2	-	3.4	0.8	0.0	0.0	0.0	0.0	0.0	0.0	68.7	0.0	89.1
30	1.1	-	0.0	2.7	15.0	22.9	0.0	0.0	0.0	22.3	15.8	0.0	79.8
31	0.6	-	0.0	-	0.2	-	0.0	74.5	-	2.8	-	6.0	84.1
Rainfall Day	22	22	27	16	14	18	3	2	2	10	17	19	172
MAX	48.2	38.1	99.2	27.0	47.0	48.5	21.7	74.5	0.3	22.3	68.7	39.5	535.0
MIN	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TOTAL	339.2	206.7	478.3	99.9	152.8	222.6	51.7	74.8	0.3	62.5	261.4	295.2	2,245.4

Source : Badan Meteorologi dan Geofisika (Meteorological and Geophysical Agency, BMG) Manado

Table C.2.40 Daily Rainfall at Manado (1995)

Station : Kayuwatu-Manado 01°30'00"N, 124°54'00", 67m(MSL)
Province : Manado, North Sulawesi
Year 1995 Unit : mm

Day	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	TOTAL
1	0.0	0.0	0.7	0.0	4.5	0.0	0.0	0.8	0.2	0.0	0.0	0.2	6.4
2	0.0	0.0	0.0	0.0	0.5	0.0	0.0	0.0	0.0	0.0	1.0	50.2	51.7
3	12.5	47.5	0.0	0.0	0.0	0.0	0.0	18.4	2.6	34.5	2.0	18.6	136.1
4	31.8	13.0	9.8	0.0	0.5	12.0	0.0	6.5	4.3	0.0	11.7	21.8	111.4
5	11.0	27.0	0.0	8.7	0.0	0.0	26.7	0.5	96.0	17.0	10.0	12.1	209.0
6	30.0	0.0	0.0	0.0	0.0	0.0	13.5	0.0	0.0	26.0	12.4	0.0	81.9
7	73.0	0.0	0.0	0.0	1.5	0.0	3.2	0.0	22.4	2.5	0.0	31.6	134.2
8	0.0	1.4	7.5	0.0	23.8	0.0	19.5	0.0	0.2	1.2	1.5	0.0	55.1
9	6.0	0.3	0.0	0.0	0.0	24.0	2.9	0.0	0.0	0.0	32.0	0.0	65.2
10	0.0	4.0	0.0	0.0	4.0	2.0	5.4	0.0	0.0	2.0	0.0	0.0	17.4
11	27.3	3.0	0.0	0.0	37.5	10.0	0.0	0.0	0.0	10.1	14.2	35.3	137.4
12	94.5	0.0	0.0	0.0	30.0	4.0	3.9	4.0	0.0	0.0	0.0	28.0	164.4
13	5.5	4.7	0.0	0.0	0.0	16.0	15.9	16.6	0.0	0.0	0.0	0.0	58.7
14	14.0	12.0	4.8	0.0	3.2	0.0	0.0	37.7	0.0	41.5	0.0	0.2	113.4
15	13.5	11.0	2.5	0.0	0.0	0.4	0.0	37.0	0.0	14.5	0.0	6.5	85.4
16	0.0	0.0	7.5	0.0	0.0	38.5	0.0	7.5	6.5	18.6	24.0	12.0	114.6
17	15.5	0.0	0.0	10.6	0.0	52.0	0.0	0.0	0.0	4.5	6.2	0.0	88.8
18	97.0	30.0	0.0	8.1	3.1	8.0	0.0	0.0	0.0	0.0	0.0	0.2	146.4
19	7.7	29.7	9.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	11.0	57.9
20	9.2	8.6	2.5	4.5	0.0	2.0	0.0	0.0	0.0	0.0	3.5	12.5	42.8
21	20.8	1.0	20.2	0.0	0.0	1.7	1.2	1.2	51.2	31.8	8.7	6.0	143.8
22	15.2	49.2	5.4	0.0	0.0	55.7	0.0	0.0	0.0	0.0	0.0	0.0	125.5
23	5.3	14.5	0.0	11.0	0.0	2.9	0.0	9.0	14.0	0.0	1.7	0.0	58.4
24	0.0	0.0	6.3	8.6	0.0	0.2	0.0	0.0	0.0	0.0	7.0	3.5	25.6
25	11.5	5.0	15.4	2.3	0.0	44.3	2.0	4.5	1.5	2.6	6.0	6.5	101.6
26	3.0	32.5	2.7	15.6	2.8	0.0	8.4	0.0	4.0	1.3	1.7	0.0	72.0
27	0.0	24.0	0.4	0.0	0.0	32.0	3.2	0.0	0.0	11.2	43.7	56.9	171.4
28	0.9	36.5	0.0	30.2	0.0	0.0	0.0	0.0	0.0	0.0	22.4	10.1	100.1
29	0.0	-	17.2	53.5	0.0	0.0	0.0	16.2	1.3	2.5	24.7	8.2	123.6
30	0.0	-	12.1	0.0	0.0	8.5	1.4	18.3	0.0	0.0	0.0	21.3	61.6
31	0.0	-	0.0	-	0.0	-	3.0	0.0	-	0.0	-	7.6	10.6
Rainfall Day	21	23	16	11	11	19	14	14	13	16	20	22	200
MAX	97.0	49.2	20.2	53.5	37.5	55.7	26.7	37.7	96.0	41.5	43.7	56.9	615.6
MIN	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TOTAL	505.2	354.9	124.5	153.1	111.4	314.2	110.2	178.2	204.2	221.8	234.4	360.3	2,872.4

Source : Badan Meteorologi dan Geofisika (Meteorological and Geophysical Agency, BMG) Manado

Table C.2.41 Daily Rainfall at Manado (1996)

Station : Kayuwatu-Manado 01°30'00"N, 124°54'00", 67m(MSL)
Province : Manado, North Sulawesi
Year 1996 Unit : mm

Day	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	TOTAL
1	6.0	14.7	10.2	0.0	1.4	0.5	10.4	0.0	18.8	0.0	75.0	11.0	148.0
2	40.8	33.2	6.5	0.0	0.0	0.0	0.0	0.0	2.2	0.0	20.0	0.0	102.7
3	3.7	78.2	35.3	2.7	0.0	0.0	0.0	0.0	0.0	3.0	42.5	0.0	165.4
4	0.0	174.8	0.0	8.3	2.3	0.0	1.2	0.0	0.0	25.3	15.1	0.0	227.0
5	0.5	5.2	22.5	0.0	0.3	25.5	3.0	0.0	0.0	13.0	17.9	40.5	128.4
6	15.3	9.8	1.7	0.0	0.0	11.5	9.6	0.0	0.0	3.7	0.0	0.0	51.6
7	51.5	0.0	0.0	0.0	0.0	0.0	4.3	0.0	0.0	0.0	0.0	29.5	85.3
8	29.0	0.6	0.0	0.0	18.5	17.5	1.2	0.0	0.0	0.0	0.0	5.4	72.2
9	65.6	0.9	13.7	0.0	5.8	14.4	17.1	0.0	0.0	0.0	0.0	50.3	167.8
10	48.8	1.3	2.7	0.0	0.0	27.3	0.0	0.0	0.0	0.0	0.0	0.0	80.1
11	13.0	0.0	2.5	20.8	2.8	10.5	10.3	0.0	0.0	78.8	11.0	0.0	149.7
12	13.3	16.8	9.9	0.8	0.0	0.0	15.4	0.0	0.0	0.0	9.0	0.0	65.2
13	0.0	18.8	0.0	0.0	0.0	0.0	11.5	0.0	0.0	13.0	0.0	42.3	85.6
14	1.0	0.0	0.0	10.2	0.0	0.0	6.8	0.0	0.0	0.0	0.0	33.0	51.0
15	10.5	9.5	0.4	6.5	0.0	8.5	0.8	0.0	0.0	17.4	0.0	1.5	55.1
16	0.0	0.1	7.0	21.9	0.0	1.0	73.1	0.0	0.0	7.3	53.2	0.0	163.6
17	0.0	0.0	0.0	1.0	0.0	50.4	0.0	0.0	0.0	0.0	0.0	0.0	51.4
18	2.9	0.0	0.0	22.5	0.0	3.5	0.0	6.0	1.2	6.0	1.9	0.0	44.0
19	36.5	2.2	0.0	0.0	0.0	37.9	0.0	2.0	0.0	1.2	0.0	3.5	83.3
20	2.5	46.0	0.0	0.0	0.0	1.2	0.0	0.0	0.0	1.0	0.0	21.0	71.7
21	0.0	34.0	10.6	0.0	0.0	9.3	0.0	8.5	0.0	0.0	0.0	61.5	123.9
22	0.0	2.5	1.4	0.0	34.2	0.0	0.0	0.0	0.0	0.0	0.0	14.3	52.4
23	0.0	24.5	45.7	1.0	7.4	0.0	0.0	0.0	0.0	54.5	5.3	0.0	138.4
24	20.5	4.2	48.8	0.1	2.7	0.0	0.0	1.5	0.0	18.1	168.0	0.0	263.9
25	0.0	35.8	4.0	2.9	0.0	1.0	0.0	0.0	21.8	4.0	0.0	0.0	69.5
26	36.5	56.0	32.3	29.8	49.5	0.0	0.0	0.0	0.0	25.0	1.5	0.0	230.6
27	1.5	22.0	49.3	0.0	29.5	15.5	0.0	0.0	0.0	0.2	0.0	46.4	164.4
28	3.2	6.5	3.0	10.8	0.0	0.0	0.0	7.0	0.0	35.3	0.6	0.0	66.4
29	1.5	18.5	10.7	3.0	0.0	0.0	0.0	0.0	0.0	46.5	5.0	0.0	85.2
30	78.5	-	2.0	0.0	0.0	22.4	0.0	1.7	0.0	7.0	0.0	0.0	111.6
31	0.0	-	3.3	-	0.0	-	0.0	21.6	-	31.5	-	0.0	56.4
Rainfall Day	22	26	22	16	11	18	13	7	5	20	15	13	188
MAX	78.5	174.8	49.3	29.8	49.5	50.4	73.1	21.6	21.8	78.8	168.0	61.5	857.1
MIN	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TOTAL	482.6	616.1	323.5	142.3	154.4	257.9	164.7	48.3	44.0	391.8	426.0	360.2	3,411.8

Source : Badan Meteorologi dan Geofisika (Meteorological and Geophysical Agency, BMG) Manado

Table C.2.42 Daily Rainfall at Manado (1997)

Station : Kayuwatu-Manado 01°30'00"N, 124°54'00", 67m(MSL)
Province : Manado, North Sulawesi
Year 1997 Unit : mm

Day	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	TOTAL
1	0.0	0.0	3.8	5.3	0.0	0.0	1.2	0.0	0.0	2.0	0.0	7.1	19.4
2	0.0	50.9	0.0	8.8	0.0	0.0	0.0	0.0	0.0	1.8	0.0	10.1	71.6
3	0.0	5.5	5.0	2.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	5.0	17.5
4	0.0	21.2	3.5	0.0	0.0	0.0	31.5	0.0	0.0	0.0	0.0	5.6	61.8
5	33.0	9.9	1.5	0.0	0.0	0.0	29.5	0.0	0.0	0.0	0.0	0.3	74.2
6	11.5	0.0	17.5	0.0	0.0	0.0	0.8	0.0	0.0	4.1	0.0	21.7	55.6
7	0.0	0.0	24.6	15.3	1.6	0.0	12.9	0.0	0.0	0.0	0.0	0.0	54.4
8	0.0	2.5	0.0	3.0	3.5	0.0	2.0	0.0	0.0	0.0	6.4	0.0	17.4
9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	12.0	0.0	12.0
10	0.0	13.5	1.9	36.1	0.0	0.0	66.4	0.0	0.0	0.0	2.2	0.0	120.1
11	0.0	0.0	4.0	0.0	2.4	0.0	0.0	0.0	0.0	13.7	0.0	0.0	20.1
12	0.0	18.9	0.0	0.0	26.0	0.0	0.0	0.0	0.0	0.0	0.0	6.9	51.8
13	0.0	4.9	0.0	1.0	7.1	0.0	0.0	0.0	0.0	0.0	0.0	1.0	14.0
14	8.7	2.5	1.5	0.0	0.0	0.0	14.5	0.0	0.0	1.0	0.0	5.0	33.2
15	0.0	5.0	1.5	25.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.0	31.7
16	75.0	18.0	2.5	0.2	0.0	0.0	0.0	0.0	0.0	5.3	0.0	2.9	103.9
17	43.0	13.0	1.5	0.0	17.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	75.0
18	0.0	28.5	0.0	0.0	16.5	0.0	0.0	0.0	0.0	0.0	0.1	0.0	45.1
19	0.0	3.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	14.1	17.1
20	7.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	7.0
21	0.0	0.0	23.0	0.0	2.0	0.0	0.0	0.0	0.0	0.0	17.7	0.0	42.7
22	13.4	15.1	0.0	6.0	0.0	0.0	0.0	0.0	0.0	0.0	11.9	0.0	46.4
23	22.0	69.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.5	5.2	97.0
24	24.0	4.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	28.5
25	0.0	4.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	3.9	0.0	9.8	17.7
26	0.0	5.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	5.8
27	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	13.0	0.0	13.0
28	0.0	4.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.4	5.1
29	3.8	-	3.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	56.5	63.3
30	11.0	-	11.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	44.0	66.3
31	0.0	-	12.4	-	0.0	-	0.0	0.0	-	0.0	-	9.2	21.6
Rainfall Day	11	23	16	11	8	1	8	0	1	7	10	17	113
MAX	75.0	69.3	24.6	36.1	26.0	0.0	66.4	0.0	0.0	13.7	17.7	56.5	385.3
MIN	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TOTAL	252.4	300.7	118.5	102.7	76.6	0.0	158.8	0.0	0.0	31.8	64.0	204.8	1,310.3

Source : Badan Meteorologi dan Geofisika (Meteorological and Geophysical Agency, BMG) Manado

Table C.2.43 Daily Rainfall at Manado (1998)

Station : Kayuwatu-Manado 01°30'00"N, 124°54'00", 67m(MSL)
Province : Manado, North Sulawesi
Year 1998 Unit : mm

Day	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	TOTAL
1	2.5	2.4	15.0	1.7	0.0	11.5	3.5	0.0	0.0	3.7	17.3	0.0	57.6
2	43.4	0.3	0.0	0.0	8.0	4.2	0.0	37.4	0.0	8.0	4.6	0.0	105.9
3	0.9	0.0	8.5	0.0	18.7	2.0	40.9	25.8	0.0	0.2	15.0	6.4	118.4
4	0.0	0.0	0.0	0.0	6.7	14.6	0.0	0.0	0.0	19.8	4.6	9.3	55.0
5	0.0	0.0	0.0	4.5	47.0	8.8	0.0	10.9	0.0	45.8	14.3	2.6	133.9
6	0.2	0.0	0.0	2.9	10.1	73.4	0.0	4.0	0.0	28.6	0.0	0.0	119.2
7	0.0	0.0	0.0	4.5	0.0	3.6	14.5	0.8	0.6	3.0	11.0	51.0	89.0
8	0.9	0.9	0.0	4.6	0.0	13.8	0.8	0.0	7.0	19.5	8.1	4.4	60.0
9	17.2	5.3	0.0	0.0	0.0	2.8	5.0	11.4	17.5	38.8	47.2	16.6	161.8
10	2.0	0.0	0.0	25.9	0.1	0.0	0.0	2.8	13.8	0.0	1.6	12.1	58.3
11	10.1	0.0	0.0	5.2	6.9	31.7	0.3	13.5	0.1	1.4	18.3	0.0	87.5
12	0.0	3.6	0.0	0.0	11.5	0.9	24.1	8.0	0.0	0.0	18.0	0.0	66.1
13	3.5	0.0	0.0	0.0	0.0	11.8	0.0	0.4	3.5	0.0	64.4	0.0	83.6
14	0.0	0.0	0.0	0.0	19.6	3.0	0.7	7.9	0.0	0.0	29.2	1.5	61.9
15	3.3	0.0	0.0	0.0	42.9	12.2	0.0	0.4	0.6	0.0	9.0	3.8	72.2
16	12.4	0.0	0.0	0.0	3.1	0.0	3.5	6.4	0.0	9.9	19.8	11.0	66.1
17	5.2	11.5	14.9	0.0	10.2	5.5	0.0	3.3	1.4	12.0	4.2	1.0	69.2
18	0.0	5.2	0.0	12.4	0.0	0.0	0.0	0.0	6.5	30.4	0.0	84.5	139.0
19	6.0	6.5	3.5	6.7	0.0	0.0	0.0	0.0	15.3	19.2	4.0	0.5	61.7
20	0.0	0.0	0.0	0.0	3.5	0.3	6.0	0.0	0.2	6.0	12.0	0.5	28.5
21	7.8	0.0	0.0	78.2	0.0	3.4	11.3	14.7	0.1	0.0	18.8	7.1	141.4
22	1.3	0.0	5.5	0.0	0.0	40.2	2.2	3.0	0.0	0.0	14.3	40.0	106.5
23	9.9	0.0	8.2	0.0	0.0	0.5	5.5	0.0	1.0	2.4	17.2	12.8	57.5
24	16.9	0.0	0.0	7.2	0.0	37.2	2.7	0.0	0.0	62.0	0.0	0.0	126.0
25	0.0	0.0	0.0	22.1	0.0	1.8	1.1	0.7	17.9	0.8	2.6	0.2	47.2
26	7.5	0.0	0.0	38.4	4.5	0.0	0.0	0.0	0.0	4.0	79.0	32.7	166.1
27	0.0	6.3	24.6	12.0	0.2	0.0	0.0	2.4	2.2	2.2	4.3	11.3	65.5
28	0.0	0.0	0.0	1.7	0.6	12.5	0.0	0.0	19.6	9.1	3.0	21.9	68.4
29	0.0	-	0.0	0.2	0.0	0.0	7.5	0.0	27.1	3.0	0.0	27.6	65.4
30	0.0	-	33.5	37.5	0.0	8.3	0.2	0.0	5.0	10.1	0.0	13.8	108.4
31	0.0	-	10.4	-	17.6	-	15.9	2.7	-	7.7	-	24.8	79.1
Rainfall Day	18	12	9	18	17	24	18	19	19	24	26	24	228
MAX	43.4	11.5	33.5	78.2	47.0	73.4	40.9	37.4	27.1	62.0	79.0	84.5	617.9
MIN	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TOTAL	151.0	42.0	124.1	265.7	211.2	304.0	145.7	156.5	139.4	347.6	441.8	397.4	2,726.4

Source : Badan Meteorologi dan Geofisika (Meteorological and Geophysical Agency, BMG) Manado

Table C.2.44 Daily Rainfall at Manado (1999)

Station : Kayuwatu-Manado 01°30'00"N, 124°54'00", 67m(MSL)
Province : Manado, North Sulawesi
Year 1999 Unit : mm

Day	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	TOTAL
1	108.8	0.0	0.0	8.5	14.6	0.0	4.8	0.0	0.0	0.0	39.2	1.2	177.1
2	58.0	0.0	18.3	7.0	14.0	0.0	8.5	0.0	31.0	0.0	29.7	0.4	166.9
3	18.9	32.5	6.0	0.0	7.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	64.4
4	1.4	0.0	0.0	0.0	0.3	0.0	1.0	0.0	0.0	0.0	0.0	14.5	17.2
5	0.0	0.0	0.8	0.0	17.0	2.0	0.0	0.0	0.4	0.0	13.8	0.2	34.2
6	0.0	0.0	30.5	0.0	0.4	0.0	0.0	0.0	0.0	0.0	4.8	0.0	35.7
7	0.0	0.0	0.0	0.0	0.0	0.0	21.5	0.0	0.0	17.6	13.8	0.2	53.1
8	20.5	0.0	0.0	3.5	6.5	0.0	13.5	0.1	0.0	0.2	2.3	2.0	48.6
9	27.5	0.0	25.2	5.9	0.0	0.0	14.5	35.0	0.0	11.5	0.0	35.0	154.6
10	0.0	0.0	0.0	45.0	0.0	12.9	2.5	0.0	0.0	0.0	3.0	46.8	110.2
11	0.0	0.0	14.9	29.0	1.5	5.3	3.0	0.0	0.0	4.4	40.5	3.7	102.3
12	0.0	0.0	14.0	0.0	1.3	4.8	0.0	0.0	0.0	0.0	119.5	131.3	270.9
13	0.0	12.5	11.5	0.0	77.1	43.6	0.0	1.2	0.0	1.7	26.0	5.4	179.0
14	6.0	0.0	13.0	15.0	1.0	0.7	1.4	0.0	0.0	0.0	6.5	0.0	43.6
15	0.0	0.0	32.5	14.5	9.0	25.4	0.0	0.0	0.3	20.5	0.0	0.0	102.2
16	28.6	0.0	5.5	48.9	15.0	0.4	0.0	0.0	0.0	0.0	3.0	0.0	101.4
17	0.0	1.2	8.0	24.4	11.5	56.5	6.3	0.0	13.1	53.2	8.1	2.5	184.8
18	8.7	0.0	0.0	0.6	3.1	0.0	33.0	0.0	0.0	2.5	0.0	0.0	47.9
19	22.5	0.0	2.7	18.0	2.5	0.0	3.0	0.0	0.0	2.7	0.0	4.0	55.4
20	2.3	0.0	31.5	7.9	61.9	1.5	0.0	0.0	0.0	3.4	0.0	0.0	108.5
21	7.0	2.0	0.0	3.5	0.0	0.0	0.0	0.0	2.7	10.4	0.0	0.7	26.3
22	13.4	75.4	38.7	5.5	0.0	0.0	0.0	0.0	0.0	3.7	0.0	5.0	141.7
23	55.2	0.8	109.6	40.5	22.2	28.0	0.0	0.0	0.0	21.8	1.8	6.3	286.2
24	29.0	3.5	25.0	0.0	7.0	22.4	0.0	0.0	6.3	0.0	0.0	0.0	93.2
25	27.0	4.5	25.0	0.0	8.3	0.0	0.0	30.6	0.0	14.2	0.0	0.0	109.6
26	20.5	0.0	7.0	0.0	4.0	18.4	0.0	25.8	2.6	0.2	0.0	0.0	78.5
27	20.7	0.0	16.0	0.0	0.0	0.5	0.0	32.8	0.3	0.5	12.3	7.5	90.6
28	3.5	2.9	32.0	2.7	13.0	0.0	31.5	0.0	6.0	2.0	0.0	6.0	99.6
29	53.2	-	0.5	13.5	2.7	25.7	0.0	0.0	0.0	4.5	0.0	2.0	102.1
30	0.7	-	69.0	1.8	0.0	8.5	0.0	0.0	2.5	30.0	0.0	24.4	136.9
31	6.0	-	0.5	-	0.0	-	0.0	0.0	-	5.5	-	0.0	12.0
Rainfall Day	22	12	24	20	23	17	13	6	11	20	16	20	204
MAX	108.8	75.4	109.6	48.9	77.1	56.5	33.0	35.0	31.0	53.2	119.5	131.3	879.3
MIN	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TOTAL	539.4	135.3	537.7	295.7	300.9	256.6	144.5	125.5	65.2	210.5	324.3	299.1	3,234.7

