### FACULTY OF APPLIED SCIENCES SABARAGAMUWA UNIVERSITY OF SRI LANKA



## OUT OF THE PRESS OUR PUBLICATIONS - OCTOBER

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# PEER-REVIEWED JOURNAL ARTICLES

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DNR
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## Influence of climate on groundwater fluoride in different climatic domains in a hard rock terrain of Sri Lanka: implications to community health

Sachintha Senarathne, J. M. C. K. Jayawardana, Rohana Chandrajith

#### ABSTRACT

Health risks associated with excessive intake of fluoride through drinking water are one of the geoenvironmental health problems observed in many parts of the world, mainly in countries of the humid tropical belt, including Sri Lanka. Fluoride- related health problems are widespread in the dry climatic region compared to the wet climatic zone of Sri Lanka. The potential health risks of fluoride for communities in a river basin which drains through two climatic zones, viz. wet and dry zones, were investigated in this study. Sixty-three groundwater samples were collected from wells in the Walawe river basin during pre- and post-monsoon periods. From collected samples, ten selected samples were analyzed for their tritium (3 H) levels to find out the approximate resident time of groundwater. In the river basin, the dry zone segment is characterized by elevated levels of fluoride (1.0 mg/L) in groundwater. Groundwater fluoride in the region was primarily of geogenic origin. The tritium values showed older groundwater contained higher fluoride levels, showing a increased dissolution of fluoride-bearing minerals. The hazard quotient (HQ<sub>fluoride</sub>) showed that about 45% of pre- and 55% of post-monsoon groundwater samples in the dry zone area were unsuitable for drinking purposes for school children who are vulnerable to non-carcinogenic risks and dental fluorosis. This study emphasizes the need for continuous water quality monitoring and mitigation measures to ensure the health of residents.

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**3** OUR PUBLICATIONS - OCTOBER

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#### Indoor Particulate Matter in Urban Households: Sources, Pathways, Characteristics, Health Effects, and Exposure Mitigation

Ling Zhang, Changjin Ou , Dhammika Magana-Arachchi, Meththika Vithanage, Kanth Swaroop Vanka, Thava Palanisami, Kanaji Masakorala, **Hasintha Wijesekara**, Yubo Yan, Nanthi Bolan and M. B. Kirkham

#### ABSTRACT

Particulate matter (PM) is a complex mixture of solid particles and liquid droplets suspended in the air with varying size, shape, and chemical composition which intensifies significant concern due to severe health effects. Based on the well-established human health effects of outdoor PM, health-based standards for outdoor air have been promoted (e.g., the National Ambient Air Quality Standards formulated by the U.S.). Due to the exchange of indoor and outdoor air, the chemical composition of indoor particulate matter is related to the sources and components of out- door PM. However, PM in the indoor environment has the potential to exceed outdoor PM levels. Indoor PM includes particles of outdoor origin that drift indoors and particles that originate from indoor activities, which include cooking, fireplaces, smoking, fuel combustion for heating, human activities, and burning incense. Indoor PM can be enriched with inorganic and organic contaminants, including toxic heavy metals and carcinogenic volatile organic compounds. As a potential health hazard, indoor exposure to PM has received increased attention in recent years because people spend most of their time indoors. In addition, as the quantity, quality, and scope of the research have expanded, it is necessary to conduct a systematic review of indoor PM. This review discusses the sources, pathways, characteristics, health effects, and exposure mitigation of indoor PM. Practical solutions and steps to reduce exposure to indoor PM are also discussed.

#### ABOUT THE JOURNAL

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#### Recycling of Triplets into Singlets for High-Performance Organic Lasers

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#### **ÅBSTRACT**

Achieving continuous-wave (CW) lasing in organic semiconductors is known to be a difficult task because long-lived triplets quench radiative singlets via singlet-triplet annihilation (STA). To avoid STA and operate organic lasers in CW or long-pulse photoexcitation, the triplets need to be removed from an organic laser gain medium. However, this triplet removal leads to a loss of excitons. In addition to removing the detrimental triplets, here it is reported a triplet recycling process, which includes triplet scavenging and successive triplet upconversion via triplet-triplet annihilation (TTA) to regenerate emissive singlet excitons in a laser medium. An anthracene derivative of 9-(1-naphthalenyl)-10-(4-(2-naphthalenyl)phenyl)anthracene (NaNaP-A) and a laser dye of 4,4'-bis[4-(diphenylamino)styryl]biphenyl (BDAVBi) are used as the triplet recycling sensitizer and the emitting laser dye, respectively. In this laser system, NaNaP-A can efficiently scavenge the triplets formed on BDAVBi because the triplet level is deeper for NaNaP-A than for BDAVBi, and then NaNaP-A successively recycles the triplets into the BDAVBi's singlet state via TTA. The TTA compensates and overcomes the STA in this laser system. Hence, these laser devices can be operated with long pulse widths of up to 10 ms. This unique triplet recycling behavior is confirmed by transient photoluminescence (PL) and electroluminescence (EL) studies.

