

LIST OF TABLES

TABLE NO.	TITLE	PAGE NO.
2.1	Generalised stratigraphic sequence of the Saurashtra Peninsula (after Shrivastava, 1963)	11
2.2	Surface Stratigraphic sequence of Bhadar river valley (after Shrivastava, 1963)	13
2.3	Morphometric analysis	19
3.1	Soil taxonomy of Bhadar basin (modified after NBSS & LUP, 1994)	33
3.2	Amount of precipitation in the basin	36
3.3	Temperature and relative humidity	39
3.4	Geologic conditions that affect typical land uses.	41
3.5	Irrigation scheme in the Bhadar basin	43
3.6	Settlements and population	45
4.1	Hydraulic gradient in the micro-water sheds of Bhadar basin	54
5.1	Water quality in Highlands	71
5.2	Water quality of the point source samples, Bhadar valley	72
5.3	Surface water quality of Bhadar river valley (pre-monsoon)	73-74
5.4	Surface water quality of Bhadar river valley (post-monsoon)	75
5.5	Pre-monsoon sub-surface water quality, Bhadar valley.	76
5.6	Post-monsoon sub-surface water quality, Bhadar valley.	77
5.7	Surface water quality in the coastal areas	78
5.8	Sub-surface water quality in the coastal area, pre-monsoon.	79
5.9	Sub-surface water quality in the coastal area, post-monsoon.	80
5.10	Statistical analysis of Pre-monsoon water samples	83
5.11	Statistical analyses of Post-monsoon water samples	84
5.12	Statistical analyses of Pre-Post monsoon water samples.	85
5.13	Trace elements on surface and sub-surface control points and point source of pre-post monsoon seasons.	86
5.14	Trace elements in the pre-monsoon water samples	87
5.15	Trace elements in the post-monsoon water samples.	88
6.1	Mean surface water quality (Pre-monsoon) Bhadar valley	91

TABLE NO.	TITLE	PAGE NO.
6.2	Mean surface water quality (post-monsoon) Bhadar valley	92
6.3	Mean sub-surface water quality (pre-monsoon) Bhadar valley	93
6.4	Mean sub-surface water quality (post-monsoon) Bhadar valley	94
6.5	Mean surface and sub-surface water quality (pre-monsoon), coastal area	95
6.6	Mean surface and sub-surface water quality (post-monsoon), coastal area	96
6.7	Important determinands for beneficial use of water	105
6.8	WQI for drinking (surface water), Bhadar valley	106
6.9	WQI for drinking (sub-surface water), Bhadar valley	107
6.10	WQI for drinking (surface & sub-surface water), Coastal area	108
6.11	WQI for Industrial use (surface water), Bhadar valley.	110
6.12	WQI for Industrial use(sub-surface water), Bhadar valley.	111
6.13	WQI for Industrial use(surface & sub-surface water), Coastal area.	112
6.14	WQI for irrigation(surface water), Bhadar valley	113
6.15	WQI for irrigation(sub-surface water), Bhadar valley	114
6.16	WQI for irrigation(surface & sub-surface water), coastal area.	115

LIST OF FIGURES

FIG. NO.	TITLE	PAGE NO.
1.1	Location Map of the Study area.	2
2.1	Geological map of Saurashtra Peninsula.	10
2.2	Geological map of Bhadar basin.	12
2.3	Lineament map of Bhadar basin.	14
2.4	Regional geomorphic map of Saurashtra.	16
2.5	Drainage map of Bhadar basin.	18
2.6	Relation of Stream order to number of streams in different sub-basin.	20
2.7	Relation of stream order to average stream length in different sub-basin.	22
2.8	Slope map of Bhadar basin.	23-25
2.9	Geomorphological map of Bhadar basin.	27
3.1	Flow chart depicting the methods of geo-environmental investigation	30

FIG. NO.	TITLE	PAGE NO.
3.2	Soil classification map of Bhadar basin.	32
3.3	Landuse pattern map of Bhadar basin.	35
3.4	Isohyet map of Bhadar basin.	37
3.5	Mean areal depth of precipitation of Bhadar basin.	38
4.1	Hydrogeological map of Bhadar basin.	47
4.2	Ribbon diagram illustrating sub-surface lithology of the Bhadar basin.	49
4.3	Water table in relation to bedrock configuration.	50
4.4	Plan (1) and profile along present stream bed (2) and original stream bed (3).	50
4.5	Locations of observatory wells (secondary data)	53
4.6	Reduced water level contour map of Bhadar basin(pre-monsoon).	55
4.7	Reduced water level contour map of Bhadar basin (post monsoon)	56
4.8	Contours of rise and fall of water table bhadar basin (pre-monsoon, 1984-1993)	57
4.9	Countours of rise and fall of water table Bhadar basin (post-monsoon, 1984-1993)	58
4.10	Ground Water flow direction in Bhadar basin	59
4.11	Cross section depicting multi-tier aquifer	61
4.12	Iso Chloride contour map (pre-monsoon)	64
4.13	Iso Chloride contour map (post-monsoon)	65
4.14	Iso -TDS contour map (pre-monsoon)	66
4.15	Iso -TDS contour map (post-monsoon)	67
5.1	Location map of sampling stations	69
6.1	Piper trilinear diagram showing chemical characteristics of surface water, Bhadar valley	97
6.2	Piper trilinear diagram showing chemical characteristics of sub-surface water, Bhdara valley	99
6.3	Piper trilinear diagram showing chemical characteristics of surface & sub-surface water in coastal area.	100
6.4	Sensitivity function versus parameter value of drinking water	102
6.5	Sensitivity function versus parameter value for Industrial use.	103
6.6	Sensitivity function versus parameter value for Irrigation.	104
6.7	Surface water quality for irrigation (U.S. salinity laboratory), Bhadar valley.	116

FIG. NO.	TITLE	PAGE NO.
6.8	Sub-surface water quality for irrigation (U.S. salinity diagram), Bhadar valley.	118
6.9	Surface and sub-surface water quality (upto Kutiyaana) for irrigation (after Wilcox, 1955)	120
6.10	U.S. salinity diagram depicting surface & sub-surface water quality of coastal area, Bhadar river basin.	121
6.11	Surface & sub-surface water quality (beyond Kutiyaana, coastal area) for irrigation(after Wilcox, 1955).	123
6.12	Mechanism controlling water chemistry in coastal area, Bhadar basin	124
6.13	Variation in concentration of surface water parameters along Bhadar river	126

LIST OF PLATES

<u>PLATE - 1</u>	138
a)	Picture showing the process of screen printing on cotton cloth in Jetpur.
b)	Picture showing the dyeing process after printing in Jetpur
c)	Picture shows boiler in which printed cloths are heated. (Location : Near Panchpipla)
<u>PLATE - 2</u>	139
a)	Picture shows washing processes after treatment in the boiler (Location : Near Panchpipla)
b)	Picture shows starch being applied on the clothes. (Location : Near Panchpipla)
c)	Picture shows the drying on the clothes in open agricultural fields. (Location : Near Panchpipla)
<u>PLATE - 3</u>	140
a)	Pictures depicting the waste effluent water being discharged from the washing units in to the streams.
b)	Picture illustrating the breaching of lined canal and entry of effluents into the river Bhadar at Jetpur. (Lens facing the old railway bridge)
c)	Various effluent water samples collected at different locations in and around Jetpur (along with a beaker containing clear water)



"This is an age in which one cannot find common sense
without a search warrant."