Source : Badan Meteorologi dan Geofisika (Meteorological and Geophysical Agency, BMG) Manado

Table C.2.45 Daily Rainfall at Tondano (1990)

Station : Tondano N01°17'42" - E124°55'30", 704m (MSL)
Province : Tondano, North Sulawesi
Year 1990 Unit : mm

Day	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	TOTAL
1	0.0	6.0	23.0	4.0	0.0	4.0	1.0	0.0	0.0	0.0	0.0	0.0	38.0
2	0.0	3.0	0.0	6.0	0.0	9.0	0.0	2.0	0.0	0.0	54.0	0.0	74.0
3	0.0	0.0	0.0	0.0	0.0	0.0	6.0	0.0	0.0	6.0	0.0	0.0	12.0
4	0.0	0.0	0.0	0.0	7.0	0.0	3.0	10.0	14.0	0.0	10.0	3.2	47.2
5	6.0	0.0	3.0	0.0	10.0	0.0	8.0	12.0	0.0	14.0	13.0	1.4	67.4
6	13.0	0.0	0.0	9.0	9.0	10.0	7.0	9.0	21.0	2.0	0.0	0.0	80.0
7	17.0	0.0	26.0	15.0	0.0	17.0	0.0	6.0	0.0	0.0	20.0	0.0	101.0
8	12.0	0.0	14.0	13.0	0.0	20.0	0.0	0.0	0.0	0.0	0.0	3.6	62.6
9	15.0	9.0	11.0	0.0	3.0	15.0	0.0	0.0	0.0	0.0	15.0	20.0	88.0
10	3.0	3.0	9.0	0.0	0.0	18.0	0.0	0.0	18.0	0.0	19.0	0.3	70.3
11	1.0	10.0	0.0	0.0	13.0	0.0	0.0	0.0	0.0	0.0	0.0	1.4	25.4
12	6.0	15.0	8.0	0.0	11.0	15.5	0.0	0.0	8.0	0.0	20.0	4.3	87.8
13	0.0	0.0	0.0	0.0	15.0	18.0	0.0	0.0	0.0	0.0	17.0	0.0	50.0
14	0.0	0.0	0.0	10.0	6.0	0.0	6.0	0.0	0.0	11.0	0.0	0.0	33.0
15	10.0	0.0	0.0	8.0	0.0	10.0	10.0	0.0	0.0	3.0	0.0	0.0	41.0
16	5.0	0.0	3.0	1.0	0.0	0.0	5.0	0.0	0.0	10.0	0.0	0.8	24.8
17	36.0	9.0	7.0	0.0	0.0	10.0	0.0	0.0	0.0	16.0	0.0	25.6	103.6
18	11.0	13.0	0.0	13.0	0.0	0.0	0.0	0.0	0.0	2.0	0.0	0.8	39.8
19	0.0	16.0	10.0	12.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	38.0
20	0.0	0.0	2.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0	1.0	0.0	4.0
21	9.0	0.0	4.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	23.5	36.5
22	10.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	8.0	2.5	20.5
23	12.0	0.0	0.0	0.0	6.0	0.0	4.0	0.0	0.0	11.0	6.0	0.0	39.0
24	0.0	0.0	0.0	11.0	13.0	0.0	4.0	0.0	20.0	15.0	15.0	35.2	113.2
25	0.0	0.0	13.0	0.0	0.0	0.0	0.0	0.0	0.0	20.0	18.0	1.0	52.0
26	16.0	0.0	0.0	0.0	10.0	0.0	0.0	0.0	35.0	13.0	4.0	0.5	78.5
27	18.0	0.0	7.0	0.0	15.0	0.0	0.0	0.0	52.0	7.0	13.0	0.0	112.0
28	0.0	0.0	5.0	0.0	0.0	0.0	1.0	0.0	0.0	9.0	10.0	0.0	25.0
29	8.0		10.0	1.0	17.0	0.0	0.0	0.0	0.0	16.0	21.0	0.0	73.0
30	0.0		13.0	0.0	15.0	0.0	0.0	0.0	0.0	9.0	6.0	0.0	43.0
31	0.0		9.0	0.0	10.0		3.0	0.0	0.0	10.0		1.5	33.5
Rainfall Days	18	9	18	12	16	11	12	5	7	17	18	16	159
MAX	36.0	16.0	26.0	15.0	17.0	20.0	10.0	12.0	52.0	20.0	54.0	35.2	313.2
TOTAL	208.0	84.0	177.0	103.0	161.0	146.5	58.0	39.0	168.0	174.0	270.0	125.6	1,714.1

Source : Badan Meteorologi dan Geofisika (Meteorological and Geophysical Agency, BMG) Manado

Table C.2.46 Daily Rainfall at Tondano (1991)

Station : Tondano N01°17'42" - E124°55'30", 704m (MSL)
Province : Tondano, North Sulawesi
Year 1991 Unit : mm

Day	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	TOTAL
1	0.0	6.0	1.0	45.0	60.0	6.0	96.0	0.0	4.0	0.0	13.0	0.0	231.0
2	3.0	0.0	0.0	1.0	41.0	0.0	22.0	0.0	0.0	0.0	9.0	0.0	76.0
3	10.0	0.0	0.0	5.0	0.0	24.0	26.0	0.0	0.0	0.0	18.0	0.0	83.0
4	24.0	4.0	0.0	8.0	0.0	10.0	3.0	0.0	0.0	0.0	10.0	3.2	62.2
5	2.0	0.0	0.0	0.0	34.0	0.0	81.0	0.0	0.0	0.0	7.0	1.4	125.4
6	0.0	0.0	0.0	0.0	5.0	0.0	8.0	0.0	0.0	0.0	0.0	0.0	13.0
7	0.0	9.0	0.0	0.0	5.0	0.0	3.0	0.0	0.0	0.0	0.0	0.0	17.0
8	0.0	8.0	0.0	0.0	2.0	0.0	0.0	0.0	0.0	0.0	0.0	3.6	13.6
9	0.0	13.0	0.0	0.0	0.0	7.0	0.0	20.0	0.0	0.0	0.0	20.0	60.0
10	0.0	6.0	3.0	0.0	0.0	2.0	0.0	0.0	0.0	0.0	40.0	0.3	51.3
11	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00.0	0.0	1.4	1.4
12	0.0	10.0	3.0	22.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	4.3	39.3
13	0.0	56.0	0.0	10.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	66.0
14	20.0	40.0	0.0	0.0	0.0	0.0	0.0	32.0	0.0	0.0	0.0	0.0	92.0
15	6.0	0.0	0.0	0.0	0.0	0.0	0.0	7.0	0.0	12.0	0.0	0.0	25.0
16	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.8	0.8
17	3.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	47.0	0.0	25.6	75.6
18	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	52.0	0.0	0.8	52.8
19	0.0	0.0	0.0	6.0	4.0	0.0	0.0	0.0	0.0	13.0	0.0	0.0	23.0
20	19.0	6.0	0.0	0.0	11.0	0.0	0.0	0.0	0.0	6.0	0.0	0.0	42.0
21	7.0	0.0	4.0	3.0	3.0	0.0	0.0	0.0	0.0	4.0	0.0	23.5	44.5
22	12.0	0.0	0.0	2.0	0.0	0.0	0.0	0.0	0.0	11.0	5.0	2.5	32.5
23	1.0	0.0	9.0	5.0	18.0	0.0	0.0	0.0	0.0	7.0	0.0	0.0	40.0
24	82.0	0.0	7.0	48.0	32.0	0.0	0.0	3.0	1.0	0.0	11.0	35.2	219.2
25	0.0	0.0	0.0	0.0	12.0	32.0	0.0	0.0	0.0	15.0	0.0	1.0	60.0
26	0.0	0.0	4.0	6.0	0.0	0.0	0.0	0.0	0.0	0.0	14.0	0.5	24.5
27	0.0	0.0	44.0	0.0	2.0	0.0	0.0	0.0	0.0	0.0	1.0	0.0	47.0
28	0.0	3.0	11.0	28.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	43.0
29	3.0		25.0	26.0	13.0	0.0	0.0	13.0	0.0	0.0	0.0	0.0	80.0
30	2.0		12.0	14.0	16.0	0.0	0.0	0.0	0.0	0.0	26.0	0.0	70.0
31	0.0		30.0		28.0		0.0	0.0		0.0		1.5	59.5
Rainfall Days	14	11	12	15	17	6	7	5	2	10	11	16	126
MAX	82.0	56.0	44.0	48.0	60.0	32.0	96.0	32.0	4.0	52.0	40.0	35.2	581.2
TOTAL	194.0	161.0	153.0	229.0	287.0	81.0	239.0	75.0	5.0	167.0	154.0	125.6	1,870.6

Source : Badan Meteorologi dan Geofisika (Meteorological and Geophysical Agency, BMG) Manado

Table C.2.47 Daily Rainfall at Tondano (1992)

Station : Tondano N01°17'42" - E124°55'30", 704m (MSL)
Province : Tondano, North Sulawesi
Year 1992 Unit : mm

Day	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	TOTAL
1	1.3	0.0	4.0	10.7	10.0	0.0	0.0	0.0	0.0	2.8	0.0	0.0	28.8
2	6.6	21.8	0.0	0.5	3.2	3.5	0.0	0.0	0.0	16.1	0.0	9.0	60.7
3	0.0	3.5	0.0	0.0	12.2	0.0	0.0	0.0	0.0	0.0	3.2	10.4	29.3
4	7.1	6.9	0.0	0.0	8.3	0.0	0.0	0.0	0.0	11.2	31.4	3.1	68.0
5	0.6	0.9	0.0	0.0	0.0	4.2	0.0	0.0	0.0	22.8	7.4	10.6	46.5
6	0.0	0.0	0.0	0.0	12.7	2.3	0.0	0.0	0.0	5.4	0.0	8.0	28.4
7	6.4	0.0	0.0	0.0	2.6	16.7	0.0	0.0	0.0	1.5	43.0	0.0	70.2
8	0.0	0.0	0.0	0.0	0.0	10.0	0.0	0.0	20.0	21.8	66.5	0.0	118.3
9	0.0	0.0	8.1	0.0	8.2	6.8	0.0	0.0	13.3	0.0	31.0	0.0	67.4
10	4.0	0.0	0.0	0.0	2.3	1.8	0.0	0.0	1.6	29.5	2.0	0.0	41.2
11	0.0	0.0	0.0	0.0	3.0	1.4	0.0	0.0	0.0	6.2	12.3	5.5	28.4
12	0.0	0.0	0.0	0.0	6.2	0.0	0.0	4.6	4.2	0.0	8.8	6.0	29.8
13	0.0	0.0	0.3	0.0	8.4	0.0	0.0	0.0	38.1	0.0	2.5	2.7	52.0
14	2.0	3.0	0.0	0.0	6.9	0.0	0.2	0.0	0.0	9.1	0.0	0.0	21.2
15	3.5	2.5	0.0	1.2	34.5	2.8	11.0	0.0	0.0	0.0	24.9	9.7	90.1
16	15.7	0.0	0.0	0.0	87.5	32.2	0.3	0.0	0.0	0.0	0.0	11.0	146.7
17	0.0	0.0	0.0	0.0	0.9	0.2	0.8	0.0	0.0	1.7	0.0	8.2	11.8
18	6.0	0.0	0.0	0.0	0.0	0.2	4.4	0.0	0.0	0.2	1.5	2.0	14.3
19	0.0	0.0	0.0	0.0	7.7	0.0	3.0	0.0	0.0	0.0	3.8	5.8	20.3
20	0.0	0.0	0.0	0.0	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2
21	0.0	0.0	0.0	0.0	51.6	1.4	1.5	0.2	0.0	0.0	0.0	25.0	79.7
22	0.0	2.1	0.0	0.0	0.0	11.0	37.2	0.0	0.0	1.2	4.6	3.0	59.1
23	0.0	0.5	0.0	0.0	0.0	0.0	6.6	10.0	0.0	0.0	55.0	13.6	85.7
24	0.0	8.0	0.0	0.0	0.0	0.0	6.2	7.2	1.7	0.0	0.0	0.0	23.1
25	0.0	2.8	0.0	0.0	2.9	9.7	0.8	0.0	4.2	16.3	0.0	24.0	60.7
26	0.0	1.0	0.0	0.0	1.1	0.0	0.0	0.0	0.0	3.5	0.0	0.0	5.6
27	0.0	0.0	0.0	0.0	1.3	0.3	0.0	0.0	0.0	18.3	0.0	14.8	34.7
28	0.5	0.0	0.0	0.0	2.8	0.2	15.3	0.0	0.0	32.7	14.6	0.0	66.1
29	5.1	0.0	1.6	0.0	2.5	0.0	0.0	0.0	0.0	0.0	0.0	3.6	12.8
30	0.0	0.0	15.5	32.1	0.0	0.0	3.7	0.0	1.1	0.0	0.0	6.1	58.5
31	0.0	0.0	0.4	0.0	4.9	0.0	24.5	0.0	0.0	5.7	0.0	0.0	35.5
Rainfall Days	12	11	6	4	24	17	14	4	8	18	16	20	154
MAX	15.7	21.8	15.5	32.1	87.5	32.2	37.2	10.0	38.1	32.7	66.5	25.0	414.3
TOTAL	58.8	53.0	29.9	44.5	281.9	104.7	115.5	22.0	84.2	206.0	312.5	182.1	1,495.1

Source : Badan Meteorologi dan Geofisika (Meteorological and Geophysical Agency, BMG) Manado

Table C.2.48 Daily Rainfall at Tondano (1993)

Station : Tondano N01°17'42" - E124°55'30", 704m (MSL)
Province : Tondano, North Sulawesi
Year 1993 Unit : mm

Day	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	TOTAL
1	0.0	0.0	0.9	0.0	33.6	4.7	0.0	61.5	0.0	0.0	0.0	4.4	105.1
2	3.0	0.0	0.0	0.0	0.0	0.2	4.0	0.0	0.0	0.0	0.0	2.5	9.7
3	0.0	0.0	0.2	0.0	0.0	0.0	10.0	0.0	0.0	0.0	7.5	0.7	18.4
4	1.4	2.1	0.0	0.8	0.0	8.9	3.9	0.0	0.0	0.0	0.0	3.8	20.9
5	1.3	0.6	0.0	0.6	0.0	4.8	0.0	0.0	0.0	0.0	5.9	0.0	13.2
6	2.3	0.3	3.5	3.0	2.0	10.0	0.0	0.0	0.0	0.0	0.0	0.1	21.2
7	1.0	0.0	0.0	0.0	0.0	17.6	0.0	0.0	0.0	0.0	0.0	6.8	25.4
8	0.0	0.5	12.8	11.6	7.8	0.8	0.6	0.0	0.0	0.0	0.0	24.2	58.3
9	0.0	0.0	37.5	7.5	3.2	0.0	0.0	0.0	0.0	0.0	0.2	0.0	48.4
10	0.0	0.0	0.0	0.0	31.1	2.8	0.0	0.0	0.0	0.0	0.0	0.0	33.9
11	0.0	0.5	0.0	0.0	13.6	0.0	0.0	0.0	0.0	0.0	3.0	10.8	27.9
12	0.0	3.0	0.0	0.0	3.8	10.9	0.0	0.0	0.0	33.0	0.0	0.0	50.7
13	0.0	3.9	0.0	52.6	0.8	0.5	0.0	0.0	0.0	8.9	20.1	0.0	86.8
14	8.0	0.0	6.5	0.0	8.3	0.0	0.0	0.0	0.0	0.4	4.5	0.0	27.7
15	0.0	3.0	7.0	0.0	0.0	0.0	0.0	0.0	0.0	0.6	20.0	0.1	30.7
16	3.1	0.0	0.0	0.2	0.0	0.0	0.0	0.0	0.0	14.4	6.4	1.2	25.3
17	26.6	0.0	0.0	0.0	0.0	4.6	0.0	0.0	18.9	16.9	12.3	0.0	79.3
18	24.7	0.0	0.0	10.1	0.0	0.0	0.0	0.0	21.2	1.3	0.0	0.0	57.3
19	8.5	1.6	0.0	0.0	0.3	0.0	0.0	0.0	0.0	0.0	64.3	0.0	74.7
20	3.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	85.3	0.0	89.0
21	0.9	0.0	0.0	2.0	8.9	4.6	0.0	0.0	0.0	0.0	48.4	0.2	65.0
22	2.2	0.0	2.0	0.0	5.8	0.0	0.0	0.0	0.0	0.0	12.9	0.0	22.9
23	1.0	0.8	0.0	1.9	0.0	0.0	0.0	0.0	0.0	0.0	5.7	0.0	9.4
24	0.3	4.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	4.6
25	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
26	15.2	0.0	0.0	0.0	3.3	0.0	0.0	0.0	0.0	19.6	0.0	1.0	39.1
27	0.0	5.4	0.0	0.0	23.5	0.0	0.0	0.0	0.0	0.0	19.0	6.8	54.7
28	0.2	8.6	28.3	0.0	0.0	0.0	0.0	0.0	12.5	6.3	0.0	2.1	58.0
29	0.0	0.0	0.0	0.0	72.0	0.0	17.0	0.0	0.0	79.5	0.0	0.0	168.5
30	0.0	0.0	8.0	0.0	10.8	9.0	2.3	0.0	0.0	0.2	24.0	0.0	54.3
31	0.0	0.0	0.0	0.0	16.9	0.0	28.9	0.0	0.0	0.0	0.0	52.2	98.0
Rainfall Days	17	13	10	10	17	13	7	1	3	11	16	15	133
MAX	26.6	8.6	37.5	52.6	72.0	17.6	28.9	61.5	21.2	79.5	85.3	52.2	543.5
TOTAL	103.4	34.6	106.7	90.3	245.7	79.4	66.7	61.5	52.6	181.1	339.5	116.9	1,478.4

Source : Badan Meteorologi dan Geofisika (Meteorological and Geophysical Agency, BMG) Manado

Table C.2.49 Daily Rainfall at Tondano (1994)

Station : Tondano N01°17'42" - E124°55'30", 704m (MSL)
Province : Tondano, North Sulawesi
Year 1994 Unit : mm

Day	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	TOTAL
1	11.6	0.0	0.0	9.0	2.7	3.4	0.0	0.0	0.0	0.0	3.2	0.0	29.9
2	4.2	0.3	5.3	0.6	0.6	1.0	53.5	0.0	0.0	0.0	3.1	0.0	68.6
3	0.0	7.0	2.6	3.0	18.1	0.0	0.0	0.0	0.0	0.0	8.6	25.5	64.8
4	0.0	3.7	1.2	5.0	2.0	2.0	1.0	0.0	0.0	0.0	1.0	1.2	17.1
5	11.0	0.0	0.7	0.0	3.4	0.0	0.0	0.0	0.0	6.9	23.3	27.1	72.4
6	8.8	0.0	3.3	0.0	0.0	6.2	0.4	0.0	0.0	0.0	0.0	2.5	21.2
7	0.0	29.0	4.6	0.0	0.0	1.3	0.0	0.0	0.0	0.0	1.4	0.0	36.3
8	0.0	4.5	0.0	0.0	0.0	5.7	0.0	0.0	0.0	0.0	1.5	1.5	13.2
9	7.2	15.3	9.2	0.0	0.2	10.8	0.0	0.0	0.0	0.0	0.0	0.0	42.7
10	3.8	1.6	0.4	20.8	0.0	1.3	0.0	0.0	0.0	0.0	0.0	5.6	33.5
11	1.2	0.0	11.1	10.4	1.7	0.7	0.0	1.7	0.0	0.0	0.0	13.0	39.8
12	5.8	28.9	11.9	0.0	10.0	0.0	0.0	0.0	0.0	0.0	0.0	20.5	77.1
13	0.0	4.4	2.2	0.5	27.5	0.0	0.0	0.0	0.0	0.0	3.8	0.0	38.4
14	0.2	1.3	7.5	0.0	12.8	29.0	0.0	0.0	0.0	8.6	9.2	0.0	68.6
15	0.0	0.0	6.5	2.0	9.2	2.6	0.0	0.2	0.0	4.0	54.4	0.0	78.9
16	0.5	0.8	21.1	3.0	0.0	0.2	0.0	0.0	0.0	0.0	30.5	0.0	56.1
17	25.8	7.3	19.1	0.6	0.0	0.0	0.0	0.0	0.0	0.0	8.2	0.0	61.0
18	12.1	0.0	19.6	33.7	0.0	1.2	0.0	0.0	0.0	0.0	1.0	1.6	69.2
19	0.4	0.0	10.6	11.1	0.0	0.0	0.0	0.0	0.0	18.0	0.0	0.0	40.1
20	0.0	0.4	79.4	22.0	40.0	0.0	0.0	0.0	0.0	0.0	13.6	0.8	156.2
21	0.0	0.0	0.9	3.0	44.7	0.0	0.0	0.0	0.0	0.0	11.4	0.8	60.8
22	0.0	0.0	0.3	0.8	6.2	0.0	0.0	0.0	0.0	0.0	0.0	7.1	14.4
23	0.0	0.0	0.6	0.2	0.0	0.2	0.0	0.0	0.0	0.0	8.7	0.0	9.7
24	16.6	0.0	2.3	0.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	19.2
25	2.3	0.0	0.0	2.9	0.0	0.0	0.0	0.0	0.0	0.8	7.2	0.0	13.2
26	0.0	0.4	12.0	0.0	0.0	1.5	0.0	0.0	0.0	0.0	0.0	0.0	13.9
27	10.4	0.0	2.3	6.0	0.0	11.8	0.0	0.2	0.0	0.0	0.0	0.0	30.7
28	9.0	0.0	6.8	15.5	28.2	7.3	0.0	0.0	0.0	5.9	11.8	0.0	84.5
29	0.0	0.0	64.9	0.0	0.0	20.1	0.0	0.0	0.0	9.3	13.6	0.0	107.9
30	0.0	0.0	26.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	10.0	0.0	36.5
31	0.2	0.0	83.8	0.0	20.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	104.0
Rainfall Days	18	14	28	20	16	18	3	3	0	7	20	12	159
MAX	25.8	29.0	83.8	33.7	44.7	29.0	53.5	1.7	0.0	18.0	54.4	27.1	400.7
TOTAL	131.1	104.9	416.7	150.4	227.3	106.3	54.9	2.1	0.0	53.5	225.5	107.2	1,579.9

