

**DEVELOPMENT OF A DRINKING WATER QUALITY  
INDEX FOR DRY ZONE OF SRI LANKA:  
APPLICATION TO KALA-OYA BASIN**

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**Degree of Master of Science**

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Thesis submitted in partial fulfillment of the requirements for the  
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## DECLARATION

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## **ABSTRACT**

Water Quality Indices have been developed to assess the suitability of water sources for its intended uses which give the status of water quality in water sources. Over past few decades, deterioration of water sources in Sri Lanka is getting critical. Ground water plays a significant role as a drinking water source in rural communities of dry zone while surface water is not that vital. In such circumstances, feasibility of use of water from traditional village irrigation tanks for drinking is utmost importance. To assess the surface water in dry zone, Drinking Water Quality Index was developed following four steps; (1) Selection of parameters considering their importance to the assessment study and availability of data. (2) Development of sub-indices by converting different units and rangers of water quality measurements for selected parameters into common scale, (3) Assigning weighting to the selected parameters considering their contribution to final index, (4) Aggregation of sub-indices and weightings using aggregation equations producing final index. Drinking Water Quality Index was then applied to Kala-oya basin in order to characterize the spatial and temporal variability of surface water quality in the basin. Kala-oya basin, located in the north-western dry zone of Sri Lanka is irrigational watershed which supplies water to agriculture, recreation and domestic purposes including drinking. Drinking Water Quality Index was calculated from ten physicochemical parameters; pH, Conductivity, Total Dissolved Solids, Turbidity, Hardness, Nitrate, Phosphate, Sulfate, Fluoride, Biochemical Oxygen Demand, Chemical Oxygen Demand, Total Coliform and Faecal Coliform periodically measured at 16 sampling sites in three reservoirs in Kala-oya basin; Kalawewa, Dambulu-oya and Bowathenna, from January to December 2014. The results revealed that Drinking Water Quality Index scores varied between 38 to 80 indicating deterioration of water quality. It was observed that surface water samples from 78% of sampling locations were categorized as 'Marginal' water quality. Results of remaining locations showed 'Fair' and 'Poor' water quality. In none of the locations, the score of the DWQI was determined as 'Good' or 'Very Poor'. Water quality analysis done for assessing the level of treatment showed all the locations need advanced water treatment. The Drinking Water Quality Index shows an overall suitability of water bodies for drinking with level of treatments. Proposed Drinking Water Quality Index can be applied for watersheds in other parts of the country.

**Key Words:** Drinking Water Quality Index, Water Quality, Water Quality Parameters, Kala-oya basin

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## TABLE OF CONTENTS

ABSTRACT.....	i
ACKNOWLEDGEMENTS .....	ii
LIST OF FIGURES .....	vi
LIST OF TABLES .....	vi
LIST OF ABBREVIATIONS .....	viii
1. INTRODUCTION .....	1
1.1 Global concern on water quality .....	1
1.2 Assessment of Water Quality.....	1
1.3 Importance of Water Quality Index .....	2
1.4 Sri Lankan Context .....	3
1.5 Kala-oya Basin.....	4
1.6 Water Quality Problems in Kala-oya Basin.....	6
1.7 Water Quality Index for Kala-oya Basin .....	7
1.8 Objectives of the Study .....	8
2. LITERATURE REVIEW .....	9
2.1 Historical Background .....	9
2.1.1 Horton’s Index (1965).....	9
2.1.2 National Sanitation Foundation Index (1970).....	10
2.1.3 Canadian Council of Ministers of the Environment Index (2001).....	12
2.1.4 Oregon Water Quality Index (2001) .....	13
2.2 Water quality indices based on physico-chemical parameters.....	14
2.2.1 Water quality indices of general water quality .....	14
2.2.2 Water quality Indices for specific water uses .....	16
2.2.3 Water quality indices for planning.....	18
2.2.4 Water quality indices through statistical approaches .....	19
2.3 Water quality indices based on biological assessments .....	21
2.4 Calculation of WQI.....	21
2.4.1 Selection of parameters.....	22
2.4.2 Development of sub-indices.....	22
2.4.3 Assignment of weightings.....	23

2.4.4 Formulating final index.....	23
2.5 Sensitivity Analysis .....	25
2.6 Summary of referred WQIs.....	26
2.7 WQIs developed in Sri Lanka.....	35
3. METHODOLOGY .....	37
3.1 Development of Drinking Water Quality Index.....	37
3.1.1 Drinking Water Quality Index .....	37
3.1.2 Selection of parameters.....	37
3.1.3 Development of sub-indices.....	37
3.1.4 Assignment of Weightings.....	42
3.1.5 Formulating Final Index .....	43
3.2 Selection of Level of Treatment.....	44
3.3 The Study Area .....	45
3.4 Data Collection .....	45
3.5 Sensitivity Analysis .....	46
4. RESULTS AND DISCUSSION .....	47
4.1 Development of Drinking Water Quality Index.....	47
4.1.1 Selection of Parameters.....	47
4.1.2 Development of Sub-indices.....	48
4.1.3 Assignment of Weightings.....	62
4.1.4 Formulating a Final Index.....	63
4.2 Selection of Level of Treatment.....	63
4.2.1 Water Quality Analysis.....	67
4.3 Evaluation of the drinking water quality status in the study area .....	68
4.4 Evaluation of spatial and temporal variability of water quality in study area.....	69
4.5 Pollution at Kala-oya basin.....	75
4.6 Sensitivity Analysis of the proposed DWQI.....	77
4.7 Possibilities and Limitations of the application of proposed DWQI .....	80
4.7.1 Possibilities .....	80
4.7.2 Limitations .....	81
5. CONCLUSIONS AND RECOMMENDATION.....	82
5.1 Conclusions.....	82