**ABOUT THE JOURNAL** ADVANCED OPTICAL MATERIALS

IMPACT FACTOR - 9.926

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# PEER-REVIEWED BOOK CHAPTERS

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#### DNR

Farmer Adaptation to Climate Variability and Soil Erosion in Samanalawewa Catchment in Sri Lanka

E. P. N. Udayakumara

#### ABSTRACT

The Samanalawewa catchment is considered one of the most important catchments in Sri Lanka because of its diverse land uses. Hence, this study examines the long-term effects on climate variability, soil erosion soil erosion, and adoption of soil and water conservation (SWC) measures in the Samanalawewa reservoir. Rainfall and temperature data indicated that annual rainfall decreased from 1922 to 2008 by an average of 5.5 mm per year while the average annual temperature increased from 1973 to 2008 at a rate of 0.02 °C per year. Moreover, model-based soil erosion assessment disclosed that the rate of soil erosion ranges from 0 to 289 t per ha per year with an average of 4.3 t per ha per year.

#### ABOUT THE BOOK

CLIMATE CHANGE AND COMMUNITY RESILIENCE INSIGHTS FROM SOUTH ASIA ISBN 978-981-16-0680-9 (EBOOK)

HTTPS://DOI.ORG/10.1007/978-981-16-0680-

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## **CONFERENCE PROCEEDINGS**

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#### DCIS

## Neural Network-based Model for Classifying the Water Sources Based on the Physico-Chemical Parameters

Dinithi Weerasinghe, B.T.G.S Kumara, Banujan Kuhaneswaran, SK Gunatilake

#### ABSTRACT

Water is considered one of the fundamental and important requirements for world survival. Groundwater is the major water source in Sri Lanka, and most of the domestic and agricultural water requirements are performed based on dug wells since ancient. In addition, over 15,000 tube wells use in the country. Generally, groundwater quality is relatively constant over the year and good. However, the quality of the water is changed based on the chemical parameters of the water. Water quality is one of the major environmental problems in Sri Lanka. Uncontrolled use of groundwater resources becomes a crisis. Because of that, it is most important to manage the groundwater resources for different kinds of uses. Therefore, this study aimed to implement and employ the feedforward Artificial Neural Network (ANN) to determine the exact water source based on the water quality parameters in the Monaragala district. This research attempts to classify water sources using ANN fitted by MLP classifies, Support Vector Machine (SVM), and decision tree model, by taking 20 water quality parameters as input variables. Collected data from the study area, divided as 80% and 20% training and testing the models. The performances of the three models are evaluated using the predicting accuracy, precision value, recall value, R squared (R^2), Root Mean Squared Error (RMSE), and Mean Absolute Error (MAE). Performance accuracy of the ANN model pointed as 90%, the SVM model 80%, and the decision tree model 75%. The performance accuracy results present that the ANN can be used for effectively and easily classifying water sources as a viable method.

#### ABOUT THE CONFERENCE

INTERNATIONAL CONFERENCE ON DATA ANALYTICS FOR BUSINESS AND INDUSTRY PUBLISHER: IEEE 25-26 OCTOBER 2021

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FACULTY OF APPLIED SCIENCES



#### Neural Network Based Approach for Identifying Suitable Sport for Beginners

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#### ABSTRACT

Anthropometric measures and morphologic features judge a sportsman's performance. The anthropometric and physical properties of an athlete are a vital prerequisite for success in every sport. It is reasonable to think that anthropometric features of an athlete affect its level of fitness and help determine an appropriate physical condition for a specific sport. Thus, we suggest suitable sports for beginners based on the Anthropometric measurements. In this research, we proposed a neural network-based approach for identifying the suitable sport for beginners based on their anthropometric measurements. Here, we considered two sports, namely Kabaddi and Kho-Kho. We compared the neural network approach with decision tree models. According to the results, the neural network-based approach outperforms the decision tree models. Neural Network achieved 98.0% accuracy.

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INTERNATIONAL CONFERENCE ON DATA ANALYTICS FOR BUSINESS AND INDUSTRY PUBLISHER: IEEE 25-26 OCTOBER 2021 OUR SCHOLARS PROF. B.T.G.S KUMARA PROFESSOR KUMARA@APPSC.SAB.AC.LK MR. BANUJAN KUHANESWARAN LECTURER (PROB.) BHAKUHA@APPSC.SAB.AC.LK





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DCIS
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#### Analyzing Tourists' Perceptions of Tourism Destinations using YouTube Comments

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#### ABSTRACT

Tourism is an activity for individuals traveling and staying for recreation or other purposes outside the home. It is one of the world's fastest-growing industries. In our everyday activities, social media is becoming increasingly essential. This is a useful resource for travelers to propose places. YouTube has become an enormous video information platform with the most popular social media platform. By sharing, liking, commenting, and viewing the videos, users connect with them. In this article, we suggested a technique for the analysis of YouTube comments to gather travelers' views about tourist places. Here we have utilized Latent Dirichlet Allocation (LDA) modeling to predict the subjects of selected tourist sites in Sri Lanka using YouTube video comments. By manual examination of collected subjects, we determined the perspectives of tourists towards tourist locations.