Source : Badan Meteorologi dan Geofisika (Meteorological and Geophysical Agency, BMG) Manado

Table C.2.50 Daily Rainfall at Tondano (1995)

Station : Tondano N01°17'42" - E124°55'30", 704m (MSL)
Province : Tondano, North Sulawesi
Year 1995 Unit : mm

Day	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	TOTAL
1	0.4	0.0	0.4	0.0	0.2	0.0	1.4	0.0	1.5	0.0	13.5	0.2	17.6
2	0.0	8.0	0.4	0.0	5.2	0.0	30.5	0.5	0.0	3.1	21.8	2.9	72.4
3	1.0	19.5	0.0	0.0	2.4	0.0	0.7	7.3	0.0	23.8	33.0	20.5	108.2
4	0.7	10.0	0.0	0.0	10.4	8.7	0.0	6.5	0.0	0.0	3.5	2.5	42.3
5	0.0	5.1	0.0	5.8	0.0	0.0	10.6	0.0	56.0	2.1	0.0	4.0	83.6
6	0.0	18.2	0.0	0.0	0.0	11.5	0.7	0.0	0.0	4.2	14.1	0.0	48.7
7	0.0	1.2	0.0	0.0	3.3	1.0	7.5	0.4	11.4	7.4	0.7	5.0	37.9
8	0.0	0.0	0.0	0.0	5.3	0.0	4.3	0.0	0.0	60.8	7.7	0.0	78.1
9	17.2	0.0	0.0	0.0	0.0	5.6	4.0	0.0	0.0	8.5	10.2	0.4	45.9
10	0.0	0.0	0.0	0.0	19.0	0.0	5.7	4.0	0.0	0.0	0.0	0.0	28.7
11	0.0	0.0	0.0	0.0	19.0	1.0	0.0	4.4	0.0	0.0	0.0	35.7	60.1
12	112.4	0.0	0.0	0.0	18.0	18.5	15.4	8.1	0.0	2.5	0.0	3.2	178.1
13	7.0	0.0	0.0	0.0	3.0	30.3	0.6	23.0	0.0	6.5	0.0	0.0	70.4
14	1.1	0.0	0.4	0.0	7.0	1.9	0.3	18.0	0.0	0.0	1.0	13.8	43.5
15	6.2	0.0	1.8	0.0	0.0	0.4	0.0	75.8	0.0	0.0	2.2	16.7	103.1
16	0.2	0.0	0.0	0.0	0.0	40.5	0.0	61.4	0.0	0.0	11.9	3.7	117.7
17	2.4	0.0	0.0	3.0	1.0	4.8	0.0	0.3	0.1	20.3	0.8	0.0	32.7
18	33.5	3.4	19.7	16.0	14.2	0.9	0.0	0.6	0.0	7.8	13.9	1.6	111.6
19	2.0	16.4	0.0	6.0	14.2	0.0	0.4	0.6	3.0	6.8	3.7	0.5	53.6
20	0.3	0.5	1.2	1.7	54.0	9.7	0.0	0.0	3.6	26.7	0.5	0.6	98.8
21	17.8	5.4	14.9	0.4	11.2	3.7	0.0	0.0	41.0	3.8	15.3	0.2	113.7
22	1.1	14.4	2.8	9.5	0.0	0.4	0.5	0.4	8.2	16.8	0.0	0.0	54.1
23	0.0	4.5	0.0	42.0	0.0	1.6	0.0	0.0	8.1	0.0	0.0	0.0	56.2
24	0.0	0.0	5.5	15.7	0.0	0.5	3.3	0.0	4.6	8.2	30.7	0.1	68.6
25	2.5	0.2	27.5	1.3	9.3	0.0	5.0	0.0	0.0	60.6	33.3	4.2	143.9
26	3.3	14.0	0.5	0.4	22.0	0.1	0.0	0.0	0.0	6.0	4.4	6.3	57.0
27	1.3	5.9	1.8	3.0	0.0	0.0	3.2	0.3	0.0	13.0	9.6	22.4	60.5
28	0.0	20.4	0.0	11.9	0.0	0.4	0.0	0.7	42.4	0.0	0.9	8.4	85.1
29	0.0	0.0	11.2	12.5	0.0	1.9	2.4	15.0	0.0	0.0	7.7	17.6	68.3
30	0.0	0.0	7.1	1.8	0.0	23.5	8.0	51.8	0.0	0.0	2.9	4.4	99.5
31	0.2	0.0	0.2	0.0	42.4	0.0	6.3	1.2	0.0	0.0	0.0	2.9	53.2
Rainfall Days	19	16	15	15	19	21	20	20	11	19	23	24	222
MAX	112.4	20.4	27.5	42.0	54.0	40.5	30.5	75.8	56.0	60.8	33.3	35.7	588.9
TOTAL	210.6	147.1	95.4	131.0	261.1	166.9	110.8	280.3	179.9	288.9	243.3	177.8	2,293.1

Source : Badan Meteorologi dan Geofisika (Meteorological and Geophysical Agency, BMG) Manado

Table C.2.51 Daily Rainfall at Tondano (1996)

Station : Tondano N01°17'42" - E124°55'30", 704m (MSL)
Province : Tondano, North Sulawesi
Year 1996 Unit : mm

Day	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	TOTAL
1	3.4	7.0	2.9	1.2	2.0	1.9	13.0	1.3	45.5	0.0	9.8	0.0	88.0
2	28.3	13.2	3.7	16.4	4.4	0.0	0.6	0.0	4.7	3.5	7.5	1.1	83.4
3	0.0	36.6	0.0	12.9	61.3	10.7	0.9	0.0	0.0	0.7	11.3	2.0	136.4
4	0.0	68.3	0.0	1.1	11.5	0.2	3.9	0.0	0.0	8.1	26.2	2.6	121.9
5	0.6	1.5	3.6	0.0	4.1	0.8	8.0	0.0	0.0	10.0	3.6	0.0	32.2
6	0.5	1.4	0.0	0.0	0.0	9.9	0.7	0.0	0.0	0.0	0.0	0.0	12.5
7	3.5	0.7	0.0	0.0	7.4	1.6	0.2	5.0	0.0	1.2	0.0	30.3	49.9
8	20.6	4.1	0.5	0.0	1.5	12.7	3.3	0.2	0.0	14.4	0.5	0.0	57.8
9	52.5	1.5	1.9	0.0	18.8	1.0	15.3	0.0	0.2	1.4	2.1	20.6	115.3
10	5.0	1.9	1.9	0.0	5.1	53.0	0.0	0.0	0.0	0.0	0.0	1.8	68.7
11	12.2	0.0	5.5	37.3	5.5	17.2	0.0	0.7	0.0	18.4	0.0	4.5	101.3
12	5.0	6.6	12.9	0.8	11.3	1.5	11.5	0.0	0.0	3.4	18.7	4.5	76.2
13	0.0	30.8	0.0	0.2	0.0	1.0	22.2	0.0	0.0	0.0	0.0	11.6	65.8
14	0.0	0.0	0.0	16.4	0.0	1.1	2.0	0.4	0.0	0.0	0.8	0.0	20.7
15	0.3	3.6	0.0	1.0	0.0	5.7	0.7	0.4	0.0	0.0	0.0	0.2	11.9
16	0.0	0.0	2.5	0.0	3.7	2.5	31.2	1.2	0.0	1.3	5.3	0.4	48.1
17	0.0	0.0	2.3	0.0	3.0	10.3	29.0	0.0	0.0	0.0	0.0	0.0	44.6
18	0.1	0.0	1.0	0.3	5.8	5.9	3.6	16.7	0.0	24.3	0.0	11.6	69.3
19	2.0	3.8	2.5	3.2	0.0	8.0	0.0	61.5	0.0	2.9	1.4	34.9	120.2
20	0.1	23.7	0.6	42.7	4.4	0.1	0.0	0.8	36.0	8.3	1.6	9.4	127.7
21	0.3	1.7	3.2	4.4	0.0	1.2	0.5	14.3	0.2	4.8	0.0	34.6	65.2
22	24.9	0.9	1.1	2.5	0.0	0.1	22.2	5.9	14.8	0.0	6.5	8.9	87.8
23	0.7	1.5	12.8	7.0	10.0	2.9	0.0	0.0	1.1	12.0	9.8	0.0	57.8
24	0.3	12.6	15.6	0.8	16.6	0.1	0.0	4.6	22.8	5.5	4.3	0.2	83.4
25	0.3	36.7	84.0	0.0	1.9	0.0	0.0	0.0	3.5	0.0	13.3	0.0	139.7
26	5.2	0.9	2.5	0.7	22.7	1.5	0.0	8.3	0.0	5.5	7.6	7.6	62.5
27	1.5	3.2	14.4	0.4	28.6	41.2	0.0	7.0	0.0	34.2	21.7	37.9	190.1
28	0.5	2.6	0.0	0.0	41.7	0.0	0.1	0.0	0.0	56.0	41.3	0.5	142.7
29	0.2	4.9	32.3	41.4	0.1	0.0	0.0	8.2	0.9	41.8	2.0	0.0	131.8
30	8.3	0.0	1.4	4.0	5.2	5.6	0.0	61.6	0.0	9.8	0.0	0.0	95.9
31	0.3	0.0	0.0	0.0	32.7	0.0	0.0	28.2	0.0	12.3	0.0	0.0	73.5
Rainfall Days	25	24	22	20	24	26	19	18	10	22	20	20	250
MAX	52.5	68.3	84.0	42.7	61.3	53.0	31.2	61.6	45.5	56.0	41.3	37.9	635.3
TOTAL	176.6	269.7	209.1	194.7	309.3	197.7	168.9	226.3	129.7	279.8	195.3	225.2	2,582.3

Source : Badan Meteorologi dan Geofisika (Meteorological and Geophysical Agency, BMG) Manado

Table C.2.52 Daily Rainfall at Tondano (1997)

Station : Tondano N01°17'42" - E124°55'30", 704m (MSL)
Province : Tondano, North Sulawesi
Year 1997 Unit : mm

Day	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	TOTAL
1	0.0	0.0	13.3	0.3	5.8	0.0	0.0	0.0	0.0	4.2	0.0	2.5	26.1
2	0.0	0.0	0.2	3.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	3.8
3	0.0	4.7	0.9	13.1	2.7	0.0	1.7	0.0	0.0	12.1	0.0	0.0	35.2
4	0.0	2.8	0.7	0.0	0.0	0.0	4.9	0.0	0.0	19.2	67.4	0.0	95.0
5	6.5	21.8	4.4	0.0	0.0	0.0	3.3	0.0	0.0	17.4	0.0	3.4	56.8
6	15.3	0.3	8.2	0.0	0.0	0.0	26.9	0.0	2.3	47.7	45.2	0.3	146.2
7	0.0	2.6	9.7	13.9	2.9	0.0	52.9	0.0	1.8	13.8	0.5	2.4	100.5
8	0.0	0.0	0.0	67.7	0.0	0.0	19.3	0.0	0.3	0.0	1.8	0.9	90.0
9	17.8	31.2	0.5	30.2	19.4	0.0	5.4	0.0	0.0	0.0	7.6	0.0	112.1
10	33.9	3.6	10.0	25.4	0.0	0.0	2.7	0.0	0.0	0.0	0.0	0.0	75.6
11	7.2	5.3	12.6	14.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	39.7
12	0.4	2.8	2.8	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	10.8	17.0
13	1.3	0.1	2.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	3.5
14	1.3	0.7	0.7	5.8	0.9	0.0	4.8	0.0	0.0	12.2	0.0	1.2	27.6
15	0.0	4.2	5.2	17.6	9.5	0.0	27.0	0.0	0.0	0.0	0.0	0.0	63.5
16	5.6	3.8	1.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.4	2.0	13.3
17	10.7	0.1	0.2	0.0	1.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	12.9
18	0.2	11.5	0.0	26.9	20.9	0.0	0.0	0.0	0.0	0.0	0.0	0.5	60.0
19	22.9	5.8	0.0	5.2	48.1	0.0	0.0	0.0	0.0	0.0	0.0	31.3	113.3
20	1.1	0.0	1.5	0.0	0.1	0.0	0.4	0.0	0.0	0.0	0.6	1.3	5.0
21	4.9	0.8	1.8	0.0	3.8	0.0	0.0	0.0	0.0	0.0	0.8	12.2	24.3
22	2.0	16.8	1.4	0.0	0.0	0.0	1.0	0.0	0.0	0.0	5.7	0.0	26.9
23	14.2	17.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	31.4
24	0.2	10.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.8	13.5	0.0	25.8
25	0.0	0.0	0.0	0.0	0.0	1.4	0.0	0.0	3.3	0.1	0.0	1.3	6.1
26	0.0	6.5	0.0	4.7	0.0	0.6	0.0	0.0	0.0	0.0	0.0	0.1	11.9
27	0.0	3.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	3.5
28	5.0	4.5	0.5	0.0	0.0	0.3	0.0	0.0	0.0	0.0	1.0	0.0	11.3
29	0.0	0.0	0.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.8	3.6	6.1
30	0.2	0.0	0.4	0.0	0.0	0.0	0.0	0.0	0.0	1.1	0.7	3.0	5.4
31	0.9	0.0	1.1	0.0	0.0	0.0	0.0	0.0	0.0	8.7	0.0	1.2	11.9
Rainfall Days	20	23	23	15	11	3	12	0	4	11	13	17	152
MAX	33.9	31.2	13.3	67.7	48.1	1.4	52.9	0.0	3.3	47.7	67.4	31.3	398.2
TOTAL	151.6	160.9	80.3	229.3	116.0	2.3	150.3	0.0	7.7	138.3	147.0	78.0	1,261.7

Source : Badan Meteorologi dan Geofisika (Meteorological and Geophysical Agency, BMG) Manado

Table C.2.53 Daily Rainfall at Tondano (1998)

Station : Tondano N01°17'42" - E124°55'30", 704m (MSL)
Province : Tondano, North Sulawesi
Year 1998 Unit : mm

Day	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	TOTAL
1	0.0	0.0	1.8	0.0	6.4	5.4	0.0	1.0	0.0	8.2	3.4	0.0	26.2
2	0.0	0.0	0.0	0.0	0.0	5.0	2.8	23.0	0.0	26.4	52.3	3.7	113.2
3	2.1	0.0	3.0	0.0	0.5	0.8	0.1	0.0	0.0	0.4	10.3	19.1	36.3
4	0.0	0.0	0.0	0.0	2.1	16.0	0.0	0.0	0.0	7.7	3.4	0.9	30.1
5	0.0	0.0	0.0	0.0	29.8	4.4	0.6	1.6	0.0	43.6	0.0	1.0	81.0
6	0.0	0.0	0.0	0.6	1.0	3.5	0.5	0.2	0.0	29.4	0.1	1.4	36.7
7	0.0	0.0	0.0	4.7	0.0	0.0	2.5	6.5	4.7	3.6	0.0	0.0	22.0
8	0.0	0.0	0.0	2.1	0.4	10.2	2.0	1.4	15.4	0.9	21.3	1.0	54.7
9	0.0	0.7	0.0	0.0	0.7	7.0	12.9	9.0	0.0	0.3	5.0	34.5	70.1
10	0.3	0.0	0.0	15.0	0.8	14.1	0.8	22.7	2.9	0.0	0.7	3.9	61.2
11	5.5	0.0	0.0	4.5	1.2	1.1	26.6	22.1	0.0	1.4	0.3	0.3	63.0
12	0.8	0.0	0.0	0.0	17.6	2.8	17.9	0.0	0.0	1.2	18.0	0.0	58.3
13	0.0	0.0	0.0	0.0	4.0	0.0	3.6	9.8	7.0	0.0	48.7	0.0	73.1
14	0.3	0.0	0.0	0.7	0.7	0.0	11.9	4.6	0.0	0.0	24.8	1.7	44.7
15	0.0	0.0	0.0	0.0	29.1	37.5	21.1	2.2	2.1	0.0	6.1	1.2	99.3
16	2.7	0.0	0.0	6.2	20.0	12.1	0.3	0.9	0.0	0.0	2.6	8.1	52.9
17	1.6	0.0	20.5	0.0	11.9	75.1	3.7	1.3	0.0	3.5	1.8	0.0	119.4
18	0.0	13.0	0.7	0.3	2.9	26.0	2.5	0.0	0.0	4.0	0.0	2.0	51.4
19	0.1	12.3	0.0	1.2	9.7	3.8	18.0	0.0	12.9	24.1	0.0	4.2	86.3
20	5.2	0.0	0.0	0.4	13.5	8.9	2.1	0.0	2.4	0.0	8.6	3.6	44.7
21	1.3	0.0	0.0	54.1	3.4	0.0	21.2	8.6	0.0	0.0	10.4	1.3	100.3
22	2.1	0.0	3.7	0.0	0.0	27.6	12.4	6.3	0.3	0.7	1.2	12.3	66.6
23	2.3	0.0	7.3	0.0	0.0	51.9	11.1	14.8	0.0	31.6	0.0	33.6	152.6
24	7.6	0.0	0.0	0.9	1.8	10.1	1.4	4.4	0.0	37.8	0.3	0.0	64.3
25	0.2	0.0	0.0	0.2	0.0	19.3	2.8	8.4	0.3	0.0	2.0	0.0	33.2
26	4.1	0.0	2.1	1.5	3.3	6.8	1.9	0.0	6.0	10.3	18.1	13.4	67.5
27	0.0	0.0	5.4	35.1	0.0	71.0	0.1	0.0	3.7	0.7	0.9	2.8	119.7
28	0.0	0.0	0.0	3.2	6.0	0.0	0.0	0.0	0.6	2.0	0.7	13.9	26.4
29	0.2	0.0	0.0	1.8	0.0	9.9	10.4	0.0	4.5	0.3	18.3	19.1	64.5
30	0.3	0.0	5.3	3.0	0.0	0.0	2.3	0.0	0.0	0.2	2.1	19.5	32.7
31	0.0	0.0	0.2	0.0	0.4	0.0	0.6	0.0	0.0	0.0	0.0	0.3	1.5
Rainfall Days	17	3	10	18	23	24	28	19	13	22	25	24	226
MAX	7.6	13.0	20.5	54.1	29.8	75.1	26.6	23.0	15.4	43.6	52.3	34.5	395.5
TOTAL	36.7	26.0	50.0	135.5	167.2	430.3	194.1	148.8	62.8	238.3	261.4	202.8	1,953.9

Source : Badan Meteorologi dan Geofisika (Meteorological and Geophysical Agency, BMG) Manado

Table C.2.54 Daily Rainfall at Tondano (1999)

Station : Tondano N01°17'42" - E124°55'30", 704m (MSL)
Province : Tondano, North Sulawesi
Year 1999 Unit : mm

Day	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	TOTAL
1	44.0	44.0	0.0	3.3	5.5	0.0	2.1	0.0	0.0	0.0	8.8	0.0	107.7
2	6.0	6.0	6.0	0.5	16.5	0.0	17.5	0.0	27.8	4.2	4.7	1.0	90.2
3	8.3	8.3	3.3	15.6	0.4	0.0	0.0	0.0	0.0	0.0	0.0	3.5	39.4
4	1.9	1.9	0.0	0.0	4.0	0.0	3.8	0.0	12.0	0.3	0.0	10.0	33.9
5	0.3	0.3	45.1	2.2	3.5	0.5	2.9	0.8	0.0	6.5	0.0	0.0	62.1
6	32.9	32.9	2.0	0.0	59.5	0.0	0.1	0.0	67.0	15.6	7.4	0.0	217.4
7	0.0	0.0	0.4	2.4	0.0	0.0	4.3	0.0	9.4	3.0	3.3	0.0	22.8
8	2.9	2.9	2.4	11.0	15.9	16.2	0.0	0.0	6.4	8.1	0.1	0.0	65.9
9	0.0	0.0	2.0	0.0	0.7	1.1	3.2	0.0	0.0	0.0	15.0	1.6	23.6
10	0.3	0.3	0.0	0.0	54.4	3.5	0.0	0.0	0.0	26.8	0.2	31.1	116.6
11	4.1	4.1	17.5	0.0	2.2	0.0	8.0	0.0	0.0	0.5	1.6	24.2	62.2
12	0.0	0.0	0.0	1.0	2.0	0.0	0.0	0.3	0.0	0.6	17.6	14.1	35.6
13	0.0	0.0	0.0	2.9	21.6	0.0	0.0	29.4	0.0	1.3	9.8	0.0	65.0
14	0.0	0.0	0.0	7.3	2.6	0.1	0.0	0.1	0.0	0.0	1.7	17.7	29.5
15	0.4	0.4	0.0	5.0	0.0	5.0	0.0	1.4	0.0	0.0	0.3	0.0	12.5
16	9.9	9.9	1.0	8.8	0.2	2.0	0.0	0.1	0.0	20.2	0.4	0.0	52.5
17	0.0	0.0	17.5	14.2	11.8	14.5	0.0	2.5	4.8	9.7	0.5	0.0	75.5
18	7.3	7.3	2.6	1.5	8.7	0.0	4.9	0.0	0.0	1.4	0.0	0.0	33.7
19	0.0	0.0	0.2	3.7	0.3	8.3	0.5	0.5	0.0	6.1	0.0	0.8	20.4
20	0.8	0.8	34.9	12.8	41.2	2.5	0.0	0.0	0.0	3.9	0.0	9.0	105.9
21	0.0	0.0	0.8	0.6	1.7	46.8	0.0	0.3	43.0	7.8	0.0	0.0	101.0
22	2.6	2.6	8.5	0.0	0.0	38.2	0.0	0.0	0.0	0.2	16.4	0.0	68.5
23	6.8	6.8	14.5	5.9	28.4	1.0	0.0	0.0	2.1	21.2	2.7	0.0	89.4
24	0.0	0.0	7.5	2.3	17.5	43.4	0.0	2.0	9.8	0.0	0.0	0.0	82.5
25	2.0	2.0	13.5	0.0	1.0	3.7	0.0	51.7	0.0	32.5	2.0	2.0	110.4
26	1.5	1.5	0.0	0.0	0.0	14.3	0.0	23.1	8.0	0.2	22.1	0.0	70.7
27	1.7	1.7	5.4	0.0	0.0	4.1	0.0	0.8	0.0	9.5	2.1	1.7	27.0
28	5.3	5.3	5.4	1.8	3.1	0.4	14.7	0.0	10.0	2.7	0.0	5.2	53.9
29	28.4	28.4	0.0	28.0	0.2	15.5	0.0	0.2	0.9	3.6	0.0	10.0	115.2
30	0.7	0.7	83.0	5.0	0.0	8.0	0.0	0.0	1.0	10.7	0.0	0.5	109.6
31	1.1	1.1	87.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	89.4
Rainfall Days	22	22	22	21	24	20	11	14	13	24	19	15	227
MAX	44.0	44.0	87.2	28.0	59.5	46.8	17.5	51.7	67.0	32.5	22.1	31.1	531.4
TOTAL	169.2	169.2	360.7	135.8	302.9	229.1	62.0	113.2	202.2	196.6	116.7	132.4	2,190.0

