

TABLE OF CONTENTS

1. INTRODUCTION.....	15
1.1. Motivation.....	15
1.2. Objectives.....	16
1.3. Structure.....	16
2. LITERATURE SURVEY AND METHODOLOGY.....	18
2.1. Literature Survey.....	18
2.2. Methodology.....	19
3. MATERIALS AND METHODS.....	20
3.1. Materials.....	20
3.2. Method.....	21
4. A CONCISE HISTORY OF SOUTH AFRICA.....	22
4.1. Introduction.....	22
4.2. The Frontier Defined.....	22
4.3. Pre-Colonial South Africa: Hominoids, Hunter-gatherers, and Agro-pastoralists.....	23
4.3.1. The Hominoids.....	23
4.3.2. The San People.....	25
4.3.3. The Khoi-Khoi.....	25
4.3.4. The Bantu People.....	26
4.4. The First Phase of the Frontier and Water Resources Utilisation.....	29
4.4.1. 1652-1834: Colonisation of South Africa and Land Grab.....	30
4.4.2. 1834-1900: <i>Mfecane (Difaqane)</i> , the Great Trek, Boer Republics, and Discovery of Minerals.....	33
4.5. The Second Phase of the Frontier.....	34
4.6. The Third Phase of the Frontier.....	37
4.7. The Final Phase of the Frontier.....	39
4.7.1. Drought and Rinderpest.....	41
4.8. 1900 - 1909: The Closing of the Frontier and the Rise of Afrikaner Nationalism.....	42
4.9. 1910-1948: From Union to National Party Victory.....	46
4.9.1. Establishment of the Union of South Africa.....	46
4.9.2. The Establishment of the ANC.....	46
4.9.3. The 1913 Land Act.....	46
4.9.4. The First World War.....	47
4.9.5. Miners go on Strike.....	48
4.9.6. Economic Prosperity.....	49
4.9.7. Economic Depression.....	49
4.9.8. Drought.....	50
4.9.9. Poor Whites.....	50
4.9.10. Abandonment of the Gold Standard.....	50
4.9.11. Afrikaner Nationalism.....	51
4.9.12. The Midas Touch and the "Long Economic Boom".....	51
4.9.13. The Second World War.....	53
4.9.14. Dissent and the Smuts Government.....	53
4.10. 1948-1990: Apartheid and South Africa's International Isolation.....	55
4.10.1. Codification of Apartheid.....	55
4.10.2. The Tomlinson Commission.....	56
4.10.3. Verwoerd becomes Prime Minister.....	61
4.10.4. Black Resistance to Apartheid.....	61
4.10.5. "Winds of Change".....	62
4.10.6. Sharpeville.....	62
4.10.7. Verwoerd's Rule is Strengthened.....	63
4.10.8. The Republic of South Africa.....	63
4.10.9. The National Party's Support.....	64
4.10.10. Verwoerd is Dead.....	64
4.10.11. The Namibia Issue.....	65
4.10.12. Vorster becomes Prime Minister.....	65
4.10.13. Commission of Enquiry into Water Matters.....	66
4.10.14. The Angolan War.....	69

4.10.15.	Détente.....	70
4.10.16.	Domestic Political Turmoil.....	70
4.10.17.	P.W. Botha and the "Total Onslaught".....	71
4.10.18.	The Economy.....	73
4.10.19.	Political Reform (Petty Apartheid).....	76
4.10.20.	Sanctions.....	77
4.10.21.	Drought.....	79
4.10.22.	Namibia and Retreat from Angola.....	80
4.10.23.	F.W. de Klerk and the Disintegration of Communism.....	80
4.10.24.	1990 to the Present: Political Reform and a Democratically Elected Government.....	81
4.10.25.	CODESA.....	82
4.10.26.	Drought.....	82
4.10.27.	Democratic Elections and the ANC is the New Ruling Party.....	83
4.10.28.	The Economy.....	84
4.10.29.	The Second Democratic Election.....	85
4.10.30.	Communities Affected by Large Dams.....	85
4.11.	Conclusion.....	87
5.	THE ORANGE RIVER BASIN.....	88
5.1.	Introduction.....	88
5.2.	Physical Description of the Orange River Basin.....	99
