

Table of content

1 Introduction

1.1	Water reservoirs	1
1.2	INNOVATE-Project.....	6
1.3	Objectives.....	8
1.4	Structure of the thesis	9
1.5	Itaparica reservoir: watershed background and general description.....	10
1.5.1	São Francisco watershed	10
1.5.2	Socio-economic conditions and visual excursion of its surroundings.....	11

2 Water availability by rainfall, hydrology and agricultural usage in the semi-arid region of Northeast Brazil

2.1	Introduction	14
2.2	Material & Methods	17
2.2.1	Study area.....	17
2.2.2	Data and proceedings	17
2.2.3	Rainfall analysis	18
2.2.3.1	Spatial scale.....	19
2.2.3.2	Temporal scale.....	19
2.2.4	Hydrology analysis.....	20
2.2.5	Agricultural production	21
2.3	Results	22
2.3.1	Rainfall variability.....	22
2.3.1.1	Spatial distribution of rainfall.....	22
2.3.1.2	Temporal distribution of rainfall	23
2.3.2	Hydrology.....	27
2.3.2.1	Long-term discharge of the Pajeú river	27
2.3.3	Rainfall - discharge response and real evaporation	28
2.3.4	Economical usage of water by agriculture	31
2.4	Discussion	33
2.4.1	Agriculture potential.....	33
2.4.2	Rainfall and erosion risk.....	34
2.4.3	Hydrology.....	35
2.5	Conclusion.....	37

3 The Itaparica reservoir and its spatial and temporal specifics: A multivariate statistical approach

3.1	Introduction	38
3.2	Material and Methods.....	40
3.2.1	Study area: Itaparica reservoir.....	40
3.2.2	Datasets	41
3.2.3	Data proceedings and statistical analysis.....	42
3.2.3.1	Climate characterization and water level changes.....	42
3.2.3.2	Limnological dataset analysis: a multivariate approach.....	42
3.3	Results	43
3.3.1	Reservoir cascade	43
3.3.2	Environmental drivers of water quality in the Itaparica reservoir.....	44

3.3.3	Spatial and temporal variations of physico-chemical water quality in the Itaparica reservoir.....	48
3.4	Discussion	55
3.5	Conclusion.....	58
4	Aquatic ecosystem functions of the Icó-Mandantes bay, Itaparica reservoir	
4.1	Introduction	59
4.2	Material & Methods	62
4.2.1	Study area: Icó-Mandantes bay and the sub-basin	62
4.2.2	Sampling design, parameters and analytics.....	64
4.2.2.1	Bathymetric mapping	64
4.2.2.2	Water quality	64
4.2.2.3	Sediment analysis	66
4.2.2.4	Drainage sampling.....	66
4.2.3	Experimental setups.....	67
4.2.3.1	Primary production experiment	67
4.2.3.2	Nutrient limitation	67
4.2.3.3	Mesocosm experiment.....	67
4.2.4	Data analysis and statistics	68
4.3	Results	69
4.3.1	Local environmental conditions during the field study	69
4.3.2	Icó-Mandantes bay: Aquatic ecosystem functions	70
4.3.2.1	Water temperature	70
4.3.2.2	Water quality	71
4.3.2.3	Sediment characteristics	72
4.3.2.4	Spatial-temporal water quality effects regarding dry, rain and extended drought periods	73
4.3.3	Water quality assessment by OECD and trophic state index (TSI).....	80
4.3.4	Primary production and respiration	82
4.3.5	Littoral mesocosm experiments.....	83
4.3.6	Nutrient limitation assessment	85
4.3.7	Phosphorus load	89
4.4	Discussion	92
4.5	Conclusion.....	99
5	Concluding remarks	99
5.1	General remarks	100
5.2	Outlook: Management and research recommendations.....	103
6	References.....	104
7	Annex	118