Source : Badan Meteorologi dan Geofisika (Meteorological and Geophysical Agency, BMG) Manado

Table C.2.55 Flow Rate of In-flow Streams to Lake Tondano by Hikmatullah

Name of the Stream	Flow Rate (m3/s)	Sudpended Sediment (mg/l)
Panasen	0.4514	119
Wori	0.6258	116
Ranowelang	0.8544	76
Karembeng	0.0928	93
Bowolean	0.3846	147
Wowolean	0.0637	100
Toubeke	0.3195	93
Lelema	0.1102	79
Tolouroki	0.0773	100
Tounsukun	0.0262	12
Serawet	0.0287	12

Table C.2.56 Flow Rate of In-flow Streams to Lake Tondano

Name of River	Catchment Area(km2)	Discharge (m3/s)
Tombangan	11.25	0.1431
Mawalelong	20.25	0.69333
Toubeke	13.00	0.02625
Saluwangko	22.85	0.096
Panasen	15.25	0.73125
Touliangoki	8.19	0.08565

Table C.2.57 (1) Flow Rate by Molenaar (m3/sec)

Date	12/30 /98	1/18 /99	2/1 /99	3/19 /99	4/10 /99	5/22 /99	6/11 /99	7/30 /99	8/20 /99	9/7 /99	10/29 /99	11/29 /99
Toulour	2.730	5.445	1.493	7.517	7.805	11.151	7.680	3.478	9.437	7.796	10.238	2.262
Touliang Oki	0.090	0.018	0.023	0.035	0.041	0.111	0.034	0.098	0.060	0.313	0.005	0.023
Toubeka	0.026	0.003	0.088	0.214	0.145	0.082	0.098	0.097	0.074	0.081	0.066	0.024
Tougela	0.277	0.015	0.030	0.058	0.087	0.089	0.005	0.006	0.087	0.115	0.059	0.040
Tounsaru	0.010	0.010	0.004	0.027	0.021	0.144	0.023	0.013	0.087	0.084	0.006	0.004
Tountimomor	1.887	0.676	1.003	0.445	0.675	1.595	0.924	0.404	1.592	0.570	0.706	0.580
Kakas	0.953	0.828	1.455	0.760	0.763	2.839	1.273	0.728	2.366	0.885	1.379	0.403
Panasen U/S	0.371	0.322	0.251	0.207	0.219	0.232	0.133	0.084	0.143	0.375	0.052	0.091
Ranoweleng U/S	0.426	0.358	1.095	0.440	0.452	0.615	0.422	0.530	0.622	1.277	0.371	0.403
Remboken Leleko	0.619	0.699	0.947	0.688	0.779	0.655	0.606	0.541	0.799	0.460	0.938	0.592

Table C.2.57 (2) Suspended Sloid by Molenaar(gr/l)

Date	12/30 /98	1/18 /99	2/1 /99	3/19 /99	4/10 /99	5/22 /99	6/11 /99	7/30 /99	8/20 /99	9/7 /99	10/29 /99	11/29 /99
Toulour	0.018	0.022	0.024	0.024	0.026	0.004	0.021	0.049	0.004	0.023	0.019	0.030
Touliang Oki	0.117	0.115	0.119	0.079	0.079	0.004	0.108	0.113	0.003	0.014	0.012	0.011
Toubeka	0.030	1.794	0.740	0.145	0.124	0.009	0.150	0.380	0.013	0.037	0.037	0.024
Tougela	0.064	0.083	0.163	0.132	0.130	0.097	0.165	0.291	0.063	0.123	0.072	0.030
Tounsaru	0.109	0.138	0.182	0.109	0.096	0.050	0.115	0.213	0.048	0.102	0.026	0.015
Tountimomor	0.098	0.036	0.152	0.059	0.047	0.042	0.083	0.156	0.042	0.072	0.044	0.032
Kakas	0.138	0.143	0.042	0.052	0.051	0.019	0.059	0.101	0.018	0.038	0.026	0.013
Panasen U/S	0.045	0.033	0.071	0.138	0.082	0.031	0.099	0.150	0.029	0.049	0.034	0.022
Ranoweleng U/S	0.041	0.037	0.056	0.214	0.223	0.038	0.229	0.293	0.037	0.067	0.036	0.024
Remboken Leleko	0.052	0.052	0.057	0.046	0.052	0.048	0.017	0.060	0.042	0.043	0.010	0.016

Table C.2.58 Discharge and Suspended Solid of Rivers around Lake Tondano by JICA STUDY

No.	First Sampling		Second Sampling		Third Sampling		Fourth Sampling	
	SS (mg/l)	DM (m^3/sec)	SS (mg/l)	DM (m^3/sec)	SS (mg/l)	DM (m^3/sec)	SS (mg/l)	DM (m^3/sec)
1	37.5	0.7231	44.2	0.1845	51.2	0.2529	19.4	0.2998
2	50.2	0.2374	19.3	0.1221	211.6	0.1325	4.2	0.1416
3	75.1	0.0457	22.1	0.0317	500.2	0.0311	17.6	0.0247
4	128.1	0.2856	22.4	0.1761	1650.4	0.2122	18.9	0.0912
5	152.7	3.8969	85.5	1.6919	629.7	1.8407	33.2	0.4460
6	12.1	0.6004	46.3	0.5469	54.3	0.3119	4.1	0.1311
7	47.3	2.4505	86.2	1.4725	23.5	0.0909	54.6	0.3353
8	18.2	0.6619	66.35	0.6719	55.4	0.2647	25.8	0.3183
9	39.2	0.6838	174.6	2.9886	265.8	0.7011	252.5	0.7954
10	100.6	4.3026	106.7	13.2930	48.9	2.5418	49.6	1.5000
11	73.3	2.2652	73.9	2.6863	40.3	1.5417	25.3	1.1022
12	159.2	0.5521	67.5	1.2878	223.5	0.4832	16.7	0.3379
13	46.5	2.2831	51.4	3.4091	42.7	1.4370	29.2	2.4200
14	1260.7	0.1316	169.2	0.0675	154.6	0.0308	165.7	0.0040
15	30.6	0.0149	17.3	0.0387	11.8	0.0056	13.1	0.0029
16	262.1	0.0364	88.2	0.0168	98.3	0.0127	86.3	0.0021
17	25.6	0.1025	20.1	0.1108	10.5	0.0527	20.3	0.0438
18	152.2	0.0600	29.3	0.1218	25.6	0.0729	30.2	0.0120
19	26.3	0.2130	8.2	0.0978	6.4	0.0699	7.1	0.0859
20	317.7	0.5963	467.5	1.1156	55.3	0.1096	32.4	0.0606
21	30.1	0.0608	13.6	0.1036	10.2	0.0170	4.0	0.0208
22	189.3	0.5519	113.7	0.4844	34.1	0.0964	70.2	0.0442
23	46.5	1.1592	97.5	1.5540	10.1	0.4858	97.6	0.6779
24	10.2	0.1327	12.4	0.1030	13.2	0.1004	7.4	0.0242
25	30.6	0.2560	23.2	0.2054	35.4	0.1209	39.3	0.1435
26	28.5	0.0912	34.6	0.0463	36.5	0.0486	35.6	0.0612
27	26.8	0.1045	33.7	0.2279	20.6	0.1097	27.6	0.0691
28	50.1	0.4348	15.9	0.4579	15.7	0.3341	14.2	0.1183
29	69.3	0.3706	72.2	0.5591	30.8	0.3191	50.6	0.1163
30	166.4	0.0582	130.3	0.1627	29.2	0.0069	27.6	0.0026
31	475.5	0.2776	271.6	0.1932	69.4	0.0788	171.7	0.0054
32	77.3	0.2523	8.7	0.0483	13.1	0.0718	9.2	0.0445
33	72.2	0.0853	156.9	0.0581	8.2	0.0335	459.5	0.0156
34	7.6	0.6439	2.3	0.4113	9.1	0.5018	51.2	0.3989
35	6.1	0.0372	28.5	0.0701	10.4	0.0499	7.0	0.0334
36	9.2	1.2868	16.6	1.9390	24.5	2.9655	13.1	1.9732
37	10.3	2.8724	58.7	7.9746	7.3	3.6966	96.2	2.6246
38	15.8	9.4644	21.5	13.6812	15.4	8.0219	46.1	3.7412
39	21.2	7.9543	39.3	10.1831	34.8	6.2217	20.2	3.5492
40	215.3	26.7718	133.2	28.8811	140.5	27.5457	11.3	25.0412
41	36.7	29.4609	55.4	40.3371	22.3	29.7352	21.5	25.0405
42	24.5	2.0434	30.6	4.3150	22.4	2.3432	17.4	1.1099
43	32.6	*	350.3	*	35.6	39.7206	21.3	39.3756
44	18.3	1.6457	198.6	4.9363	6.2	1.1632	9.2	1.1965
45	23.1	1.8929	11.4	1.6652	13.5	1.7088	7.0	0.6859
46	5.4	1.6807	13.5	4.7153	6.1	4.4514	7.1	3.2910
47	40.5	28.4597	24.7	23.6640	24.4	19.0952	18.6	25.3295
48	12.2	1.2274	17.6	2.5749	12.6	1.5868	10.2	1.1218
49	39.4	1.0316	11.3	0.8240	30.7	0.8361	7.3	0.3550
50	72.1	0.1058	15.1	0.1873	5.2	0.0907	6.1	0.0963

Note *: (*) The river was flooding during sampling, measured from March 28 to May 15, 2000 by JICA Study Team*

Table C.2.59 (1) Intake Discharge at Tonsealama Power Plant : Year 1996

Date	Discharge (1,000,000 m3)											
	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
1	1.028	0.870	0.897	0.704	0.784	0.963	0.998	0.911	0.931	0.729	0.851	0.862
2	1.035	0.872	0.894	0.704	0.790	0.977	0.947	0.855	0.968	0.715	0.912	0.856
3	1.036	0.881	0.894	0.702	0.818	0.976	0.975	0.867	0.970	0.683	0.887	0.817
4	1.033	0.916	0.894	0.698	0.844	0.865	0.941	0.940	0.946	0.618	0.777	0.838
5	1.028	0.947	0.894	0.693	0.850	0.982	0.925	0.947	0.944	0.649	0.735	0.820
6	1.023	0.954	0.893	0.687	0.852	0.962	0.980	0.918	0.949	0.658	0.811	0.855
7	1.018	0.958	0.891	0.682	0.850	0.987	0.939	0.883	0.926	0.747	0.812	0.823
8	1.016	0.956	0.885	0.678	0.854	0.950	0.949	0.866	0.830	0.780	0.894	0.844
9	1.019	0.951	0.878	0.675	0.869	0.910	0.810	0.802	0.914	0.762	0.870	0.828
10	1.024	0.947	0.871	0.672	0.880	0.890	0.813	0.785	0.802	0.742	0.810	0.848
11	1.030	0.942	0.865	0.670	0.882	0.981	0.993	0.756	0.865	0.771	0.859	0.829
12	1.037	0.942	0.858	0.667	0.878	0.920	1.031	0.735	0.860	0.649	0.925	0.879
13	1.046	0.937	0.850	0.663	0.869	0.946	0.946	0.636	0.847	0.754	0.881	0.828
14	1.054	0.933	0.842	0.657	0.861	0.968	0.985	0.754	0.860	0.715	0.882	0.839
15	1.056	0.933	0.834	0.652	0.852	0.966	1.007	0.750	0.825	0.693	0.878	0.879
16	1.054	0.926	0.827	0.650	0.845	0.933	0.897	0.744	0.826	0.752	0.870	0.747
17	1.049	0.919	0.825	0.649	0.838	0.993	0.983	0.708	0.688	0.743	0.820	0.857
18	1.042	0.914	0.823	0.650	0.832	0.844	0.924	0.725	0.801	0.737	0.837	0.821
19	1.036	0.909	0.819	0.651	0.826	1.003	1.007	0.743	0.771	0.730	0.829	0.783
20	1.030	0.907	0.814	0.652	0.820	0.922	1.011	0.768	0.813	0.742	0.876	0.820
21	1.021	0.907	0.808	0.653	0.815	0.968	0.980	0.709	0.771	0.640	0.663	0.791
22	1.016	0.905	0.802	0.655	0.809	0.746	0.959	0.772	0.765	0.810	0.843	0.879
23	1.013	0.902	0.796	0.657	0.803	0.968	1.012	0.857	0.807	0.808	0.848	0.835
24	1.005	0.905	0.796	0.659	0.805	0.890	0.947	0.855	0.772	0.764	0.848	0.905
25	0.998	0.909	0.800	0.668	0.814	0.927	0.956	0.955	0.763	0.772	0.834	0.951
26	0.993	0.914	0.806	0.693	0.836	1.023	1.005	0.667	0.765	0.640	0.859	0.991
27	0.990	0.908	0.817	0.730	0.868	0.956	1.031	0.699	0.753	0.783	0.849	0.871
28	0.985	0.898	0.803	0.763	0.901	1.009	1.007	0.640	0.759	0.752	0.846	0.883
29	0.917	0.895	0.753	0.780	0.932	0.990	0.965	0.694	0.731	0.801	0.862	0.978
30	0.896		0.716	0.784	0.950	0.968	0.922	0.684	0.750	0.902	0.853	0.781
31	0.895		0.708		0.958		0.975	0.770		0.842		0.926
Total	31.422	26.658	25.853	20.502	26.385	28.384	29.823	24.395	24.972	22.885	25.322	26.465

Table C.2.59 (2) Intake Discharge at Tonsealama Power Plant : Year 1997

Date	Discharge (m3)											
	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
1	0.940	0.947	0.980	0.765	0.820	0.600	0.230	0.217	0.140	0.097	0.100	0.000
2	0.988	0.923	0.935	0.766	0.832	0.527	0.319	0.246	0.132	0.094	0.094	0.000
3	1.005	0.835	0.948	0.799	0.771	0.486	0.227	0.229	0.122	0.092	0.097	0.156
4	0.956	0.962	1.019	0.800	0.750	0.482	0.234	0.246	0.097	0.107	0.102	0.155
5	0.935	0.827	1.007	0.784	0.739	0.424	0.238	0.223	0.118	0.126	0.108	0.142
6	0.990	0.906	1.021	0.785	0.740	0.451	0.246	0.233	0.116	0.133	0.124	0.147
7	0.812	0.965	0.963	0.722	0.773	0.455	0.237	0.225	0.107	0.093	0.149	0.135
8	0.980	1.002	1.010	0.762	0.723	0.456	0.204	0.239	0.098	0.106	0.121	0.140
9	0.959	0.918	0.963	0.777	0.740	0.440	0.235	0.080	0.132	0.124	0.075	0.134
10	0.935	0.946	0.983	0.744	0.703	0.388	0.387	0.231	0.125	0.109	0.108	0.177
11	0.987	0.957	0.971	0.774	0.742	0.453	0.239	0.137	0.098	0.119	0.089	0.263
12	0.962	0.976	0.980	0.765	0.705	0.443	0.222	0.277	0.092	0.129	0.172	0.362
13	0.954	0.984	0.943	0.800	0.727	0.385	0.193	0.211	0.094	0.126	0.093	0.440
14	0.922	0.966	0.969	0.808	0.671	0.359	0.199	0.222	0.084	0.163	0.124	0.475
15	1.000	1.002	0.995	0.786	0.654	0.440	0.196	0.204	0.096	0.163	0.098	0.468
16	0.918	0.853	0.996	0.834	0.661	0.430	0.189	0.258	0.095	0.128	0.100	0.422
17	0.950	0.969	0.977	0.866	0.659	0.307	0.199	0.400	0.083	0.120	0.096	0.418
18	0.977	0.934	0.920	0.826	0.681	0.329	0.194	0.215	0.093	0.122	0.101	0.430
19	0.919	0.978	0.963	0.809	0.690	0.351	0.189	0.208	0.093	0.108	0.113	0.412
20	0.914	0.959	0.986	0.842	0.668	0.336	0.160	0.211	0.091	0.164	0.099	0.467
21	0.754	0.918	0.961	0.871	0.617	0.342	0.201	0.208	0.073	0.122	0.097	0.440
22	1.005	0.963	0.944	0.802	0.662	0.325	0.176	0.212	0.092	0.151	0.098	0.471
23	1.001	0.972	0.956	0.814	0.663	0.316	0.198	0.212	0.100	0.113	0.096	0.486
24	0.965	0.976	0.946	0.803	0.648	0.286	0.202	0.118	0.102	0.125	0.145	0.474
25	0.981	0.947	0.868	0.807	0.632	0.351	0.208	0.130	0.091	0.131	0.162	0.526
26	0.983	0.962	0.846	0.774	0.661	0.332	0.201	0.142	0.100	0.102	0.127	0.459
27	0.978	0.941	0.842	0.828	0.677	0.314	0.182	0.135	0.108	0.115	0.160	0.493
28	0.905	0.989	0.812	0.797	0.653	0.290	0.197	0.123	0.093	0.224	0.119	0.439
29	0.966		0.775	0.865	0.586	0.225	0.257	0.135	0.101	0.163	0.000	0.407
30	0.886		0.804	0.817	0.625	0.232	0.231	0.137	0.116	0.145	0.000	0.416
31	0.972		0.771		0.598		0.224	0.133		0.103		0.433
Total	29.398	26.480	29.053	23.994	21.470	11.555	6.817	6.196	3.082	3.916	3.167	10.386

Table C.2.59 (3) Intake Discharge at Tonsealama Power Plant : Year 1998

Date	Discharge (m3)											
	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
1	0.435	0.148	0.138	0.055	0.134	0.424	0.786	0.839	0.460	0.532	0.677	0.733
2	0.401	0.148	0.137	0.055	0.137	0.433	0.787	0.836	0.456	0.531	0.685	0.730
3	0.382	0.147	0.136	0.055	0.140	0.442	0.788	0.833	0.453	0.530	0.691	0.728
4	0.380	0.147	0.135	0.055	0.144	0.451	0.789	0.828	0.450	0.529	0.696	0.725
5	0.401	0.148	0.134	0.055	0.147	0.458	0.791	0.823	0.447	0.529	0.698	0.722
6	0.432	0.148	0.133	0.055	0.150	0.464	0.793	0.818	0.445	0.529	0.699	0.720
7	0.421	0.148	0.132	0.056	0.152	0.468	0.797	0.813	0.442	0.528	0.699	0.718
8	0.370	0.148	0.131	0.056	0.153	0.472	0.800	0.809	0.440	0.528	0.700	0.717
9	0.363	0.149	0.130	0.057	0.154	0.475	0.803	0.804	0.439	0.529	0.701	0.717
10	0.376	0.149	0.129	0.057	0.155	0.479	0.806	0.801	0.437	0.530	0.702	0.719
11	0.377	0.150	0.129	0.059	0.155	0.483	0.806	0.797	0.435	0.532	0.704	0.723
12	0.395	0.151	0.128	0.060	0.156	0.489	0.805	0.794	0.435	0.534	0.707	0.730
13	0.359	0.152	0.127	0.064	0.159	0.499	0.802	0.789	0.436	0.537	0.711	0.739
14	0.357	0.153	0.126	0.069	0.164	0.511	0.797	0.780	0.439	0.541	0.717	0.751
15	0.347	0.154	0.124	0.077	0.173	0.528	0.791	0.767	0.445	0.547	0.723	0.766
16	0.239	0.154	0.121	0.086	0.186	0.547	0.784	0.747	0.453	0.556	0.731	0.782
17	0.192	0.155	0.118	0.095	0.202	0.569	0.777	0.722	0.462	0.566	0.738	0.799
18	0.181	0.155	0.114	0.105	0.221	0.590	0.770	0.694	0.473	0.577	0.745	0.815
19	0.185	0.154	0.109	0.113	0.240	0.610	0.763	0.665	0.483	0.589	0.750	0.829
20	0.224	0.154	0.104	0.119	0.257	0.628	0.759	0.639	0.494	0.599	0.753	0.841
21	0.174	0.125	0.099	0.123	0.271	0.644	0.756	0.617	0.505	0.608	0.753	0.851
22	0.175	0.126	0.094	0.126	0.282	0.658	0.755	0.598	0.515	0.614	0.753	0.858
23	0.185	0.127	0.089	0.128	0.293	0.671	0.756	0.583	0.524	0.619	0.752	0.864
24	0.172	0.128	0.084	0.130	0.303	0.684	0.759	0.568	0.532	0.623	0.750	0.869
25	0.176	0.129	0.080	0.131	0.315	0.697	0.763	0.555	0.537	0.626	0.749	0.874
26	0.202	0.131	0.076	0.131	0.328	0.711	0.769	0.541	0.540	0.629	0.747	0.879
27	0.157	0.133	0.072	0.131	0.343	0.725	0.777	0.528	0.541	0.633	0.746	0.884
28	0.207	0.135	0.068	0.131	0.359	0.739	0.787	0.515	0.540	0.638	0.744	0.890
29	0.166		0.065	0.132	0.375	0.755	0.798	0.501	0.538	0.645	0.741	0.895
30	0.151		0.061	0.133	0.391	0.770	0.811	0.487	0.535	0.654	0.737	0.901
31	0.148		0.058		0.407		0.825	0.474		0.665		0.907
Total	8.729	4.046	3.378	2.698	7.048	17.073	24.350	21.566	14.332	17.826	21.697	24.675