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DFST

### Correlation between in-vitro starch digestibility and in-vivo glycaemic index of selected rice varieties

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#### ABSTRACT

The glycaemic index (GI) ranks carbohydrate-containing foods based on their postprandial blood glucose concentration relative to a referent carbohydrate, generally pure glucose. However, testing GI is an in-vivo process which is costly and consumes much time compare to the in-vitro starch digestion (hydrolysis index – HI) method. The objective of this study was to determine the correlation between in-vivo GI and in-vitro starch digestion HI of seven rice varieties namely "Sudu Suduru", "Fragrant Red", "Rathu Suduru", "White Basmati", "Suwandel", "Black 02" and "Red Nadu". Proximate composition of rice was determined using AOAC-2000 methods. The colorimetric phenol sulfuric acid method and the iodine colorimetric method were used to determine the available carbohydrate and the amylose content of all varieties, respectively. Thirteen healthy individuals (aged between 20-27 years and BMI between 18-23  $kg/m^2$ ) voluntarily consented to participate in the in-vivo GI study. The in-vitro HI was performed using non-restricted incubation with the  $\alpha$ -amylase enzyme followed by the colorimetric analysis for glucose. Rice variety "Rathu Suduru" recorded a high GI value (72.9±5.6). "Black-02" (48.3±1.9) and "Fragrant Red" (54.8±1.5) recorded low GI values. All other tested rice varieties: "Sudu Suduru", "Rathu Suduru", "White Basmati", "Suwandel" and "Red Nadu" had medium GI values. Amylose ( $R^2 = 0.7897$ ) and fibre content ( $R^2 = 0.9024$ ) were significantly (p<0.05) correlated with GI values. An inverse relationship was observed between fibre content and GI values of rice varieties. Based on the procedures followed in this study, GI values showed a significant correlation with HI values of starch digestion time 120 minutes ( $R^2 = 0.8003$ , p<0.05). There is a significant correlation between GI values and HI values of the tested rice varieties. Invitro studies can be used as a prediction tool for GI values of rice. Further extended studies on range of rice varieties are warranted to develop a standard correlation equation between GI and HI.

#### **ABOUT THE CONFERENCE**

Young Scientists' Conference Multidisciplinary Research (YSCMR)-2021 National Institute of Fundamental Studies, Sri Lanka (Online) 21st October 2021 MRS. K.M. SOMAWATHIE SENIOR LECTURER SOMAWATHIEKM@APPSC.SAB.A C.LK



Implications for vector transport of polyethylene microplastics bound Pb<sup>2+</sup>: adsorption capacity and interaction mechanism

OUR SCHOLAR

Madushika Sewwandi, **Hasintha Wijesekara**, Anushka U. Rajapaksha, H. **Sasimali M. Soysa**, Nadeeshani Nanayakkara, Meththika Vithanage

#### ABSTRACT

Microplastics are lightweight materials, and found ubiquitously in the aquatic environment due to the discharge of primary and secondary plastics.  $Pb^{2+}$  is a common micropollutant found in water discharged from wastewater from industries, service stations, and landfill leachate. Thus, microplastics are considered as a vector to transport Pb<sup>2+</sup> ions influencing their migration through the water. The present study is to evaluate the interactions of polyethylene (PE) microplastics (MPs) with  $Pb^{2+}$  and to assess mechanisms in between them at different environmental conditions and competing ions. The adsorption behaviour of Pb<sup>2+</sup> on PE-MPs was investigated through batch adsorption experiments under various conditions, i.e., ionic strengths (0.001-0.1 M NaNO3), pH (2-8), reaction time,  $Pb^{2+}$  loading, and the presence of dissolved organic matter (DOM) (0.5-2.5 ppm) at a PE-MPs loading of 1.0 g/L. PE-MPs were characterized by Scanning Electron Microscopy (SEM) and Fourier Transform Infrared Spectroscopic (FTIR) analysis, respectively. Surface titrations were conducted to determine the pH zero point charge of PE-MPs. The adsorption of  $Pb^{2+}$  showed a gradual increase with increasing pH, reaching the maximum adsorption at pH 5.0-6.0 and > pH 6.0 demonstrated  $Pb^{2+}$  precipitation. The overall  $Pb^{2+}$  adsorption of PE-MPs decreased at higher ionic strengths, while enhanced with increasing DOM concentration, revealing the hydrophobic and electrostatic interactions. FTIR spectra exhibited non-polar hydrophobic properties of PE-MPs. Pb<sup>2+</sup> adsorption kinetic data were well described by Elovich and Fractional power models, suggesting that adsorption was assisted through diffusioncontrolled and time-dependent processes. The isotherm equilibrium data fitted well for Freundlich and Hill isotherm models, implying multilayer adsorption. The findings demonstrated the possibility of PE-MPs to act as a vector for  $Pb^{2+}$  ions, impacting their migration and destination in water systems where the adsorption was significantly dependent on the pH, ionic strength, and DOM of the water column.

#### ABOUT THE CONFERENCE

YOUNG SCIENTISTS' CONFERENCE MULTIDISCIPLINARY RESEARCH (YSCMR)-2021

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