5.2 Recommendations.....	83
REFERENCES .....	85
Appendix A: Questionnaire Survey .....	91
Appendix B: Schematic representation of stream network of Kala-oya basin .....	94
Appendix C: Water quality sampling locations .....	95
Appendix D: Statistical summary of water quality measurements .....	98



## LIST OF FIGURES

Figure 3.1: Map showing study area with three reservoirs considered.....	46
Figure 4.1: Rating Curve for pH.....	49
Figure 4.2: Rating Curve for Conductivity.....	50
Figure 4.3: Rating Curve for Sulfate.....	51
Figure 4.4: Rating Curve for Total Dissolved Solids.....	52
Figure 4.5: Rating Curve for Turbidity.....	53
Figure 4.6: Rating Curve for Hardness.....	54
Figure 4.7: Rating Curve for Nitrate.....	55
Figure 4.8: Rating Curve for Phosphate.....	56
Figure 4.9: Rating Curve for Fluoride.....	57
Figure 4.10: Rating Curve for BOD5.....	58
Figure 4.11: Rating Curve for COD.....	58
Figure 4.12: Rating Curve for Total Coliform.....	59
Figure 4.13: Rating Curve for Faecal Coliform.....	59
Figure 4.14: DWQI for Kalawewa Reservoir.....	70
Figure 4.15: DWQI for Dambulu-oya Reservoir.....	71
Figure 4.16: DWQI for Bowathenna Reservoir.....	71
Figure 4.17: Categorizing of Locations using DWQI.....	72
Figure 4.18: Spatial variation of annual average DWQI for Kalawewa Reservoir.....	72
Figure 4.19: Spatial variation of annual average DWQI for Dambulu-oya Reservoir.....	73
Figure 4.20: Spatial variation of annual average DWQI for Bowathenna Reservoir.....	73
Figure 4.21: Temporal variation of DWQI for Kalawewa Reservoir.....	74
Figure 4.22: Temporal variation of WQI for Dambulu-oya Reservoir.....	75
Figure 4.23: Temporal variation of DWQI for Bowathenna Reservoir.....	75
Figure 4.24: Variation of DWQI without Phosphate for Kalawewa Reservoir.....	77
Figure 4.25: Variation of DWQI without Turbidity for Dambulu-oya Reservoir.....	78
Figure 4.26: Variation of DWQI without Turbidity for Bowathenna Reservoir.....	78
Figure B.1: Schematic representation of stream network of Kala-oya basin.....	94
Figure C.1: Water Quality Sampling Locations of Kalawewa Reservoir.....	95
Figure C.2: Water Quality Sampling Locations of Dhambulu-Oya Reservoir.....	96
Figure C.3: Water Quality Sampling Locations of Bowathanna Reservoir.....	97

## LIST OF TABLES

Table 2.1: Characteristics of index aggregation formulas .....	24
Table 2.2: Summary of referred WQIs .....	26
Table 3.1: Water Quality Standards used for the study .....	39
Table 3.2: Classification of DWQI Scores.....	44
Table 4.1: Water quality criteria used for the study.....	49
Table 4.2: Hard water classification (Mackenzie, 2010) .....	54
Table 4.3: Mathematical equations for sub index development .....	60
Table 4.4: Temporary Weightings and Weighting Factors of each parameter .....	62
Table 4.5: Health risks of water quality parameters.....	64
Table 4.6: Water Quality Analysis .....	67
Table D.1: Statistical summary of water quality measurements of Kalawewa Reservoir.....	98
Table D.2: Statistical summary of water quality measurements of Kalawewa Reservoir ...	100
Table D.3: Statistical summary of water quality measurements of Kalawewa Reservoir ...	101

## **LIST OF ABBREVIATIONS**

BOD <sub>5</sub>	Biochemical Oxygen Demand
CCME WQI	Canadian Council of Ministers of the Environment Water Quality Index
CKDu	Chronic Kidney Disease of unknown etiology
COD	Chemical Oxygen Demand
DO	Dissolved Oxygen
DWQI	Drinking Water Quality Index
MASL	Mahaweli Authority of Sri Lanka
NSF WQI	National Science Foundation Water Quality Index
OWQI	Oregon Water Quality Index
TDS	Total Dissolved Solids
WHO	World Health Organization
WQI	Water Quality Index
WQIs	Water Quality Indices
SLS	Sri Lankan Standards