Table C.2.59 (4) Intake Discharge at Tonsealama Power Plant : Year 1999

Date	Discharge (m3)											
	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
1	0.974	0.899	0.711	1.036	0.930	0.907	0.945	0.730	0.616	0.551	0.685	0.780
2	0.944	0.946	0.728	0.963	0.912	1.006	0.790	0.768	0.605	0.581	0.857	0.746
3	0.920	0.831	0.757	1.024	0.938	0.952	0.984	0.693	0.611	0.587	0.854	0.767
4	0.985	1.056	0.729	0.987	0.869	0.898	0.961	0.605	0.609	0.570	0.878	0.761
5	1.096	0.786	0.748	1.044	0.927	0.993	0.978	0.595	0.598	0.589	0.758	0.718
6	1.072	0.965	0.730	1.008	0.896	0.950	0.873	0.588	0.631	0.582	0.786	0.748
7	1.087	0.977	0.691	1.034	0.980	0.887	0.999	0.623	0.597	0.607	0.720	0.760
8	1.003	0.981	0.722	1.023	0.929	0.912	0.990	0.613	0.614	0.560	0.830	0.738
9	1.055	0.954	0.719	1.010	0.937	0.980	0.997	0.614	0.616	0.559	0.778	0.753
10	0.985	0.946	0.722	0.994	0.847	0.964	0.893	0.620	0.581	0.536	0.756	0.760
11	1.047	0.882	0.785	0.988	0.984	0.956	0.902	0.616	0.594	0.550	0.745	0.734
12	1.033	0.921	0.800	0.974	0.998	1.012	0.878	0.607	0.558	0.571	0.739	0.725
13	1.035	0.889	0.844	1.011	0.984	0.924	0.973	0.593	0.615	0.565	0.722	0.813
14	0.997	0.822	0.824	0.943	0.932	0.927	0.973	0.576	0.629	0.589	0.796	0.851
15	1.005	0.831	0.814	1.009	1.004	0.870	0.981	0.559	0.604	0.589	0.798	0.893
16	0.977	0.755	0.885	0.949	0.961	0.938	0.973	0.592	0.579	0.563	0.770	0.861
17	0.969	0.749	0.869	0.958	0.988	0.912	0.958	0.534	0.573	0.536	0.785	0.856
18	0.955	0.729	0.857	0.971	0.910	0.940	0.928	0.550	0.573	0.549	0.770	0.887
19	0.945	0.722	0.830	1.019	1.003	0.941	0.900	0.563	0.542	0.525	0.742	0.873
20	0.949	0.695	0.891	0.967	0.979	0.930	1.051	0.581	0.596	0.556	0.727	0.897
21	0.978	0.678	0.898	1.075	0.985	0.889	0.909	0.574	0.577	0.537	0.727	0.857
22	0.935	0.723	0.912	0.980	1.007	0.933	0.880	0.560	0.597	0.551	0.789	0.872
23	0.981	0.774	0.964	1.006	0.976	0.997	0.878	0.572	0.569	0.521	0.766	0.790
24	0.970	0.728	0.954	0.997	0.965	0.915	0.831	0.613	0.607	0.543	0.767	0.872
25	0.994	0.744	0.942	0.979	0.989	1.020	0.784	0.635	0.576	0.552	0.767	0.801
26	0.917	0.754	1.021	1.022	0.903	0.996	0.831	0.608	0.522	0.648	0.810	0.819
27	0.956	0.721	1.010	0.638	1.021	0.973	0.808	0.588	0.593	0.575	0.841	0.884
28	0.940	0.695	1.012	0.845	0.921	0.887	0.767	0.646	0.591	0.676	0.806	0.834
29	0.954		0.944	0.964	1.036	1.034	0.681	0.607	0.594	0.760	0.747	0.834
30	0.971		0.961	0.948	1.011	1.031	0.737	0.629	0.595	0.732	0.774	0.860
31	0.951		1.034		1.013		0.764	0.642		0.773		0.889
Total	30.581	23.150	26.309	29.366	29.736	28.473	27.795	18.896	17.761	18.182	23.291	25.234

Table C.2.60 (1) Weekly Water Surface Level of Lake Tondano at Toulour (PLN, 1980 to 1989)

Week	Water Surface Elevation Above Sea Level at 08.00									
	1980 (cm)	1981 (cm)	1982 (cm)	1983 (cm)	1984 (cm)	1985 (cm)	1986 (cm)	1987 (cm)	1988 (cm)	1989 (cm)
1		682.68	682.74	681.90	682.23	682.21	682.40	682.32	682.26	683.21
2		682.72	682.28	681.84	682.24	682.32	682.33	682.36	682.22	683.15
3		682.74	682.25	681.82	682.18	682.26	682.34	682.37	682.18	683.15
4		682.71	682.22	681.81	682.26	682.17	682.34	682.42	682.14	683.15
5		682.68	682.28	681.74	682.55	682.10	682.47	682.40	682.13	683.21
6		682.62	682.29	681.72	682.68	682.06	682.38	682.43	682.12	683.26
7		682.60	682.29	681.67	682.67	682.50	682.36	682.35	682.14	683.32
8		682.58	682.29	681.64	682.65	682.47	682.44	682.29	682.23	683.35
9		682.68	682.34	681.60	682.57	682.46	682.36	682.27	682.23	683.48
10		682.65	682.59	681.57	682.51	682.43	682.52	682.20	682.26	683.53
11		682.58	682.62	681.54	682.44	682.43	682.52	682.16	682.25	683.58
12		682.66	682.50	681.52	682.72	682.42	682.51	682.22	682.35	683.57
13		682.79	682.41	681.53	682.68	682.34	682.48	682.17	682.43	683.67
14	682.93	682.99	682.31	681.39	682.62	682.35	682.41	682.25	682.41	683.55
15	683.07	683.18	682.30	681.36	682.53	682.30	682.36	682.18	682.51	683.54
16	683.17	683.58	682.42	681.32	682.56	682.37	682.32	682.21	682.59	683.56
17	683.10	683.73	682.46	681.33	682.67	682.36	682.27	682.19	682.62	683.48
18	683.06	683.52	682.65	681.50	682.80	682.27	682.28	682.36	682.73	683.34
19	683.21	683.45	682.70	681.57	682.83	682.31	682.27	682.52	682.79	683.46
20	683.13	683.35	682.69	681.61	682.95	682.29	682.24	682.64	682.82	683.52
21	683.09	683.50	682.56	681.65	682.61	682.29	682.17	682.63	683.03	683.50
22	683.07	683.29	682.50	681.68	682.90	682.22	682.08	682.55	682.94	683.37
23	683.06	683.10	682.58	681.71	682.95	682.28	682.07	682.48	682.99	683.37
24	683.19	682.96	682.72	681.74	683.05	682.25	682.07	682.38	683.11	683.39
25	683.22	682.84	682.63	681.96	683.03	682.19	682.13	682.28	683.39	683.48
26	683.11	682.86	682.46	682.17	683.03	682.07	682.17	682.19	683.28	683.49
27	683.00	682.83	682.33	682.13	683.04	682.01	682.19	682.12	683.22	683.45
28	682.91	682.78	682.21	682.26	682.98	682.00	682.20	682.06	683.16	683.48
29	682.82	682.69	682.12	682.48	682.92	681.98	682.17	681.98	683.09	683.48
30	682.76	682.62	682.06	682.60	682.83	681.96	682.15	681.98	683.26	683.42
31	682.67	682.52	682.01	682.59	682.74	681.96	682.13	682.04	683.21	683.32
32	682.64	682.42	681.98	682.57	682.66	681.90	682.07	682.02	683.17	683.24
33	682.60	682.34	681.92	682.58	682.62	681.93	681.99	682.00	683.22	683.15
34	682.52	682.24	681.84	682.51	682.64	681.88	681.94	681.92	683.21	683.06
35	682.49	682.27	681.80	682.58	682.65	681.90	681.93	681.89	683.14	682.99
36	682.40	682.26	681.74	682.49	682.54	681.84	681.81	681.84	683.04	682.94
37	682.32	682.29	681.72	682.42	682.41	681.89	681.80	681.80	682.96	682.86
38	682.24	682.32	681.70	682.33	682.38	681.92	681.78	681.85	682.87	682.80
39	682.18	682.28	681.68	682.21	682.31	681.92	681.69	681.81	682.79	682.74
40	682.12	682.32	681.64	682.21	682.40	681.90	681.72	681.77	682.79	682.85
41	682.10	682.38	681.60	682.16	682.38	681.93	681.69	681.83	682.79	682.99
42	682.26	682.28	681.55	682.06	682.31	681.89	681.70	681.90	682.81	683.08
43	682.24	682.22	681.54	682.08	682.34	682.04	681.72	681.88	682.77	683.12
44	682.26	682.32	681.54	682.32	682.32	682.01	681.82	681.87	682.72	683.12
45	682.26	682.41	681.52	682.32	682.30	682.07	682.12	681.89	682.69	683.24
46	682.29	682.53	681.55	682.44	682.18	682.17	682.16	681.97	682.90	683.35
47	682.49	682.59	681.57	682.43	682.16	682.18	682.10	682.11	683.14	683.44
48	682.74	682.55	681.58	682.34	682.23	682.20	682.36	682.11	683.21	683.44
49	682.74	682.50	681.70	682.22	682.21	682.32	682.43	682.12	683.14	683.41
50	682.67	682.47	681.78	682.26	682.16	682.30	682.42	682.26	683.28	683.34
51	682.62	682.43	681.84	682.24	682.15	682.36	682.36	682.31	683.13	683.23
52	682.59	682.38	681.88	682.20	682.08	682.28	682.31	682.30	683.24	683.33
53					682.05					

Table C.2.60 (2) Weekly Water Surface Level of Lake Tondano at Toulour (PLN, 1990 to 1999)

Week	Water Surface Elevation Above Sea Level at 08.00									
	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
	(cm)	(cm)	(cm)	(cm)	(cm)	(cm)	(cm)	(cm)	(cm)	(cm)
1	683.36	682.77	682.98	682.99	682.75	682.81	683.72	683.33	682.36	682.86
2	683.40	682.69	682.87	682.94	682.75	682.89	683.70	683.28	682.30	682.86
3	683.35	682.70	682.99	683.00	682.79	683.02	683.78	683.24	682.25	682.74
4	683.55	682.85	682.92	682.99	682.79	683.03	683.70	683.22	682.21	682.72
5	683.52	682.77	682.89	682.92	682.76	682.95	683.63	683.13	682.18	682.71
6	683.46	682.72	682.87	682.86	682.75	682.91	683.73	683.23	682.14	682.73
7	683.36	682.99	682.85	682.80	682.78	682.86	683.72	683.18	682.11	682.67
8	683.31	682.92	682.82	682.76	682.70	682.85	683.66	683.10	682.09	682.56
9	683.25	682.85	682.85	682.75	682.61	682.86	683.66	683.19	682.06	682.70
10	683.27	682.78	682.82	682.70	682.56	682.88	683.67	683.20	682.01	682.83
11	683.23	682.75	682.84	682.78	682.62	682.82	683.61	683.13	681.97	682.84
12	683.24	682.72	682.83	682.79	682.77	682.81	683.52	683.09	681.93	682.83
13	683.33	682.94	682.81	682.80	682.83	683.00	683.46	683.02	681.91	682.90
14	683.66	683.00	682.82	682.76	683.01	682.99	683.63	682.96	681.89	683.10
15	683.86	682.95	682.79	682.70	683.01	682.92	683.63	683.13	681.88	683.03
16	683.85	683.00	682.77	682.81	683.05	682.86	683.57	683.14	681.88	683.04
17	683.68	683.23	682.76	682.77	683.22	682.93	683.51	683.09	681.91	683.02
18	683.58	683.45	682.82	682.76	683.16	682.98	683.51	683.01	681.94	682.95
19	683.55	683.49	682.88	682.79	683.17	682.99	683.72	682.93	681.99	682.94
20	683.69	683.39	683.18	682.89	683.13	683.07	683.77	682.89	682.14	683.11
21	683.67	683.53	683.22	682.87	683.13	683.16	683.65	682.89	682.19	683.21
22	683.65	683.61	683.25	683.02	683.06	683.13	683.64	682.78	682.17	683.29
23	683.76	683.62	683.23	683.13	683.02	683.10	683.82	682.70	682.26	683.16
24	683.85	683.52	683.19	683.25	683.01	683.07	683.91	682.64	682.53	683.06
25	683.77	683.40	683.22	683.21	682.94	683.17	684.05	682.57	682.74	683.06
26	683.61	683.30	683.12	683.14	682.85	683.17	683.95	682.53	682.86	683.29
27	683.52	683.45	683.01	683.15	683.07	683.18	683.83	682.53	682.81	683.29
28	683.45	683.38	682.93	683.13	683.02	683.22	683.77	682.60	682.76	683.31
29	683.40	683.28	682.91	683.08	682.93	683.22	683.71	682.59	682.77	683.24
30	683.35	683.17	682.99	683.00	682.86	683.14	683.70	682.55	682.81	683.12
31	683.26	683.07	682.97	683.14	682.79	683.15	683.63	682.51	682.73	683.05
32	683.23	683.02	682.91	683.08	682.73	683.20	683.52	682.45	682.66	682.96
33	683.21	682.99	682.85	683.01	682.70	683.37	683.39	682.37	682.67	682.91
34	683.08	682.93	682.77	682.92	682.65	683.90	683.34	682.30	682.60	682.79
35	682.95	682.86	682.72	682.84	682.60	683.79	683.45	682.29	682.59	682.92
36	682.85	682.80	682.69	682.78	682.55	683.79	683.51	682.28	682.50	682.89
37	682.82	682.71	682.81	682.72	682.50	683.76	683.43	682.25	682.43	682.89
38	682.75	682.64	682.80	682.74	682.45	683.64	683.34	682.21	682.37	682.81
39	682.68	682.61	682.76	682.67	682.42	683.66	683.30	682.17	682.33	682.76
40	682.92	682.54	682.74	682.63	682.39	683.57	683.21	682.24	682.40	682.72
41	682.88	682.46	682.91	682.57	682.38	683.67	683.13	682.28	682.55	682.74
42	682.79	682.59	682.86	682.56	682.36	683.68	683.10	682.26	682.51	682.71
43	682.72	682.56	682.81	682.53	682.33	683.71	683.05	682.24	682.54	682.79
44	682.70	682.58	682.83	682.60	682.37	683.74	683.06	682.20	682.52	682.88
45	682.81	682.62	682.91	682.57	682.44	683.71	683.27	682.27	682.58	682.86
46	682.93	682.59	683.09	682.54	682.47	683.75	683.27	682.26	682.72	682.90
47	682.91	682.57	683.09	682.75	682.65	683.74	683.25	682.27	682.73	682.84
48	682.96	682.64	683.10	682.79	682.67	683.88	683.21	682.23	682.74	682.93
49	683.04	682.69	683.09	682.80	682.75	683.84	683.22	682.20	682.69	682.88
50	683.00	682.72	683.07	682.78	682.76	683.79	683.20	682.30	682.68	682.90
51	682.99	682.79	683.03	682.72	682.80	683.80	683.20	682.38	682.63	682.93
52	682.93	683.03	683.06	682.70	682.84	683.71	683.34	682.39	682.70	682.89
53	682.84						683.42			

Table C.2.61 Flow Rate of Tondano River at Kairagi by PU (m3/sec)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1985					16.5	15	14.8	14.3	13.5	13.8	16.3	15.6
1986	17.3	16.2	13.7	15.2	16.2	16.8	17	19.5	16.1	16.3	16.7	16.4
1987	15.5	15.9	16.4	17.2	15	16.1	17.7	20.1	20	18.9	17.9	17.6
1988	17.9	16.8	17.7	16.9	16.1	14.9	15.7	16.3	17.3	15.9	14.6	13.8
1989	16.2	16.1	18.7	16.5	15.4	15.6	16	12.3	13	16.2	17.9	15.8
1990	17.3	14.5	16.9	18.5	16.8	17.7	13	12.7	10.9	11.3	13.2	13.1
1991	13.3	13.5	12	15.3		14.9	13.4	22.6	11.7	10.4	11.8	
1992			10.4	10.2	10.2			9.3	9	11.4	13.2	
1993						9.8						
1994	15.2	19.9	15.3	14.6	14.7		14	11.6	12.3	12.4	13	15.1
1995	15.5	14.8	14.7	14	12.5	11.3	9.5	9.3	7.8	6.5	5.1	7.5

Table C.3.1 Locations of Test Pits for Soil Survey

No	Location	Longitude North		Latitude East		Slope Slope Gradient		Slope Direction*	Altitude
		degree	minute	degree	minute	degree	%	degree	m
1	Tonsewer	1	09.790	124	47.556	3	6	330	815
2	Tumaratas	1	08.946	124	48.154	4	7	0	830
3	Tumaratas	1	09.589	124	47.305	8	15	60	930
4	Tumaratas	1	08.350	124	46.812	8	15	85	1020
5	Raringis	1	08.016	124	47.925	4	7		880
6	Noongan	1	07.274	124	47.322	45	100	45	930
7	Kaayuran Atas	1	07.469	124	49.820	2	4		810
8	Kakas	1	09.730	124	53.161	20	36	290	790
9	Kaweng	1	10.618	124	54.265	15	26		805
10	Eris	1	13.304	124	55.064	15	26		800
11	Tandengan	1	13.594	124	56.109	28	53	55	820
12	Touliang Oki	1	14.922	124	56.941	18	32	50	820
13	Makalonsouw	1	16.868	124	57.298	16	29	265	770
14	Tataaran 2	1	17.006	124	52.195	10	18	130	780
15	Parepei	1	14.049	124	50.441	7	12	200	805
16	Leleko	1	14.466	124	52.234	2	4	290	750
17	Tampusu	1	15.277	124	51.230	2	4	245	930
18	Paleloan	1	15.360	124	53.322	3	5	100	800
19	Pulutan	1	12.456	124	50.561	16	29	250	750
20	kasuratan	1	14.447	124	49.736	6	11	55	900

*: direction from North in degree

Table C.3.2 (1/20) Soil Profile Description - TONSEWER

Horizon/Layer	Depth (cm)	Explanation
A	0-26	Colour: black (7.5yr32/1), Structure: Crumb, Size: very fine to fine, Texture: loamy sand, Consistency: friable to very friable, Root condition: dense
C	26-37	Buried horizon: Sandy
I	37-67	Colour: dark brown (10yr 3/3), Structure: Crumb, Size: very fine to fine, Texture: loamy sand, Consistency: friable, Root condition: lacked
II	67-96	Colour: black (10yr 7.1/1), Structure: crumb, Size: very fine to medium, Consistency: friable, Root consistency: lacked
III	More than 97	Colour: black (10yr 2/1), Structure: Crumb to blocky, Size: medium, Consistency: friable, Root consistency: lacked
This profile has two (2) parts. The first part is within 0-37 cm depth, and the second is within 37-105 cm depth. The second part developed earlier than the first part and it consists of materials from and older volcanic eruption. This part then covered by the second part which is having volcanic materials resulted from a newer volcanic eruption. Horizon A developed very slowly since it is effected by the soil cultivation.		

Table C.3.2 (2/20) Soil Profile Description - TUMARATAS-1

Horizon/Layer	Depth (cm)	Explanation
A	0-30	Colour: black (7.5yr 2/1), Structure: Crumb, Size: very fine to medium, Texture: sandy loam, Consistency: very friable to friable, Root condition: dense
C	30-49	Buried horizon: Sandy fraction
I	49-82	Colour: brownish black (10yr 2/2), Structure: Crumb, Size: very fine to fine, Texture: landy loam, Consistency: friable, Root condition: lacked
II	82-97	Colour: black (10yr 2/1), Structure: crumb, Size: very fine to fine, Consistency: friable
III	97-100	Colour: black (10yr 2/1), Structure: Crumb to blocky, Size: fine to medium, Texture: sandy loam, Consistency: friable
This profile has two (2) parts. The first part is within 0-49 cm depth, and the second is within 49-100 cm depth. The second part developed earlier than the first part and it consists of materials from and older volcanic eruption. This part then covered by the second part which is having volcanic materials resulted from a newer volcanic eruption. Horizon A developed very slowly since it is effected by the soil cultivation.		

Table C.3.2 (3/20) Soil Profile Description - TUMARATAS-2

Horizon/Layer	Depth (cm)	Explanation
I	0-13	Colour: brownish black (7.5yr 3/1), Structure: Loose to Crumb, Size: very fine to fine, Texture: loamy sand, Consistency: very friable to friable, Root condition: dense
II	13-30	Colour: dark brown (7.5yr 3/3), Structure: Loose Crumb, Size: very fine, Texture: loamy sand, Consistency: very friable, Root condition: dense
III	30-71	Colour: brownish black (10yr 2/2), Structure: crumb, Size: fine, Consistency: friable, Root condition: lacked
IV	71-100	Colour: brownish black (10yr 3/1), Structure: Crumb, Size: fine , Texture: sandy loam, Consistency: friable, Root condition: lacked
This soil have been and being cultivated just recently, and the differentiation process is taking place slowly so the A horizon not yet developed		

Table C.3.2(4/20) Soil Profile Description - TUMARATAS-3

Horizon/Layer	Depth (cm)	Explanation
A	0-29	Colour: brownish black (10yr 3/1), Structure: Loose to Crumb, Size: very fine to fine, Texture: loamy sand, Consistency: very friable
C	29-62	Buried horizon
I	62-86	Colour: greyish yellow brown (10yr 4/2), Structure: Crumb to blocky, Size: fine to medium, Texture: sandy loam, Consistency: friable
II	86-100	Colour: brownish black (10yr 2/2), Structure: crumb to blocky, Size: fine to medium, Texture: sandy loam, Consistency: friable
This profile has two (2) parts. The first part is within 0-62 cm depth, and the second is within 62-100 cm depth. The second part developed earlier than the first part and it consists of materials from and older volcanic eruption. This part then covered by the second part which is having volcanic materials resulted from a newer volcanic eruption. Horizon A developed very slowly since it is effected by the soil cultivation.		