5.3.	Early History of the Orange River Basin.....	100
5.3.1.	Colonel Robert Jacob Gordon.....	101
5.3.2.	More Expeditions by Other Explorers.....	102
5.3.3.	The Arrival of the Missionary.....	104
5.3.4.	The Orange River as a Boundary of the Cape Colony.....	105
5.3.5.	The Appearance of Farm Dams.....	106
5.3.6.	Discovering the Source of the Orange River.....	106
5.3.7.	Drought.....	107
5.3.8.	Navigation of the River.....	107
5.3.9.	A Start with Irrigation Projects?.....	107
5.3.10.	Border Dispute between the OFS and ZAR.....	107
5.3.11.	The Pote Canal.....	108
5.3.12.	Brown's Analysis.....	108
5.3.13.	The Civil Commissioners' Reports.....	111
5.3.14.	The Gamble Report.....	114
5.3.15.	Irrigation Development in Fits and Starts.....	116
5.3.16.	The Prieska Irrigation Works.....	118
5.3.17.	Schröder and Lutz.....	118
5.3.18.	Thomas Bain.....	119
5.3.19.	Prieska Again.....	130
5.3.20.	Irrigation near Upington.....	130
5.3.21.	Van Wyk's Vlei.....	131
5.3.22.	Douglas Irrigation Works.....	131
5.3.23.	Buchberg Irrigation Works.....	132
5.3.24.	The Harts River Irrigation Scheme.....	132
5.3.25.	Increased Attention on the Orange River.....	132
5.3.26.	Irrigation under the Irrigation Works Bill.....	133
5.3.27.	Le Roex and Litchfield's Report.....	134
5.3.28.	The Hartz and Vaal River Irrigation Works.....	136
5.3.29.	Near Joint Cooperation between the Cape Colony and the OFS.....	139
5.3.30.	Irrigation Projects Underway.....	144
5.3.31.	The Vluitjes Kraal Irrigation Works.....	146
5.3.32.	The Rooiberg Dam.....	146
5.3.33.	Utilisation of Groundwater.....	147
5.3.34.	Cooperation: The Vaal River.....	148
5.3.35.	The Buchberg Irrigation Scheme Finally Abandoned.....	150
5.4.	The First Irrigation Congress.....	152
5.5.	A Tale of Two Cities.....	159

5.5.1.	Kimberley.....	159
5.5.2.	Johannesburg.....	160
5.6.	Water Resources Development after the Establishment of the Union of South Africa.....	165
5.7.	National Schemes.....	167
5.8.	Lewis's Caution.....	168
5.9.	Sudden Instructions: Irrigation Projects as Relief Works.....	170
5.10.	The Orange-Fish Project.....	173
5.11.	Large Schemes, Small Schemes, the Raising of Dams and Betterments.....	174
5.11.1.	The Sand-Vet Government Waterworks.....	174
5.11.2.	The Douglas Irrigable Areas Board Water Scheme.....	175
5.11.3.	The Hardap Dam.....	176
5.11.4.	The Naute Dam.....	177
5.11.5.	The Klerksdorp Irrigation Board Betterment Works.....	178
5.11.6.	Reconstruction of the Smartt Irrigation Board Dam.....	179
5.11.7.	The Schoonspruit Irrigation Board Scheme.....	180
5.11.8.	Lower Riet River Government Waterworks.....	181
5.11.9.	The Orange River Project.....	183
5.11.10.	The Northern Free State Water Board Scheme.....	190
5.11.11.	The Krugersdrif Dam.....	192
5.11.12.	Raising of Koppies Dam.....	193
5.11.13.	The Mooi River Canals.....	193
5.11.14.	The Klipdrift Government Waterwork.....	194
5.11.15.	The Vaal-Gamagara Water Supply Scheme.....	195
5.11.16.	The Kakamas Government Waterwork.....	197
5.11.17.	The Oppermansdrift Dam.....	198
5.11.18.	The Uppington Island Scheme.....	199
5.11.19.	The Vaal Dam Ancillary Pipeline.....	202
5.11.20.	The OFS. Goldfields Water Extension Scheme.....	202
5.11.21.	Extension of Buchuberg-Karos Scheme.....	203
