

**FEASIBILITY OF IMPROVING WATER QUALITY  
USING *Terminalia arjuna* MEDICINAL PLANT AND ITS'  
ECONOMIC BENEFITS**

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(128254 M)

Degree of Master of Business Administration in Project Management

Department of Civil Engineering

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Thesis/Dissertation submitted in partial fulfilment of requirement for the  
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## **Declaration of the candidate and supervisor**

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## Dedication

This work is dedicated to both parents of mine, who laid foundation stones to all the achievements in my life.



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## Abstract

### Feasibility of Improving Water Quality using *Terminalia arjuna* Medicinal Plant and its' Economic Benefits

One of the main issues faced by the isolated rural poor communities is the unavailability of safe drinking water<sup>1</sup>, resulting in the worsening of health conditions (eg. chronic kidney disease) and related social issues. With the pollution of natural water bodies, the government has to spend enormous amount of revenue for water treatment to produce safe drinking water to the nation. Approximate cost of chemical consumption for a conventional water treatment plant is US\$4to5 per 1m<sup>3</sup> per year<sup>2</sup>and presently, NWSDB produces 590million m<sup>3</sup> of water annually<sup>3</sup> in Sri Lanka.

An opinion survey was carried-out regarding water purifying natural plants in Sri Lanka among traditional medical practitioners, through a questionnaire. The survey results show that *Terminalia arjuna* (Kumbuk[S]), *Strychnos potatorum* (Ingini[S]), *Vetiveria zizanioides* (Sevendara[S]), *Nelumbo* (Nelum[S]), *Madhuca longifolia* (Mee[S]), *Aponogeton* (Kekatiya[S]) plants are among the commonly used plants for water purification in Sri Lanka. Literature reviewed and data collected from traditional doctors and villages revealed that many traditional methods are used for water purifications with freely available natural resources. However, most of these methods lack scientific evidence and are not combined with new technological findings to improve the effectiveness of application for water purification and value addition for economic benefits.

The following is a study attempting to scientifically reveal the possibility of water purification by Medicinal Plants/*Terminalia arjuna* plants. This study included a detailed investigation of the water purification ability of *Terminalia arjuna* plants. A sample reservoirs with a significant plant coverage in the North Central province of Sri Lanka, was selected. The selected reservoirs act as drinking water sources of the villagers in the area. Water samples collected from the reservoirs were tested for a chosen pollutant concentration (Cadmium<sup>4</sup>)in the laboratory. Test results were analysed to develop a relationship between water quality and coverage of *Terminalia arjuna* plant. A trend of reducing cadmium concentration with the increase in *Terminalia arjuna* plant coverage in the surroundings, was observed.

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<sup>1</sup> In Sri Lanka, 16% of Citizens do not have access to safe drinking water, as per National Water Supply & Drainage Board (NWSDB) Website, Safe Water Coverage data, updated as at 15 July 2016.

<sup>2</sup>Green Tech Consultants (Designed and Supervision Consultant) prepared for Rideemaliyadda PS, Detailed project report for Rideemaliyadda Water Supply Scheme under ADB Financed LGESP-AF, June 2016.

<sup>3</sup>P.H. Sarath Gamini, NWSDB, Challenges in the Water Sector and Wastewater Sector, March 2013.

<sup>4</sup> Renal tubular damage due to exposure to cadmium develops at lower levels of cadmium body burden than previously anticipated - Lars Järup, et al; Low Level Exposure to Cadmium and Early Kidney Damage: The OSCAR Study, Occupational and Environmental Medicine, Vol. 57, No. 10 (Oct., 2000), pp. 668-672.

The outcome of the research demonstrates a sustainable means of water purification with a greater contribution to the forest cover.

*Keywords:* Water purification, medicinal plants, Terminalia arjuna, Cadmium, ion adsorption/adsorption.

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## List of abbreviations

<b>Abbreviation</b>	<b>Description</b>
BOD	biochemical Oxygen demand
CKD	chronic kidney disease
COD	chemical Oxygen demand
DO	dissolved Oxygen
FC	fecal coliforms
FTW	Floating treatment wetlands
FWS	free water surface
GDP	Gross Domestic Product
HLR	hydraulic loading rate
HSSF	horizontal subsurface flow
MPCA	Medical Plant Conservation Area
NCD	Non Communicable Diseases
NTU	Nephelometric Turbidity Unit
S	Sinhala name
TC	total coliforms
TFP	total factor productivity
TSS	total suspended solids
WHO	World Health Organization
MIC	minimum inhibitory concentration