Table C.3.2 (5/20) Soil Profile Description - RARINGIS

Horizon/Layer	Depth (cm)	Explanation
Ap	0-28	Colour: brownish black (10yr 3/1), Structure: Crumb, Size: fine, Texture: sandy loam, Consistency: very friable, Root condition: dense
AC	28-39	Colour: brownish black to black (7.5yr 2/2-2/1), Structure: Crumb to blocky, Size: fine to medium, Texture: loamy sand
C	61-76	Colour: brownish black (7.5yr 3/2), Structure: Loose to Crumb, Size: very fine to fine, Consistency: very friable to friable, Root condition: lacked
I	76-100	Colour: brownish black (75yr 3/1), Structure: Crumb to blocky, Size: fine to medium, Texure: loamy sand, Consistency: friable, Root condition: very lacked
This profile has two (2) parts. The first part is within 0-76 cm depth, and the second is within 76-100 cm depth. The second part developed earlier than the first part and it consists of materials from and older volcanic eruption. This part then covered by the second part which is having volcanic materials resulted from a newer volcanic eruption. Horizon A developed very slowly since it is effected by the soil cultivation.		

Table C.3.2 (6/20) Soil Profile Description - NOONGAN

Horizon/Layer	Depth (cm)	Explanation
C	0-14	Buried horizon; Sand
A	14-39	Colour: black (75yr 1.7/1), Structure: Crumb, Size: very fine to fine, Texture: sandy, Consistency: friable, Root condition: dense
AC	39-87	Colour: brownish black (75yr 3/1), Structure: Crumb, Size: very fine to fine, Texture: loamy sand, Consistency: friable, Root condition: lacked
C	68-87	Colour: black (75yr 3/3), Structure: Loose to crumb, Size: very fine, Texture: Loamy sandy, Consistency: very friable to friable, Root condition: lacked
I	87-118	Colour: dark brown (75yr 3/3), Structure: Crumb, Size: fine to medium, Consistency: friable, Root condition: lacked
This profile has two (3) parts. The first part is within 0-14 cm depth is the most recent layer, and the second is within 14-87 cm depth resulted from a second volcanic eruption. The layer within range from 87-118 is the oldest.		

Table C.3.2 (7/20) Soil Profile Description - KAAYURAN ATAS

Horizon/Layer	Depth (cm)	Explanation
Ap	0-13	Colour: brownish black (10 YR 2/3), Structure: Crumb, Size: very fine, Texture: sandy loam, Consistency: very friable, Root condition: dense
AB	13-26	Colour: dark brown (10YR 3/3), Structure: Crumb, Size: very fine, Texture: sandy loam, Consistency: very friable, Root condition: dense
B	26-75	Colour: dark brown to greyish yellow (10YR ¾-10YR 4/2), Structure: crumb to blocky, Size: fine to medium, Texture: Loam, Consistency: friable to firm, Root condition: lacked
BC	75-105	Colour: brown (10YR 4/4-4/6), Structure: blocky, Size: medium to coarse, Consistency: friable to firm, Root condition: -

Table C.3.2 (8/20) Soil Profile Description - KAKAS

Horizon/Layer	Depth (cm)	Explanation
A	0-15	Colour: very dark brown (7.5YR 2/3), Structure: blocky, Size: fine to medium, Texture: clay, Consistency: friable to firm, Root condition: dense
B	15-77	Colour: brownish black (75YR 4/3-4/6), Structure: blocky, Size: medium-coarse, Texture: clay, Consistency: friable to firm, Root condition: lacked
BC	77-115	Colour: brown (75YR 4/4-4/6), Structure: crumb to blocky, Size: fine to medium, Texture: clay, Consistency: friable to firm, sticky, Root condition: lacked

Table C.3.2 (9/20) Soil Profile Description - TUMPAAN KAWENG

Horizon/Layer	Depth (cm)	Explanation
Ap	0-18	Colour: brown black (7.5YR 3/1), Structure: blocky, Size: fine to medium, Texture: clay, Consistency: friable to firm, Root condition: dense
B	18-87	Colour: brownish black (75YR 3/2), Structure: blocky, Size: medium-coarse, Texture: clay, Consistency: friable to firm, Root condition: lacked
BC	77-115	Colour: dar brown to brown (75YR 3/4-4/3), Structure: blocky, Size: medium to coarse, Consistency: firm, Root condition: lacked

Table C.3.2 (10/20) Soil Profile Description - ERIS

Horizon/Layer	Depth (cm)	Explanation
A	0-7	Colour: black (7.5YR 2/1), Structure: blocky, Size: fine to medium, Consistency: friable , Root condition: dense
AB	7-33	Colour: brownish black (75YR 2/2), Structure: blocky, Size: medium-coarse, Texture: clay, Consistency: friable to firm, Root condition: lacked
B	33-105	Colour: brownish black to dark brown (75YR 3/2), Structure: blocky, Teksture: clay loam, Size: medium to coarse, Consistency: friable to firm, Root condition: lacked

Table C.3.2 (11/20) Soil Profile Description - TANDENGAN

Horizon/Layer	Depth (cm)	Explanation
Ap	0-5	Color: brownish black (7.5YR 3/2), Structure: Crumb to blocky, Size: very fine to fine, Consistency: friable, Root condition: dense
AB	5-28	Color: dark brown (7.5YR 3/3), Structure: Crumb to blocky, Size: fine–medium, Consistency: friable, Root condition: dense
B	28-78	Color: dark brown to brown (7.5YR ¾-4/3), Structure: crumb to blocky, Size: fine to medium, Consistency: friable , Root condition: lacked
BC	78-100	Color: brown (7.5YR 4/4), Structure: crumb, Size: fine to medium, Consistency: friable, Root condition: lacked of hair root

Table C.3.2 (12/20) Soil Profile Description - TOULIANG OKI

Horizon/Layer	Depth (cm)	Explanation
BA	0-5	Color: dull reddish brown (5YR 4/3), Structure: blocky, Size: mdium to coarse, Texture: clay, Consistency: firm and sticky, Root condition: lack
B	5-90	Color: dark reddish brown (7.5YR 4/4-5/6), Structure: blocky, Size: medium to coarse, Texture: clay, Consistency: friable to firm and sticky, Root condition: lack
BC	90-104	Color: bright reddish brown (5YR 5/6), Structure: blocky, Size: medium to coarse, Texture: clay, Consistency: friable to firm, Root condition: lack

Table C.3.2 (13/20) Soil Profile Description - MAKALONSOUW

Horizon/Layer	Depth (cm)	Explanation
A	0-20	Color: brownish black to dark brown (7.5YR 3/2), Structure: blocky, Size: fine to medium, Consistency: firm and firm, Root condition: dense
BA	20-46	Color: brown (7.5YR 4/3), Structure: crumb-blocky, Size: fine-medium , Consistency: friable , Root condition: dense
B	46-109	Color: brown (7.5YR 4/4), Structure: crumb, Size: fine to medium, Consistency: friable, Root condition: lack

Table C.3.2 (14/20) Soil Profile Description - TATAARAN

Horizon/Layer	Depth (cm)	Explanation
A	0-6	Color: brownish black (10YR 3/1), Structure: Crumb to blocky, Size: very fine to fine, Texture: clay, Consistency: friable, Root condition: dense
AB	6-33	Color: brownish black (10YR 3/1), Structure: blocky, Size: medium to coarse, Texture: clay, Consistency: friable to firm, Root condition: dense
B	33-90	Color: brownish black to dark brown (10YR 3/2), Structure: crumb to blocky, Size: medium to coarse, Texture: clay, Consistency: friable to firm, Root condition: lack
C	90-110	Color: dull yellowish brown (10YR 4/3), Structure: gravel, Size: caorse, Consistency: sticky, Root condition: lack

Table C.3.2 (15/20) Soil Profile Description - PAREPEI

Horizon/Layer	Depth (cm)	Explanation
Ap	0-10	Color: brownish black (7.5YR 3/2), Structure: Crumb to blocky, Size: fine to medium, Texture: clay loam, Consistency: friable, Root condition: dense
BA	10-31	Color: dark brown (7.5YR 3/3), Structure: crum to blocky, Size: medium, Texture: clay, Consistency: friable to firm, sticky, Root condition: lack
B	31-86	Color: brownish black to dark brown (10YR 3/2), Structure: crumb to blocky, Size: medium to coarse, Texture: clay, Consistency: friable to firm, Root condition: lack
BC	86-102	Color: dark brown (7.5YR 3/4), Structure: blocky, Size: fine to medium, Consistency: firm and sticky, Root condition: lack

Table C.3.2 (16/20) Soil Profile Description - LELEKO-REMBOKEN

Horizon/Layer	Depth (cm)	Explanation
Ap	0-10	Color: very dark brown (7.5YR 2/3), Structure: Crumb, Size: fine to medium, Consistency: friable, Root condition: dense
AB	10-30	Color: brownish (7.5YR 3/2), Structure: Crumb to blocky, Texture: silty clay loam, Size: fine to medium, Consistency: friable to firm, Root condition: dense
B	30-100	Color: dark brown (7.5YR 3/3–3/4), Structure: crumb to blocky, Size: fine to medium, Texture: silty clay, Consistency: friable , Root condition: lack

Table C.3.2 (17/20) Soil Profile Description - TAMPUSU

Horizon/Layer	Depth (cm)	Explanation
Ap	0-19	Color: brownish black (7.5YR 3/2), Structure: Crumb to blocky, Size: fine to medium, Consistency: friable, Root condition: dense
AB	19-30	Color: dark brown (7.5YR 3/3), Structure: blocky, Size: medium to coarse, Consistency: firm and sticky, Root condition: fair
B	30-84	Color: brown (7.5YR 4/3 – 4/4), Structure: blocky, Size: medium to coarse, Consistency: firm and sticky, Root condition: lack
CB	84-107	Color: bright brown (7.5YR 5/6), Structure: blocky to crumb, Size: medium, Consistency: sticky, Root condition: lack

Table C.3.2 (18/20) Soil Profile Description - PALELOAN

Horizon/Layer	Depth (cm)	Explanation
A	0-19	Color: brownish black (7.5YR 2/2), Structure: Crumb to blocky, Size: fine to medium, Consistency: friable, Root condition: dense
AB	19-51	Color: dark brown (7.5YR 3/3), Structure: blocky, Size: fine to medium, Consistency: friable to firm, Root condition: fair
B	51-101	Color: dark brown (7.5YR 4/3), Structure: blocky, Size: fine medium, Consistency: friable to firm, Root condition: lack

Table C.3.2 (19/20) Soil Profile Description - PULUTAN

Horizon/Layer	Depth (cm)	Explanation
Ap	0-9	Color: brownish black (7.5YR 2/2), Structure: Crumb to blocky, Size: fine to medium, Consistency: friable, Root condition: dense
AB	9-22	Color: very dark brown (7.5YR 2/3), Structure: crumb to blocky, Size: fine to medium, Consistency: friable, Root condition: dense
B	22-94	Color: dark brown (7.5YR 3/3), Structure: crumb to blocky, Size: fine to medium, Texture: clay loam, Consistency: friable and sticky , Root condition: fair
BC	94-112	Color: dark brown (7.5YR 3/4), Structure: crumb to blocky, Size: fine to medium, Consistency: very sticky, Root condition: few

Table C.3.2 (20/20) Soil Profile Description - KASURATAN

Horizon/Layer	Depth (cm)	Explanation
Ap	0-17	Color: very dark brown (7.5YR 2/3), Structure: blocky to crumb, Size: fine to medium, Texture: clay loam, Consistency: friable to firm, Root condition: dense
AB	17-35	Color: brownish black (7.5YR 3/2), Structure: crumb to blocky, Size: fine to medium, Consistency: friable, Root condition: dense
B	35-92	Color: dark brown (7.5YR 3/3-3/4), Structure: crumb to blocky, Size: medium, Texture: clay, Consistency: friable to firm, Root condition: fair
BC	94-112	Color: brown (7.5YR 4/3), Structure: blocky to crumb, Size: fine to medium, Consistency: firm and sticky, Root condition: lack

Table C.3.3 (1/20) Soil Infiltration Rate - TONSEWER

Date: Thursday, 11 October 2000			Tested by: Verry Warouw		
Liquid Used: rain/well water pH: 6.9			Depth to groundwater table (m): 10-15 m		
Penetration of rings	Inner (cm): 5		Outer(cm): 5		
Liquid level maintained using : [ ] Flow valve; [ ] Float valve; [ ] Mariotte tube					
Constants	Area (cm2)	Depth of liquid (cm)	Liquid Displacement (cm)	Liquid Containers	
				No.	Vol./dH (cm3/cm)
Inner ring:	706.85	19	2		
Annular space:	2463.00	19	2		
Observation No.	Time (min)	Infiltration Rate (mm/hr)	Remarks		
1	1:46	822	Slope: 5 – 6 % Alt: +/- 815 m Cloudy, some rain Vegetations: Peanuts, Bananas, Clove, Maize and Grass Cultivated (harvested)		
2	2:01	597			
3	2:18	550.2			
4	2:31	519.6			
5	2:42	498			
6	2:50	480			
7	3:32	361.2			
8	4:13	290.4			
9	4:18	286.8			
10	4:28	280.2			
11	4:31	278.4			
12	5:05	237.6			
13	5:08	236.2			
14	5:08	236.2			
15	5:08	236.2 Constant			

Table C.3.3 (2/20) Soil Infiltration Rate - TUMARATAS-1

Date: Thursday, 11 October 2000			Tested by: Verry Warouw		
Liquid Used: spring water pH: 6.56			Depth to groundwater table (m): +/- 10m		
Penetration of rings	Inner (cm): 4		Outer(cm): 4		
Liquid level maintained using : [ ] Flow valve; [ ] Float valve; [ ] Mariotte tube					
Constants	Area (cm2)	Depth of liquid (cm)	Liquid Displacement (cm)	Liquid Containers	
				No.	Vol./dH (cm2/cm)
Inner ring:	706.85	19	2		
Annular space:	2463.00	19	2		
Observation No.	Time (min)	Infiltration Rate (mm/hr)	Remarks		
1	2.20	546	Cloudy Alt.: 830m Slope: 2-3% Vegetations: Cultivation (harvested)		
2	2.28	526.2			
3	2.30	522			
4	2.36	508.2			
5	2.37	506.4			
6	2.38	504			
7	2.40	499.8			
8	2.43	493.8			
9	2.45	489.6			
10	2.46	487.8			
11	2.47	485.4			
12	2.48	483.6			
13	2.50	480			
14	2.50	480			
15	2.50	480 Constant			

Table C.3.3 (3/20) Soil Infiltration Rate - TUMARATAS-2

Date: Thursday, 12 October 2000			Tested by: Verry Warouw		
Liquid Used: spring water pH: 6.8			Depth to groundwater table (m): 13-15 m		
Penetration of rings	Inner (cm): 6		Outer(cm): 6		
Liquid level maintained using : [ ] Flow valve; [ ] Float valve; [ ] Mariotte tube					
Constants	Area (cm2)	Depth of liquid (cm)	Liquid Displa-cement (cm)	Liquid Containers	
				No.	Vol./dH (cm2/cm)
Inner ring:	706.85	18	2		
Annular space:	2463.00	18	2		
Observation No.	Time (min)	Infiltration Rate (mm/hr)	Remarks		
1	2.56	468.6	Cloudy Slope: 8 deg Alt.: 930m Vegetations: Grass/shrub Harvested		
2	3.07	390.6			
3	3.08	389.4			
4	3.11	385.8			
5	3.29	364.8			
6	3.38	354.6			
7	3.50	342.6			
8	4.06	295.2			
9	4.09	293.4			
10	4.15	289.2			
11	4.30	279			
12	4.32	277.8			
13	4.35	276			
14	4.35	276			
15	4.35	276 constant			

Table C.3.3 (4/20) Soil Infiltration Rate - TUMARATAS-3

Date: Thursday, 12 October 2000			Tested by: Verry Warouw		
Liquid Used: spring water pH: 6.8			Depth to groundwater table (m): 15 m		
Penetration of rings	Inner (cm): 5		Outer(cm): 5		
Liquid level maintained using : [ ] Flow valve; [ ] Float valve; [ ] Mariotte tube					
Constants	Area (cm2)	Depth of liquid (cm)	Liquid Displacement (cm)	Liquid Containers	
				No.	Vol./dH (cm2/cm)
Inner ring:	Same above	19	2		
Annular space:	Same above	19	2		
Observation No.	Time (min)	Infiltration Rate (mm/hr)	Remarks		
1	1.38	869.4	Cloudy Alt.: 1020m Slope: 8 deg east direction Vegetations: Bananas, Maize and Grass Harvested		
2	1.51	794.4			
3	1.59	754.8			
4	2.01	597			
5	2.05	585			
6	2.08	576.6			
7	2.14	560.4			
8	2.17	552.6			
9	2.19	547.8			
10	2.20	546			
11	2.21	543			
12	2.24	535.8			
13	2.25	532.8			
14	2.25	532.8			
15	2.25	532.8 Constant			

Table C.3.3 (5/20) Soil Infiltration Rate - RARINGIS

Date: Thursday, 13 October 2000			Tested by: Verry Warouw		
Liquid Used: spring water pH: 6.9			Depth to groundwater table (m): 15-20 m		
Penetration of rings	Inner (cm): 6		Outer(cm): 5		
Liquid level maintained using : [ ] Flow valve; [ ] Float valve; [ ] Mariotte tube					
Constants	Area (cm2)	Depth of liquid (cm)	Liquid Displacement (cm)	Liquid Containers	
				No.	Vol./dH (cm2/cm)
Inner ring:		19	2		
Annular space:		19	2		
Observation No.	Time (min)	Infiltration Rate (mm/hr)	Remarks		
1	1.20	1000	Cloudy Alt.: 880m Slope: 35 deg Vegetations: Tomatoes, Peanuts, Bananas, Onion, Maize and Grass Plow		
2	1.24	967.7			
3	1.27	944.8			
4	1.31	916			
5	1.33	902.2			
6	1.34	895.5			
7	1.35	888.8			
8	1.36	882.3			
9	1.38	869.5			
10	1.39	963.3			
11	1.40	857.1			
12	1.41	851			
13	1.42	845.1			
14	1.42	845.1			
15	1.42	845.1 Constant			

Table C.3.3 (6/20) Soil Infiltration Rate - NOONGAN

Date: Thursday, 13 October 2000			Tested by: Verry Warouw		
Liquid Used: spring water pH: 6.8			Depth to groundwater table (m):		
Penetration of rings	Inner (cm): 8		Outer(cm): 8		
Liquid level maintained using : [ ] Flow valve; [ ] Float valve; [ ] Mariotte tube					
Constants	Area (cm2)	Depth of liquid (cm)	Liquid Displacement (cm)	Liquid Containers	
				No.	Vol./dH (cm2/cm)
Inner ring:		15	2		
Annular space:		15	2		
Observation No.	Time (min)	Infiltration Rate (mm/hr)	Remarks		
1	0.48	2499.6	Cloudy Alt.: 930m Slope 45 deg. Vegetations: Secondary forest Woods/Forest		
2	0.58	2068.8			
3	0.59	2033.4			
4	1.01	1188			
5	1.04	1153.8			
6	1.10	1090.8			
7	1.11	1080.6			
8	1.12	1071			
9	1.14	1052.4			
10	1.17	1025.4			
11	1.19	1008			
12	1.20	999.6			
13	1.21	991.7			
14	1.21	991.7			
15	1.21	991.7 Constant			

Table C.3.3 (7/20) Soil Infiltration Rate - KAAYURAN ATAS

Date: Thursday, 16 October 2000			Tested by: Verry Warouw		
Liquid Used: well water		pH: 6.85	Depth to groundwater table (m): 5-7 m		
Penetration of rings		Inner (cm): 5	Outer(cm): 5		
Liquid level maintained using : [ ] Flow valve; [ ] Float valve; [ ] Mariotte tube					
Constants	Area (cm2)	Depth of liquid (cm)	Liquid Displacement (cm)	Liquid Containers	
				No.	Vol./dH (cm2/cm)
Inner ring:		19	2		
Annular space:		19	2		
Observation No.	Time (min)	Infiltration Rate (mm/hr)	Remarks		
1	1.45	827.4	Cloudy Alt.: 810 Slope: 2 deg Vegetations: Mahoni, Cempaka,Bananas and Grass Woods		
2	1.56	769.2			
3	2.18	550.2			
4	2.31	519.6			
5	2.40	499.8			
6	2.50	480			
7	2.55	470.4			
8	2.58	465			
9	2.59	463.2			
10	3.04	394.8			
11	3.06	391.8			
12	3.16	379.2			
13	3.17	378.5			
14	3.17	378.5			
15	3.17	378.5 Constant			

Table C.3.3 (8/20) Soil Infiltration Rate - KAKAS

Date: Thursday, 16 October 2000			Tested by: Verry Warouw		
Liquid Used: river water		pH: 6.75	Depth to groundwater table (m):		
Penetration of rings		Inner (cm): 5	Outer(cm): 5		
Liquid level maintained using : [ ] Flow valve; [ ] Float valve; [ ] Mariotte tube					
Constants	Area (cm2)	Depth of liquid (cm)	Liquid Displacement (cm)	Liquid Containers	
				No.	Vol./dH (cm2/cm)
Inner ring:		19	2		
Annular space:		19	2		
Observation No.	Time (min)	Infiltration Rate (mm/hr)	Remarks		
1	3.14	382.2	Raining Slope: 20 deg Alt.: 790m Vegetations: Kayumanis, Clove, woods, maize and grass		
2	3.39	354			
3	3.50	342.6			
4	5.20	230.4			
5	5.32	225.6			
6	5.41	221.4			
7	5.50	217.8			
8	5.58	214.8			
9	6.02	199.2			
10	6.45	186			
11	7.18	166.8			
12	7.45	160.8			
13	7.49	160.2			
14	7.49	160.2			
15	7.49	160.2 Constant			