5.11.22.	Heilbron's Water Supply.....	204
5.11.23.	Water Supplied to Mafeking.....	204
5.11.24.	The Spitskop Dam.....	208
5.11.25.	The Tugela-Vaal River Scheme.....	209
5.11.26.	Water Supplied to Springbok.....	217
5.11.27.	The Douglas Weir.....	219
5.11.28.	The Noord-Oranje Irrigation Board.....	220
5.11.29.	Betterments to the OFS. Goldfields Government Water Scheme.....	221
5.11.30.	The Modder River Weirs.....	223
5.11.31.	The Usutu-Vaal River Government Water Scheme.....	224
5.11.32.	Drainage Works for the Vaal-Hartz Scheme.....	227
5.11.33.	The Koppies Canals.....	228
5.11.34.	Betterment Works for the Hoeko Irrigation Board.....	229
5.11.35.	Betterments to the Kalkfontein Dam.....	230
5.11.36.	Vaal Dam Betterments.....	231
5.11.37.	Douglas Irrigation Scheme Betterments.....	233
5.11.38.	The Lesaka Government Water Scheme.....	234
5.11.39.	The Total Water Strategy for the Vaal Triangle.....	235
5.11.40.	Water Supply for the Lethabo Power Station.....	238
5.11.41.	The Kalahari West Rural Water Supply Scheme.....	239
5.11.42.	The Lesotho Highlands Water Project.....	241
5.11.43.	The Zaaihoek Dam.....	255
5.11.44.	The Caledon-Modder River Scheme.....	256
5.11.45.	The Kalahari East Rural Water Supply Scheme.....	257
5.12.	The World Commission on Dams' Hearings.....	258
5.12.1.	The Gariiep and Van der Kloof Dams.....	258
5.12.2.	The LHWP.....	258
5.13.	Conclusion.....	261
6.	THE LIMPOPO RIVER BASIN.....	263

6.1.	Introduction	263
6.2.	Physical Description of the Limpopo River Basin.....	264
6.3.	Early Developments in the Limpopo River Basin	265
6.4.	Large Schemes, Small Schemes, the Raising of Dams and Betterments	266
6.4.1.	The Olifants Nek Irrigation District	267
6.4.2.	The Zeerust Irrigation Board	267
6.4.3.	The Middelburg Irrigation Board	267
6.4.4.	The Marico Bosveld Irrigation Works.....	267
6.4.5.	The Letaba North Irrigation Scheme	268
6.4.6.	The N and N Irrigation Board Scheme.....	269
6.4.7.	The Nwanedzi River Government Waterwork.....	269
6.4.8.	The Koster River Government Waterwork	271
6.4.9.	The Bon Accord Irrigation Board Canal Improvements.....	272
6.4.10.	Raising of the Bospoort Dam.....	273
6.4.11.	Raising of the Klein Maricopoort Dam	274
6.4.12.	Betterments to the Driehoek Canal.....	275
6.4.13.	The Pusela Irrigation Board Water Scheme	276
6.4.14.	Polokwane's Water Supply	276
6.4.15.	The Njelele Irrigation Board Water Scheme.....	278
6.4.16.	The Klipvoor and Rooideplaar Dams	279
6.4.17.	The Magalakwin River Government Waterwork.....	280
6.4.18.	Raising of the Lindleyspoort Dam.....	281
6.4.19.	Raising of the Albasini Dam.....	282
6.4.20.	Potgietersrus's Water Supply Scheme.....	283
6.4.21.	The Phalaborwa Water Board Scheme.....	285
6.4.22.	Raising of the Rooikraal Dam.....	287
6.4.23.	Raising of the Hartebeespoort Dam.....	288
6.4.24.	Raising of the Jan Wassenaar Dam	291
6.4.25.	Raising of the Buffelspoort Dam	292
6.4.26.	The Palala River Weirs	292
6.4.27.	The Watervals River Government Waterwork.....	293
6.4.28.	The Vaalkop Dam	294
6.4.29.	The Vergelegen Government Waterwork.....	296
6.4.30.	The Magoebaskloof Dam.....	297
6.4.31.	Waterwork for the Selons River Irrigation Board.....	298
6.4.32.	The George's Valley Irrigation Board Water Scheme	298