Table C.3.3 (9/20) Soil Infiltration Rate - TUMPAAN KAWENG

Date: Thursday, 16 October 2000			Tested by: Verry Warouw		
Liquid Used: spring water pH: 6.85			Depth to groundwater table (m):		
Penetration of rings	Inner (cm): 5		Outer(cm): 5		
Liquid level maintained using : [ ] Flow valve; [ ] Float valve; [ ] Mariotte tube					
Constants	Area (cm2)	Depth of liquid (cm)	Liquid Displacement (cm)	Liquid Containers	
				No.	Vol./dH (cm2/cm)
Inner ring:		19	2		
Annular space:		19	2		
Observation No.	Time (min)	Infiltration Rate (mm/hr)	Remarks		
1	1.02	1176	Clear Alt.:805 Vegetations: Red Pea, Bananas, Clove, Maize, Papaya and Grass Caultivation (growing)		
2	1.05	1142.4			
3	1.07	1122			
4	1.08	1111.2			
5	1.09	1101			
6	1.10	1090.8			
7	1.11	1080.6			
8	1.12	1071			
9	1.13	1062			
10	1.15	1044			
11	1.16	1034.4			
12	1.16	1034.4			
13	1.16	1034.4			
14	1.16	1034.4			
15	1.16	1034.4 Constant			

Table C.3.3 (10/20) Soil Infiltration Rate - ERIS

Date: Thursday, 18 October 2000			Tested by: Verry Warouw		
Liquid Used: river water pH: 6.8			Depth to groundwater table (m):		
Penetration of rings	Inner (cm): 5		Outer(cm): 5		
Liquid level maintained using : [ ] Flow valve; [ ] Float valve; [ ] Mariotte tube					
Constants	Area (cm2)	Depth of liquid (cm)	Liquid Displacement (cm)	Liquid Containers	
				No.	Vol./dH (cm2/cm)
Inner ring:		19	2		
Annular space:		19	2		
Observation No.	Time (min)	Infiltration Rate (mm/hr)	Remarks		
1	1.13	1062	Cloudy/rain Slope: 19 deg Vegetations: Bamboo, Clove, Durian, and Alang-Alang (grass) Harvested / left		
2	1.27	945			
3	1.30	922.8			
4	1.32	909			
5	1.35	888.6			
6	1.37	876			
7	1.42	844.8			
8	1.45	827.4			
9	1.47	816			
10	1.48	810.6			
11	1.49	805.2			
12	1.50	799.8			
13	1.51	794.4			
14	1.51	794.4			
15	1.51	794.4 Constant			

Table C.3.3 (11/20) Soil Infiltration Rate - TANDENGAN

Date: Thursday, 19 October 2000			Tested by: Verry Warouw		
Liquid Used: Lake water		pH: 6.1	Depth to groundwater table (m):		
Penetration of rings		Inner (cm): 6	Outer(cm): 6.1		
Liquid level maintained using : [ ] Flow valve; [ ] Float valve; [ ] Mariotte tube					
Constants	Area (cm2)	Depth of liquid (cm)	Liquid Displacement (cm)	Liquid Containers	
				No.	Vol./dH (cm2/cm)
Inner ring:		18	2		
Annular space:		18	2		
Observation No.	Time (min)	Infiltration Rate (mm/hr)	Remarks		
1	2.23	537.6	Cloudy Alt.: 820m Slope: 28 deg Vegetations: Mainly Clove, coconut and Grass		
2	2.58	465			
3	3.23	371.4			
4	3.45	347.4			
5	4.03	297.6			
6	4.35	275.4			
7	4.51	265.8			
8	5.03	238.2			
9	5.35	224.4			
10	6.04	198.6			
11	6.08	196.8			
12	6.15	195			
13	6.53	183.6			
14	6.53	183.6			
15	6.53	183.6 Constant			

Table C.3.3 (12/20) Soil Infiltration Rate - TOULIANG OKI

Date: Thursday, 19 October 2000			Tested by: Verry Warouw		
Liquid Used: spring water		pH: 6.1	Depth to groundwater table (m):		
Penetration of rings		Inner (cm): 5	Outer(cm): 5		
Liquid level maintained using : [ ] Flow valve; [ ] Float valve; [ ] Mariotte tube					
Constants	Area (cm2)	Depth of liquid (cm)	Liquid Displacement (cm)	Liquid Containers	
				No.	Vol./dH (cm2/cm)
Inner ring:		19	2		
Annular space:		19	2		
Observation No.	Time (min)	Infiltration Rate (mm/hr)	Remarks		
1	3:15	381	Clear Alt.: 820 m Slope: 18-20 deg Vegetations: Guajava, Bananas, Clove, Coconut and Grass Cultivation		
2	3:34	360			
3	3:42	350.4			
4	4:45	270			
5	5:35	224.4			
6	6:23	192.6			
7	7:40	162			
8	8:05	150			
9	8:07	148.8			
10	8:50	141			
11	10:34	115.8			
12	11:20	108			
13	11:21	107			
14	11:21	107			
15	11:21	107 Constant			

Table C.3.3 (13/20) Soil Infiltration Rate - MAKALONSOW

Date: Thursday, 20 October 2000			Tested by: Verry Warouw		
Liquid Used: river water pH: 5.9			Depth to groundwater table (m):		
Penetration of rings	Inner (cm): 5		Outer(cm): 5		
Liquid level maintained using : [ ] Flow valve; [ ] Float valve; [ ] Mariotte tube					
Constants	Area (cm2)	Depth of liquid (cm)	Liquid Displacement (cm)	Liquid Containers	
				No.	Vol./dH (cm2/cm)
Inner ring:		19	2		
Annular space:		19	2		
Observation No.	Time (min)	Infiltration Rate (mm/hr)	Remarks		
1	5.15	233	Hot and clear Alt.: 770m Slope: 16 deg Vegetations: Bananas, Clove, and Grassland		
2	5.22	229.8			
3	5.40	222			
4	6.02	199.3			
5	6.18	194.1			
6	6.35	188.9			
7	7.02	170.9			
8	7.22	166.2			
9	7.51	159.7			
10	7.54	159			
11	8.34	143.8			
12	8.35	143.7			
13	8.36	143.5			
14	8.36	143.5			
15	8.36	143.5 Constant			

Table C.3.3 (14/20) Soil Infiltration Rate - TATAARAN

Date: Thursday, 20 October 2000			Tested by: Verry Warouw		
Liquid Used: spring water pH: 5.8			Depth to groundwater table (m):		
Penetration of rings	Inner (cm): 5		Outer(cm): 5		
Liquid level maintained using : [ ] Flow valve; [ ] Float valve; [ ] Mariotte tube					
Constants	Area (cm2)	Depth of liquid (cm)	Liquid Displacement (cm)	Liquid Containers	
				No.	Vol./dH (cm2/cm)
Inner ring:		19	2		
Annular space:		19	2		
Observation No.	Time (min)	Infiltration Rate (mm/hr)	Remarks		
1	5.02	239	Raining Slope: 10 deg Alt.: 780m Vegetations: Bamboo, Coconut, Bananas, Clove, and Grass		
2	5.11	234.8			
3	5.20	230.7			
4	5.30	226.4			
5	5.38	223			
6	5.43	221			
7	5.58	215			
8	6.08	197.4			
9	6.10	196.7			
10	6.13	195.7			
11	6.17	194.5			
12	6.18	194.2			
13	6.19	193.8			
14	6.19	193.8			
15	6.19	193.8 Constant			

Table C.3.3 (15/20) Soil Infiltration Rate - PAREPEI

Date: Thursday, 23 October 2000			Tested by: Verry Warouw		
Liquid Used: well water	pH: 6.2		Depth to groundwater table (m):		
Penetration of rings	Inner (cm): 5		Outer(cm): 5		
Liquid level maintained using : [ ] Flow valve; [ ] Float valve; [ ] Mariotte tube					
Constants	Area (cm2)	Depth of liquid (cm)	Liquid Displ cement (cm)	Liquid Containers	
				No.	Vol./dH (cm2/cm)
Inner ring:		20	2		
Annular space:		20	2		
Observation No.	Time (min)	Infiltration Rate (mm/hr)	Remarks		
1	3.03	396	Cloudy, after rain Alt.: 805m Slope: 7 deg Vegetations: Papaya, Maize,Coconut, Bananas, Clove, and Grass Pasture (grassland)		
2	3.25	369			
3	3.43	349.8			
4	3.45	348			
5	4.15	289.2			
6	4.18	286.8			
7	4.33	277.2			
8	4.58	261.6			
9	5.11	234.6			
10	5.21	230.4			
11	5.23	229.2			
12	5.27	228			
13	5.29	226.8			
14	5.29	226.8			
15	5.29	226.8 Constant			

Table C.3.3 (16/20) Soil Infiltration Rate - LELEKO-REMBOKEN

Date: Thursday, 23 October 2000			Tested by: Verry Warouw		
Liquid Used: spring water	pH: 6.2		Depth to groundwater table (m):		
Penetration of rings	Inner (cm): 6		Outer(cm): 6		
Liquid level maintained using : [ ] Flow valve; [ ] Float valve; [ ] Mariotte tube					
Constants	Area (cm2)	Depth of liquid (cm)	Liquid Displacement (cm)	Liquid Containers	
				No.	Vol./dH (cm2/cm)
Inner ring:		18	2		
Annular space:		18	2		
Observation No.	Time (min)	Infiltration Rate (mm/hr)	Remarks		
1	5.25	114.3	Cloudy, just after a rain Alt.: 750m Slope: 2 deg Vegetations: Bananas, Maize.Bamboo,Palm, Clove, and Pasture (Grassland)		
2	5.37	111.7			
3	5.50	109.1			
4	5.58	107.5			
5	6.11	98.2			
6	6.31	95.1			
7	6.47	92.7			
8	6.50	92.3			
9	7.38	81.3			
10	9.23	65			
11	9.28	64.6			
12	9.33	64.3			
13	9.34	64.2			
14	9.34	64.2			
15	9.34	64.2 Constant			

Table C.3.3 (17/20) Soil Infiltration Rate - TAMPUSU

Date: Thursday, 25 October 2000			Tested by: Verry Warouw		
Liquid Used: spring water pH: 6.6			Depth to groundwater table (m):		
Penetration of rings	Inner (cm): 8		Outer(cm): 8		
Liquid level maintained using : [ ] Flow valve; [ ] Float valve; [ ] Mariotte tube					
Constants	Area (cm2)	Depth of liquid (cm)	Liquid Displacement (cm)	Liquid Containers	
				No.	Vol./dH (cm2/cm)
Inner ring:		16	2		
Annular space:		16	2		
Observation No.	Time (min)	Infiltration Rate (mm/hr)	Remarks		
1	22.10	27.10	Clear, rain the day before Alt.: 920-930m Slope: 2 deg Vegetations: Maize, Kayumanis, Bananas, Clove, and Grass Plow		
2	23.31	25.70			
3	23.46	25.50			
4	24.40	24.60			
5	24.43	24.55			
6	24.44	24.54			
7	24.45	24.53			
8	24.46	24.52			
9	24.46	24.52			
10	24.46	24.52 Constant			

Table C.3.3 (18/20) Soil Infiltration Rate - PALELOAN

Date: Thursday, 25 October 2000			Tested by: Verry Warouw		
Liquid Used: river water pH: 6.5			Depth to groundwater table (m):		
Penetration of rings	Inner (cm): 5		Outer(cm): 5		
Liquid level maintained using : [ ] Flow valve; [ ] Float valve; [ ] Mariotte tube					
Constants	Area (cm2)	Depth of liquid (cm)	Liquid Displacement (cm)	Liquid Containers	
				No.	Vol./dH (cm2/cm)
Inner ring:		20	2		
Annular space:		20	2		
Observation No.	Time (min)	Infiltration Rate (mm/hr)	Remarks		
1	2.11	568.8	Heavy rain Alt.: 800m Slope: 3 deg Vegetations: Papaya, Mango, Bananas, Clove, Maize, and Pasture (Grassland)		
2	2.18	550.2			
3	2.23	538.2			
4	2.35	510.6			
5	2.43	493.8			
6	2.51	480.6			
7	2.52	477.6			
8	3.01	398.4			
9	3.11	385.8			
10	3.18	377.4			
11	3.19	376.2			
12	3.19	376.2			
13	3.20	375			
14	3.20	375			
15	3.20	375 Constant			

Table C.3.3 (19/20) Soil Infiltration Rate - PULUTAN

Date: Thursday, 26 October 2000			Tested by: Verry Warouw		
Liquid Used: river water pH: 6.3			Depth to groundwater table (m):		
Penetration of rings	Inner (cm): 6		Outer(cm): 6		
Liquid level maintained using : [ ] Flow valve; [ ] Float valve; [ ] Mariotte tube					
Constants	Area (cm2)	Depth of liquid (cm)	Liquid Displacement (cm)	Liquid Containers	
				No.	Vol./dH (cm2/cm)
Inner ring:		18	2		
Annular space:		18	2		
Observation No.	Time (min)	Infiltration Rate (mm/hr)	Remarks		
1	2.08	576.6	Cloudy Alt.: 750m Slope: 16 deg Vegetations: Kaliandra, Bamboo, Maize, Bananas, Clove, and Grass Natural slope Woods		
2	2.19	547.8			
3	2.25	532.8			
4	2.33	514.8			
5	2.39	501.6			
6	2.40	499.8			
7	2.43	493.8			
8	2.45	489.6			
9	2.50	480			
10	2.52	475.8			
11	3.15	381			
12	3.17	378.6			
13	3.18	377.4			
14	3.18	377.4			
15	3.18	377.4 Constant			

Table C.3.3 (20/20) Soil Infiltration Rate - KASURATAN

Date: Thursday, 26 October 2000			Tested by: Verry Warouw		
Liquid Used: well waterpH: 6.4			Depth to groundwater table (m):		
Penetration of rings	Inner (cm): 4		Outer(cm): 4		
Liquid level maintained using : [ ] Flow valve; [ ] Float valve; [ ] Mariotte tube					
Constants	Area (cm2)	Depth of liquid (cm)	Liquid Displacement (cm)	Liquid Containers	
				No.	Vol./dH (cm2/cm)
Inner ring:		20	2		
Annular space:		20	2		
Observation No.	Time (min)	Infiltration Rate (mm/hr)	Remarks		
1	3.15	381	Cloudy Alt.: 900m Slope: 6 deg Vegetations: Peanut, Maize, Bananas, Clove, and Grass Plow		
2	3.34	360			
3	3.42	350.4			
4	4.45	270			
5	5.35	224.4			
6	6.23	192.6			
7	7.40	162			
8	8.05	150			
9	8.07	148.8			
10	8.50	141			
11	10.34	115.8			
12	11.20	108			
13	11.21	107			
14	11.21	107			
15	11.21	107 Constant			

Table C.3.4 (1/20) Physical Properties of Soil (Top layer) - TONSEWER

Item	Unit	Value	Note
1) Percent modified silt (0.002-0.1mm)	%	9.20	
2) Percent modified sand (0.1-2.0mm)	%	80.6	Sandy
3) Percent organic matter	%	2.32	Low
4) Code of classes for structure	-	4*[1)], CRUMB	
5) Permeability (basic intake rate)	cm/hour	5.91	Medium
6) Bulk Density	g/cm^3	1.42	
7) Specific gravity	g/cm^3	2.65	
8) Porosity	%	46.4	
9) Moisture content	%	21.5	
10) Plasticity Index	%	8.27	Low

Table C.3.4 (2/20) Physical Properties of Soil (Top layer) - TUMARATAS-1

Item	Unit	Value	Note
1) Percent modified silt	%	19.10	
2) Percent modified sand	%	71.82	Sandy
3) Percent organic matter	%	2.85	Medium
4) Code of classes for structure	-	4*[1)], CRUMB	
5) Permeability	cm/hour	2.01	Medium
6) Bulk Density	g/cm^3	1.36	
7) Specific gravity	g/cm^3	2.65	
8) Porosity	%	48.6	
9) Moisture content	%	23.9	
10) Plasticity Index	%	9.84	Low

Table C.3.4 (3/20) Physical Properties of Soil (Top layer) - TUMARATAS-2

Item	Unit	Value	Note
1) Percent modified silt	%	13.30	
2) Percent modified sand	%	79.06	Sandy
3) Percent organic matter	%	2.46	Low
4) Code of classes for structure	-	4*[1)], LOOSE-CRUMB	
5) Permeability (Basic Intake rate	cm/hour	2.78	Medium
6) Bulk Density	g/cm^3	1.40	
7) Specific gravity	g/cm^3	2.65	
8) Porosity	%	47.1	
9) Moisture content	%	21.4	
10) Plasticity Index	%	10.00	Low

*[1)]: *1-very fine granular, 2-fine granular, 3-coarse granular, 4-blocky, platy, or massive, (from the Soil Survey Manual, USDA 1951)*

Table C.3.4 (4/20) Physical Properties of Soil (Top layer) - TUMARATAS-3

Item	Unit	Value	Note
1) Percent modified silt	%	10.82	
2) Percent modified sand	%	80.42	Sandy
3) Percent organic matter	%	2.74	Medium
4) Code of classes for structure	-	4*[1)], LOOSE-CRUMB	
5) Permeability	cm/hour	2.23	Medium
6) Bulk Density	g/cm^3	1.41	
7) Specific gravity	g/cm^3	2.65	
8) Porosity	%	46.7	
9) Moisture content	%	21.6	
10) Plasticity Index	%	7.81	Low

Table C.3.4 (5/20) Physical Properties of Soil (Top layer) - RARINGIS

Item	Unit	Value	Note
1) Percent modified silt	%	13.68	
2) Percent modified sand	%	78.00	Sandy
3) Percent organic matter	%	2.05	Low
4) Code of classes for structure	-	4*[1)], CRUMB	
5) Permeability	cm/hour	2.44	Medium
6) Bulk Density	g/cm^3	1.44	
7) Specific gravity	g/cm^3	2.65	
8) Porosity	%	45.6	
9) Moisture content	%	20.3	
10) Plasticity Index	%	9.18	Low

Table C.3.4 (6/20) Physical Properties of Soil (Top layer) - NOONGAN

Item	Unit	Value	Note
1) Percent modified silt	%	12.52	
2) Percent modified sand	%	78.24	Sandy
3) Percent organic matter	%	1.77	Low
4) Code of classes for structure	-	3*[1)], LOOSE-CRUMB	
5) Permeability	cm/hour	14.81	High
6) Bulk Density	g/cm^3	1.53	
7) Specific gravity	g/cm^3	2.65	
8) Porosity	%	42.2	
9) Moisture content	%	20.1	
10) Plasticity Index	%	7.45	Low

*[1)]: *1-very fine granular, 2-fine granular, 3-coarse granular, 4-blocky, platy, or massive, (from the Soil Survey Manual, USDA 1951)*

Table C.3.4 (7/20) Physical Properties of Soil (Top layer) - KAAYURAN ATAS

Item	Unit	Value	Note
1) Percent modified silt	%	18.80	
2) Percent modified sand	%	71.72	Sandy
3) Percent organic matter	%	3.60	Medium
4) Code of classes for structure	-	4*[1)], CRUMB	
5) Permeability	cm/hour	2.36	Medium
6) Bulk Density	g/cm^3	1.34	
7) Specific gravity	g/cm^3	2.65	
8) Porosity	%	49.4	
9) Moisture content	%	29.0	
10) Plasticity Index	%	10.83	Medium

Table C.3.4 (8/20) Physical Properties of Soil (Top layer) – KAKAS

Item	Unit	Value	Note
1) Percent modified silt	%	27.90	
2) Percent modified sand	%	19.98	
3) Percent organic matter	%	3.83	High
4) Code of classes for structure	-	4*[1)], BLOCKY	
5) Permeability	cm/hour	1.02	Medium-Low
6) Bulk Density	g/cm^3	1.14	
7) Specific gravity	g/cm^3	2.65	
8) Porosity	%	56.9	
9) Moisture content	%	36.4	
10) Plasticity Index	%	20.39	High

Table C.3.4 (9/20) Physical Properties of Soil (Top layer) - TUMPAAN KAWENG

Item	Unit	Value	Note
1) Percent modified silt	%	35.04	
2) Percent modified sand	%	13.32	
3) Percent organic matter	%	3.96	Medium
4) Code of classes for structure	-	4*[1)], BLOCKY	
5) Permeability	cm/hour	0.96	Medium-Low
6) Bulk Density	g/cm^3	1.12	
7) Specific gravity	g/cm^3	2.65	
8) Porosity	%	57.7	
9) Moisture content	%	33.0	
10) Plasticity Index	%	18.25	Medium

*[1)]: *1-very fine granular, 2-fine granular, 3-coarse granular, 4-blocky, platy, or massive, (from the Soil Survey Manual, USDA 1951)*

Table C.3.4 (10/20) Physical Properties of Soil (Top layer) - ERIS

Item	Unit	Value	Note
1) Percent modified silt	%	28.74	
2) Percent modified sand	%	9.86	
3) Percent organic matter	%	3.01	Medium
4) Code of classes for structure	-	4*[1)], BLOCKY	
5) Permeability	cm/hour	0.62	Medium-Low
6) Bulk Density	g/cm^3	1.06	
7) Specific gravity	g/cm^3	2.65	
8) Porosity	%	60.0	
9) Moisture content	%	37.2	
10) Plasticity Index	%	19.25	Medium

Table C.3.4 (11/20) Physical Properties of Soil (Top layer) - TANDENGAN

Item	Unit	Value	Note
1) Percent modified silt	%	16.74	
2) Percent modified sand	%	12.58	
3) Percent organic matter	%	4.375	High
4) Code of classes for structure	-	4*[1)], CRUMB-BLOCKY	
5) Permeability	cm/hour	2.00	Medium
6) Bulk density	g/cm^3	1.05	
7) Specific gravity	g/cm^3	2.65	
8) Porosity	%	60.3	
9) Moisture content	%	39.5	
10) Plasticity Index	%	18.59	Medium

Table C.3.4 (12/20) Physical Properties of Soil (Top layer) - TOULIANG OKI

Item	Unit	Value	Note
1) Percent modified silt	%	15.18	
2) Percent modified sand	%	21.70	
3) Percent organic matter	%	1.98	Low
4) Code of classes for structure	-	4*[1)], BLOCKY	
5) Permeability	cm/hour	0.26	Low
6) Bulk Density	g/cm^3	1.03	
7) Specific gravity	g/cm^3	2.65	
8) Porosity	%	61.1	
9) Moisture content	%	38.5	
10) Plasticity Index	%	28.97	High

*[1)]: *1-very fine granular, 2-fine granular, 3-coarse granular, 4-blocky, platy, or massive, (from the Soil Survey Manual, USDA 1951)*

Table C.3.4 (13/20) Physical Properties of Soil (Top layer) - MAKALONSOW

Item	Unit	Value	Note
1) Percent modified silt	%	9.72	
2) Percent modified sand	%	19.56	
3) Percent organic matter	%	4.51	High
4) Code of classes for structure	-	4*[1)], BLOCKY	
5) Permeability	cm/hour	0.62	Medium-Low
6) Bulk Density	g/cm^3	1.02	
7) Specific gravity	g/cm^3	2.65	
8) Porosity	%	61.5	
9) Moisture content	%	38.5	
10) Plasticity Index	%	20.54	High

Table C.3.4 (14/20) Physical Properties of Soil (Top layer) - TATAARAN

Item	Unit	Value	Note
1) Percent modified silt	%	39.28	
2) Percent modified sand	%	26.44	
3) Percent organic matter	%	3.69	Medium
4) Code of classes for structure	-	4*[1)], CRUMB-BLOCKY	
5) Permeability	cm/hour	0.83	Medium-Low
6) Bulk Density	g/cm^3	1.16	
7) Specific gravity	g/cm^3	2.65	
8) Porosity	%	56.2	
9) Moisture content	%	35.4	
10) Plasticity Index	%	22.59	High

Table C.3.4 (15/20) Physical Properties of Soil (Top layer) - PAREPEI

Item	Unit	Value	Note
1) Percent modified silt	%	38.30	
2) Percent modified sand	%	29.62	
3) Percent organic matter	%	1.78	Low
4) Code of classes for structure	-	4*[1)], CRUMB-BLOCKY	
5) Permeability	cm/hour	0.85	Medium-Low
6) Bulk Density	g/cm^3	1.23	
7) Specific gravity	g/cm^3	2.65	
8) Porosity	%	53.58	
9) Moisture content	%	29.6	
10) Plasticity Index	%	14.20	Medium

*[1)]: *1-very fine granular, 2-fine granular, 3-coarse granular, 4-blocky, platy, or massive, (from the Soil Survey Manual, USDA 1951)*

Table C.3.4 (16/20) Physical Properties of Soil (Top layer) - LELEKO-REMBOKEN

Item	Unit	Value	Note
1) Percent modified silt	%	45.36	
2) Percent modified sand	%	25.92	
3) Percent organic matter	%	2.05	Low
4) Code of classes for structure	-	3*[1)], CRUMB	
5) Permeability	cm/hour	0.50	Low
6) Bulk Density	g/cm^3	1.20	
7) Specific gravity	g/cm^3	2.65	
8) Porosity	%	54.7	
9) Moisture content	%	31.1	
10) Plasticity Index	%	19.86	Medium

Table C.3.4 (17/20) Physical Properties of Soil (Top layer) - TAMPUSU

Item	Unit	Value	Note
1) Percent modified silt	%	40.66	
2) Percent modified sand	%	25.58	
3) Percent organic matter	%	2.32	Low
4) Code of classes for structure	-	4*[1)], CRUMB-BLOCKY	
5) Permeability	cm/hour	0.27	Low
6) Bulk Density	g/cm^3	1.10	
7) Specific gravity	g/cm^3	2.65	
8) Porosity	%	58.4	
9) Moisture content	%	34.9	
10) Plasticity Index	%	15.57	Medium

Table C.3.4 (18/20) Physical Properties of Soil (Top layer) - PALELOAN

Item	Unit	Value	Note
1) Percent modified silt	%	41.26	
2) Percent modified sand	%	22.74	
3) Percent organic matter	%	2.19	Low
4) Code of classes for structure	-	4*[1)], CRUMB-BLOCKY	
5) Permeability	cm/hour	0.35	Low
6) Bulk Density	g/cm^3	1.32	
7) Specific gravity	g/cm^3	2.65	
8) Porosity	%	50.1	
9) Moisture content	%	30.5	
10) Plasticity Index	%	13.08	Medium

*[1)]: *1-very fine granular, 2-fine granular, 3-coarse granular, 4-blocky, platy, or massive, (from the Soil Survey Manual, USDA 1951)*

Table C.3.4 (19/20) Physical Properties of Soil (Top layer) - PULUTAN

Item	Unit	Value	Note
1) Percent modified silt	%	36.52	
2) Percent modified sand	%	33.32	
3) Percent organic matter	%	2.83	Medium
4) Code of classes for structure	-	4*[1)], CRUMB-BLOCKY	
5) Permeability	cm/hour	0.75	Medium-Low
6) Bulk Density	g/cm^3	1.17	
7) Specific gravity	g/cm^3	2.65	
8) Porosity	%	55.8	
9) Moisture content	%	30.4	
10) Plasticity Index	%	17.10	Medium

Table C.3.4 (20/20) Physical Properties of Soil (Top layer) - KASURATAN

Item	Unit	Value	Note
1) Percent modified silt	%	29.80	
2) Percent modified sand	%	35.68	
3) Percent organic matter	%	2.14	Low
4) Code of classes for structure	-	4*[1)], CRUMB-BLOCKY	
5) Permeability	cm/hour	1.40	Medium-Low
6) Bulk Density	g/cm^3	1.20	
7) Specific gravity	g/cm^3	2.65	
8) Porosity	%	54.7	
9) Moisture content	%	33.7	
10) Plasticity Index	%	16.62	Medium

*[1)]: *1-very fine granular, 2-fine granular, 3-coarse granular, 4-blocky, platy, or massive, (from the Soil Survey Manual, USDA 1951)*

Table C.3.5 (1/20) Chemical Properties of Soil - TONSEWER

Item		Unit	Top layer(1)	Middle layer (2)	Bottom Layer (3)
N-Total		%	0.23	0.20	0.16
P-Available		ppm	154.3	101.2	26.5
K-dd		me/100g	0.30	0.36	0.54
Organic mater		%	2.32	2.948	1.876
CEC		me/100g	13.98	10.38	15.60
pH H_2O (2:1)			6.60	6.6	6.80
pH KCL (2:1)			5.25	5.30	5.40
Tex-ture	Coarse Sand	%	75.9	77.1	80.3
	Fine Sand	%	4.7	2.0	6.5
	Silt	%	9.2	11.0	5.4
	Clay	%	10.2	9.9	7.8

Note: (1) Top layer depth 30cm+/-, (2) Middle layer depth 60cm+/-, (3) Bottom layer depth 90cm+/-,

Table C.3.5 (2/20) Chemical Properties of Soil - TUMARATAS-1

Item		Unit	Top layer(1)	Middle layer (2)	Bottom Layer (3)
N-Total		%	0.27	0.11	0.10
P-Available		ppm	151.1	104.2	42.0
K-dd		me/100g	0.28	0.16	0.25
Organic mater		%	2.85	0.134	1.395
CEC		me/100g	14.41	10.19	12.61
pH H_2O (2:1)			6.80	6.7	6.85
pH KCL (2:1)			5.3	5.20	5.25
Tex-ture	Coarse Sand	%	65.5	72.0	58.6
	Fine Sand	%	6.3	4.6	1.8
	Silt	%	19.1	15.3	30.2
	Clay	%	9.1	8.1	9.4

Table C.3.5 (3/20) Chemical Properties of Soil - TUMARATAS-2

Item		Unit	Top layer(1)	Middle layer (2)	Bottom Layer (3)
N-Total		%	0.22	0.14	0.16
P-Available		ppm	53.3	20.5	14.0
K-dd		me/100g	0.26	0.15	0.22
Organic mater		%	2.46	0.837	1.116
CEC		me/100g	13.41	8.64	9.460
pH H_2O (2:1)			6.90	6.80	6.80
pH KCL (2:1)			5.2	5.25	5.15
Tex-ture	Coarse Sand	%	77.5	81.1	73.5
	Fine Sand	%	1.6	0.2	2.0
	Silt	%	13.3	10.2	16.4
	Clay	%	7.6	8.4	8.2

Table C.3.5 (4/20) Chemical Properties of Soil - TUMARATAS-3

Item		Unit	Top layer(1)	Middle layer (2)	Bottom Layer (3)
N-Total		%	0.26	0.13	0.19
P-Available		ppm	59.0	10.0	7.0
K-dd		me/100g	0.13	0.16	0.14
Organic mater		%	2.74	1.675	1.395
CEC		me/100g	12.46	12.92	11.39
pH H_2O (2:1)			6.60	6.6	6.70
pH KCL (2:1)			5.0	5.0	5.1
Tex-ture	Coarse Sand	%	74.4	64.0	59.9
	Fine Sand	%	6.1	6.7	4.4
	Silt	%	10.8	22.0	25.2
	Clay	%	8.8	7.3	10.6

Note: (1) Top layer depth 30cm+/-, (2) Middle layer depth 60cm+/-, (3) Bottom layer depth 90cm+/-,

Table C.3.5 (5/20) Chemical Properties of Soil - RARINGIS

Item		Unit	Top layer(1)	Middle layer (2)	Bottom Layer (3)
N-Total		%	0.21	0.27	0.13
P-Available		ppm	91.0	59.0	39.0
K-dd		me/100g	0.13	0.19	0.16
Organic mater		%	2.05	3.350	0.418
CEC		me/100g	12.29	14.47	8.24
pH H_2O (2:1)			6.60	6.8	6.75
pH KCL (2:1)			5.1	5.1	5.1
Tex-ture	Coarse Sand	%	68.8	78.7	63.2
	Fine Sand	%	9.2	1.3	0.6
	Silt	%	13.7	12.1	27.4
	Clay	%	8.3	8.0	8.7

Table C.3.5 (6/20) Chemical Properties of Soil - NOONGAN

Item		Unit	Top layer(1)	Middle layer (2)	Bottom Layer (3)
N-Total		%	0.28	0.24	0.09
P-Available		ppm	6.0	8.5	16.5
K-dd		me/100g	0.26	0.22	0.17
Organic mater		%	0.977	1.675	0.418
CEC		me/100g	12.06	11.54	23.53
pH H_2O (2:1)			6.15	6.2	6.5
pH KCL (2:1)			5.1	5.25	5.3
Tex-ture	Coarse Sand	%	90.7	77.0	71.4
	Fine Sand	%	1.1	2.6	8.3
	Silt	%	1.1	12.1	12.8
	Clay	%	7.1	8.2	7.6

Table C.3.5 (7/20) Chemical Properties of Soil - KAAYURAN ATAS

Item		Unit	Top layer(1)	Middle layer (2)	Bottom Layer (3)
N-Total		%	0.31	0.37	0.23
P-Available		ppm	10.5	8.5	8.0
K-dd		me/100g	0.14	0.36	0.18
Organic mater		%	3.90	3.58	1.95
CEC		me/100g	17.13	42.50	39.77
pH H_2O (2:1)			6.4	6.45	6.45
pH KCL (2:1)			5.25	5.25	5.30
Tex-ture	Coarse Sand	%	63.7	52.8	28.9
	Fine Sand	%	8.1	7.5	16.0
	Silt	%	18.8	25.3	38.2
	Clay	%	9.5	14.4	16.9

Note: (1) Top layer depth 30cm+/-, (2) Middle layer depth 60cm+/-, (3) Bottom layer depth 90cm+/-,

Table C.3.5 (8/20) Chemical Properties of Soil - KAKAS

Item		Unit	Top layer(1)	Middle layer (2)	Bottom Layer (3)
N-Total		%	0.29	0.14	0.13
P-Available		ppm	39.0	23.0	24.0
K-dd		me/100g	0.15	0.14	0.12
Organic mater		%	3.830	1.072	1.072
CEC		me/100g	26.31	32.57	26.39
pH H_2O (2:1)			6.4	6.5	6.5
pH KCL (2:1)			5.15	5.1	5.1
Tex-ture	Coarse Sand	%	13.3	4.4	5.8
	Fine Sand	%	6.7	4.0	33.7
	Silt	%	27.9	10.4	16.3
	Clay	%	52.1	81.2	44.1

Table C.3.5 (9/20) Chemical Properties of Soil - TUMPAAN KAWENG

Item		Unit	Top layer(1)	Middle layer (2)	Bottom Layer (3)
N-Total		%	0.29	0.23	0.14
P-Available		ppm	4.0	6.0	12.0
K-dd		me/100g	0.18	0.17	0.14
Organic mater		%	3.960	1.876	1.474
CEC		me/100g	28.20	28.69	35.13
pH H_2O (2:1)			6.4	6.4	6.50
pH KCL (2:1)			5.0	5.1	5.1
Tex-ture	Coarse Sand	%	8.9	2.5	7.7
	Fine Sand	%	4.4	14.4	2.7
	Silt	%	35.0	23.9	1.2
	Clay	%	51.6	59.2	74.4

Table C.3.5 (10/20) Chemical Properties of Soil - ERIS

Item		Unit	Top layer(1)	Middle layer (2)	Bottom Layer (3)
N-Total		%	0.26	0.22	0.19
P-Available		ppm	12.0	15.5	2.5
K-dd		me/100g	0.15	0.14	0.14
Organic mater		%	3.216	1.876	1.742
CEC		me/100g	25.82	25.82	25.60
pH H_2O (2:1)			6.4	6.4	6.5
pH KCL (2:1)			5.0	5.0	5.1
Tex-ture	Coarse Sand	%	5.2	14.0	10.3
	Fine Sand	%	4.6	18.3	23.9
	Silt	%	28.7	29.3	28.3
	Clay	%	61.4	38.4	37.5

Note: (1) Top layer depth 30cm+/-, (2) Middle layer depth 60cm+/-, (3) Bottom layer depth 90cm+/-,

Table C.3.5 (11/20) Chemical Properties of Soil - TANDENGAN

Item		Unit	Top layer(1)	Middle layer (2)	Bottom Layer (3)
N-Total		%	0.24	0.15	0.15
P-Available		ppm	18.0	9.5	8.5
K-dd		me/100g	0.15	0.14	0.14
Organic mater		%	2.14	1.206	1.206
CEC		me/100g	36.87	33.34	32.83
pH H_2O (2:1)			6.0	6.0	5.9
pH KCL (2:1)			4.9	4.85	4.75
Tex-ture	Coarse Sand	%	6.2	3.8	4.0
	Fine Sand	%	10.7	8.7	10.0
	Silt	%	13.8	20.5	43.0
	Clay	%	69.3	67.0	43.0

Table C.3.5 (12/20) Chemical Properties of Soil - TOULIANG OKI

Item		Unit	Top layer(1)	Middle layer (2)	Bottom Layer (3)
N-Total		%	0.23	0.15	0.23
P-Available		ppm	5.0	4.5	4.5
K-dd		me/100g	0.12	0.21	0.14
Organic mater		%	2.140	0.938	0.268
CEC		me/100g	52.42	54.48	51.00
pH H_2O (2:1)			6.4	6.3	6.2
pH KCL (2:1)			4.8	4.9	4.8
Tex-ture	Coarse Sand	%	4.3	4.7	3.4
	Fine Sand	%	22.7	13.7	17.2
	Silt	%	27.0	9.9	25.7
	Clay	%	46.0	71.7	53.7

Table C.3.5 (13/20) Chemical Properties of Soil - MAKALONSOW

Item		Unit	Top layer(1)	Middle layer (2)	Bottom Layer (3)
N-Total		%	0.29	0.14	0.10
P-Available		ppm	22.0	3.5	2.0
K-dd		me/100g	0.52	0.75	0.31
Organic mater		%	4.510	0.847	0.134
CEC		me/100g	34.72	31.15	34.24
pH H_2O (2:1)			6.3	6.2	6.1
pH KCL (2:1)			4.9	4.8	4.6
Tex-ture	Coarse Sand	%	9.8	3.0	3.0
	Fine Sand	%	9.7	22.2	18.4
	Silt	%	9.7	22.9	32.6
	Clay	%	70.7	49.9	46.0

Note: (1) Top layer depth 30cm+/-, (2) Middle layer depth 60cm+/-, (3) Bottom layer depth 90cm+/-,

Table C.3.5 (14/20) Chemical Properties of Soil - TATAARAN

Item		Unit	Top layer(1)	Middle layer (2)	Bottom Layer (3)
N-Total		%	0.19	0.18	0.17
P-Available		ppm	13.0	13.0	14.0
K-dd		me/100g	0.19	0.19	0.16
Organic mater		%	2.140	1.876	1.876
CEC		me/100g	29.24	29.47	29.43
pH H_2O (2:1)			6.8	6.8	6.8
pH KCL (2:1)			5.1	5.2	5.1
Tex-ture	Coarse Sand	%	18.6	30.1	23.7
	Fine Sand	%	11.0	9.3	7.5
	Silt	%	15.8	9.2	25.6
	Clay	%	54.6	51.5	43.2

Table C.3.5 (15/20) Chemical Properties of Soil - PAREPEI

Item		Unit	Top layer(1)	Middle layer (2)	Bottom Layer (3)
N-Total		%	0.19	0.17	0.10
P-Available		ppm	31.5	19.0	13.0
K-dd		me/100g	0.47	0.81	0.87
Organic mater		%	1.780	1.340	0.402
CEC		me/100g	25.96	29.66	32.70
pH H_2O (2:1)			6.4	6.35	6.4
pH KCL (2:1)			5.4	5.4	5.35
Tex-ture	Coarse Sand	%	22.0	14.9	11.9
	Fine Sand	%	7.6	8.0	1.4
	Silt	%	38.3	29.8	29.2
	Clay	%	32.1	47.2	57.6

Table C.3.5 (16/20) Chemical Properties of Soil - LELEKO-REMBOKEN

Item		Unit	Top layer(1)	Middle layer (2)	Bottom Layer (3)
N-Total		%	0.18	0.21	0.16
P-Available		ppm	11.0	11.0	8.5
K-dd		me/100g	0.21	0.8	0.19
Organic mater		%	1.675	1.675	0.558
CEC		me/100g	26.24	32.13	32.31
pH H_2O (2:1)			6.2	6.3	6.2
pH KCL (2:1)			5.2	5.25	5.3
Tex-ture	Coarse Sand	%	19.5	12.3	10.5
	Fine Sand	%	18.6	6.8	5.9
	Silt	%	48.0	41.5	40.5
	Clay	%	28.1	39.5	43.2

Note: (1) Top layer depth 30cm+/-, (2) Middle layer depth 60cm+/-, (3) Bottom layer depth 90cm+/-,

Table C.3.5 (17/20) Chemical Properties of Soil - TAMPUSU

Item		Unit	Top layer(1)	Middle layer (2)	Bottom Layer (3)
N-Total		%	0.21	0.14	0.13
P-Available		ppm	40.0	37.5	21.0
K-dd		me/100g	0.31	0.19	0.17
Organic mater		%	1.840	0.837	0.837
CEC		me/100g	27.19	39.22	37.39
pH H_2O (2:1)			6.7	6.7	6.75
pH KCL (2:1)			5.0	5.0	5.1
Tex-ture	Coarse Sand	%	16.4	0.7	7.4
	Fine Sand	%	2.5	2.0	5.2
	Silt	%	42.7	31.4	34.0
	Clay	%	38.4	65.8	53.5

Table C.3.5 (18/20) Chemical Properties of Soil - PALELOAN

Item		Unit	Top layer(1)	Middle layer (2)	Bottom Layer (3)
N-Total		%	0.16	0.15	0.14
P-Available		ppm	4.5	16.5	7.0
K-dd		me/100g	0.49	0.48	0.52
Organic mater		%	3.210	1.395	0.418
CEC		me/100g	23.41	30.06	32.35
pH H_2O (2:1)			6.8	6.8	6.8
pH KCL (2:1)			5.1	5.1	5.05
Tex-ture	Coarse Sand	%	16.0	9.5	7.3
	Fine Sand	%	5.6	7.0	4.0
	Silt	%	45.1	32.8	27.4
	Clay	%	33.2	50.7	61.2

Table C.3.5 (19/20) Chemical Properties of Soil - PULUTAN

Item		Unit	Top layer(1)	Middle layer (2)	Bottom Layer (3)
N-Total		%	0.18	0.19	0.17
P-Available		ppm	16.5	17.5	12.5
K-dd		me/100g	0.34	0.44	0.30
Organic mater		%	2.010	1.876	1.206
CEC		me/100g	20.09	26.24	28.20
pH H_2O (2:1)			6.5	6.4	6.4
pH KCL (2:1)			5.1	5.0	5.0
Tex-ture	Coarse Sand	%	28.1	26.9	21.3
	Fine Sand	%	6.0	6.6	6.4
	Silt	%	30/0	32.4	32.7
	Clay	%	36.1	34.1	39.6

Note: (1) Top layer depth 30cm+/-, (2) Middle layer depth 60cm+/-, (3) Bottom layer depth 90cm+/-,

Table C.3.5 (20/20) Chemical Properties of Soil - KASURATAN

Item		Unit	Top layer(1)	Middle layer (2)	Bottom Layer (3)
N-Total		%	0.26	0.20	0.14
P-Available		ppm	19.0	21.0	22.0
K-dd		me/100g	0.98	0.45	0.58
Organic mater		%	2.140	1.474	1.340
CEC		me/100g	27.96	31.66	35.61
pH H_2O (2:1)			6.1	6.3	6.2
pH KCL (2:1)			5.0	5.1	5.0
Tex-ture	Coarse Sand	%	24.2	15.1	13.9
	Fine Sand	%	11.5	7.0	4.3
	Silt	%	29.8	22.3	19.3
	Clay	%	34.5	55.6	62.6