6.4.33.	The Nwanedzi River Irrigation Board Water Scheme	299
6.4.34.	The Selati River Irrigation Board Water Scheme.....	300
6.4.35.	The Vygenhoek Dam	301
6.4.36.	The Tzaneen Dam	301
6.4.37.	The Great Letaba River Storage Weirs.....	303
6.4.38.	The Blyde River Poort Dam	304
6.4.39.	The Hans Strijdom Dam	305
6.4.40.	The Duiwelskloof Government Regional Water Supply Scheme	306
6.4.41.	Raising of the Doorndraai Dam.....	306
6.4.42.	The Loskop Dam.....	307
6.4.43.	The Roodekopjes Dam.....	310
6.4.44.	The Thor Dam	311
6.4.45.	Concrete Lining of Hartebeespoort's Old Furrows.....	313
6.4.46.	The Soutpansberg Government Water Supply Scheme	314
6.4.47.	The South Ndebele Water Distribution Scheme	315
6.4.48.	Betterments to the Rust der Winter Canals.....	317
6.4.49.	Extension of the Loskop Distribution System.....	319
6.4.50.	The Molatedi Dam	320
6.4.51.	Future Developments on the Olifants River.....	321
6.5.	The World Commission on Dams' Hearings.....	322
6.5.1.	The Loskop Dam.....	322
6.6.	Conclusion.....	323

7.	THE INCOMATI RIVER BASIN	324
7.1.	Introduction	324
7.2.	Physical Description of the Incomati River Basin	325
7.3.	Early Developments	326
7.4.	Large Schemes, Small Schemes, the Raising of Dams and Betterments	326
7.4.1.	The Ranch Karino Irrigation District	326
7.4.2.	Gorge-Impala	327
7.4.3.	The Malelane Irrigation Board Scheme	327
7.4.4.	The Sand River Government Waterwork	329
7.4.5.	The White River Estates Irrigation Board	330
7.4.6.	The Louws Creek Irrigation Board Water Scheme	332
7.4.7.	The White River Conservation Scheme	333
7.4.8.	The Crocodile River Irrigation District	334
7.4.9.	The Burgershall Irrigation Board Scheme	335
7.4.10.	The Da Gama Dam	336
7.4.11.	The Curlews Irrigation Board Water Scheme	337
7.4.12.	The Kaalrug Irrigation Board Water Supply Scheme	338
7.4.13.	The Sterkspruit Dam	339
7.4.14.	Storage on the Upper Inkomati: Water for Electricity Generation	341
7.4.15.	The Driekoppies Dam	346
7.4.16.	The Injaka Dam and Bosbokrand Transfer Pipeline	348
7.5.	The World Commission on Dams Hearings	350
7.5.1.	The Maguga Dam	350
7.6.	Conclusion	350
8.	THE MAPUTO RIVER BASIN	352
8.1.	Introduction	352
8.2.	Physical Description of the Maputo River Basin	353
8.3.	Early Developments	354
8.4.	Water Resources Development Projects	354
8.4.1.	The Pongola Irrigation Project	354
8.4.2.	The Pongola-Makatini Flats Government Water Scheme	359
8.4.3.	The Bivane Dam	360
8.5.	The World Commission on Dams' Hearings	362
8.5.1.	The Pongolapoort Dam	362
8.6.	Conclusion	363
9.	LEGISLATION AND INSTITUTIONAL CAPACITY PERTAINING TO THE WATER RESOURCES OF SOUTH AFRICA	364
9.1.	Introduction	364
9.2.	The Origin of South African Water Law	364
9.2.1.	Early Developments of the Water Law in South Africa	365
9.2.2.	The Foundations of South African Water Law	367
9.2.3.	From Irrigation Law to Water Law and Departmental Responsibilities	375
9.2.4.	The National Water Act (Act 36 of 1998)	381
9.2.5.	Rural Water Supply	384
9.3.	The South African Namibian Border Disagreement	384
9.4.	International Agreements and Treaties	386
9.5.	Conclusion	391
10.	DISCUSSION, RECOMMENDATIONS AND CONCLUSIONS	393
10.1.	Discussion	393
10.1.1.	State-of-the-art	394
10.2.	Recommendations	394
10.3.	Conclusion	395
11.	REFERENCES	402
12.	NEWSPAPER AND MAGAZINE ARTICLES	438