

## Effects of Different Ventilation Strategies on the Microclimate and Transpiration of a Rose Crop in a Greenhouse

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### Abstract

The study was aimed at reducing internal air temperatures of a greenhouse shelter as this is one of the main problems facing greenhouse management in warm climates such as in Zimbabwe. The water vapour balance method was used to evaluate the ventilation rate and the results were employed in calibrating and validating the ventilation sub-model of the greenhouse climate model, the GDGCM model, in a naturally ventilated three span Azrom type greenhouse in Zimbabwe. Two ventilation regimes namely: configuration with roof vents only with closed side vents and configuration with both side vents and roof vents open, were investigated. Crop transpiration was estimated using the Penman-Monteith method. The model was fitted to experimental data for ventilation rates, and the parameters for the model, the discharge and wind effect coefficient were determined using statistical analysis. The results showed that there was a good fit between measured and predicted values ( $R^2 = 0.702$  and  $0.729$ ) for the model on the two ventilation regimes. The air renewal rate was found to be influenced by the nature of ventilation regime in place. The model simulation revealed that the greenhouse has higher air renewal rates for the configuration with both roof and side vents. The greenhouse internal air temperature was reduced significantly for the latter configuration as it had lower simulated air temperatures than the former.

**Keywords:** ventilation rate, greenhouse, GDGCM model, air renewal, Zimbabwe.

2013, Greener Journal of Science, Engineering and Technological Research, Vol. 3(5), pp 166-181.

# Climate Change and Variability in Southeast Zimbabwe: Scenarios and Societal Opportunities<sup>\*</sup>

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## Abstract

A lot of research has been done on the negative impacts and challenges caused by extreme weather conditions due to climate change and variability. Not much research has been focused on the positive side in form of opportunities presented due to climate change. The study aimed to show the climate change scenarios and explore possible opportunities that could be derived from such scenarios in the south eastern region of Zimbabwe. The research used climate data records from three Zimbabwe Meteorological Services Department run weather stations in the region. The time series data was analyzed to show trends of rainfall and temperature over time. A questionnaire survey was also carried out to enquire from the farmers if they perceived climate change to have any opportunities. The rainfall trend analysis showed that rainfall amounts have declined at two of the three stations used. Rainfall total were also shown to be variable from year to year at all the stations. Ambient temperatures at all the stations were shown to have increased for both winter and summer. Opportunities that could be derived from climate change in the region were identified as the hydrological, agricultural and industrial. The research concludes that taking advantages of opportunities offered by climate change and variability provides the quickest way of embracing climate change adaptation.

**Keywords:** opportunities, climate change, climate variability, adaptation, rainfall, temperature, southeast Zimbabwe and Masvingo region.

2013, American Journal of Climate Change, Vol. 2(3), pp 1-10.

# Perceptions, Vulnerability and Adaptation to Climatic Change and Variability in Masvingo Province

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## Abstract

Most farmers in Masvingo Province are subsistence farmers who rely on rain fed agriculture that is becoming unreliable. The study assessed the perceptions, vulnerability and adaptation options of the farmers in Masvingo province to climate change. A quantitative questionnaire was administered, places sampled were randomly chosen in a GIS. Climatic data over 60 years was used to derive temperature and rainfall trends and for dry spell analysis. Results show that the Province is increasingly vulnerable to climate change and vulnerability as seen in the increase in the severity and length of dry spells, increase in temperatures and a late start of the rainy season. The farmers also show that they correctly perceive climate change to be occurring but they lack the means and know how to adopt. The farmers need to utilise the water bodies in the province, plant indigenous crop species and adopt drought resistant and short season variety seeds.

**Keywords:** climate change, drought, perception, vulnerability, adaptive capacity, adaptation, Masvingo Province.

2012, Greener Journal of Physical Sciences, Vol. 2(5), pp156-165.

# **Reclassification of Agroecological Zones in Zimbabwe-The Rationale, Methods and Expected Benefits: The Case of Masvingo Province**

**Chikodzi, D., Zinhiva, H., Simba, F.M. & Murwendo, T.**

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## **Abstract**

There is now a need to redraw the boundaries of Zimbabwe agro-ecological regions because the current ones developed by Vincent and Thomas (1960) have become redundant and outdated. This paper justifies the need for a reclassification of the country into disaggregated agro-ecological zones (AEZ) using Masvingo as a case in point. It examines the method, the shortcomings of the current classification and the expected benefits of the reclassified AEZs. A holistic approach is recommended in the reclassification attempt and must incorporate factors such as climate and bioclimatic features, physiographic features, edaphic characteristics, use of geospatial technologies and length of growing season. Among the benefits of the new AEZs are improved land use planning and management, high agricultural productivity, development of appropriate technologies, transferrable across similar zones, and accurate research and extension services. This paper culminates into the derivation of new AEZs in Masvingo Province at a finer scale and it is hoped similar techniques could be applied at a national scale and beyond.

**Keywords:** agroecological, zonation, climate change, Masvingo, Zimbabwe

2013, Journal of Sustainable Development in Africa (JSDA)

## **Drought monitoring for Masvingo province in Zimbabwe: A remote sensing perspective**

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### **Abstract**

The research was aimed at analysing and monitoring the seasonal occurrences of drought in Masvingo province of Zimbabwe so as to determine the areas that are prone to drought episodes. The Vegetation Condition Index which shows how close the Normalized Difference Vegetation Index of the current time is to the minimum Normalized Difference Vegetation Index calculated from the long-term record for that given time was used to monitor drought occurrence over the Province. Time series of dekadal SPOT Normalized Difference Vegetation Index images of Masvingo province were also used to compute seasonal Vegetation Condition Index maps from 2005-2010. The resulting Vegetation Condition Index maps were then classified as follows: Severe, Moderate and Mild. Results showed that droughts occur in Masvingo province at least at some place every rainy season but on average the droughts are mild rather than severe or moderate. The occurrence and the spatial distribution of drought in Masvingo was also found to be random but some parts of Chiredzi, Mwenezi and Bikita districts are more frequently beset by severe droughts than any other parts of the province.

**Keywords:** drought monitoring, Masvingo province, Vegetation Condition Index, remote sensing.

2013, Herald Journal of Geography and Regional Planning, Vol. 2(1), pp. 056 - 060

## **Geology and structure of the dryland Mutubuki wetland of Gutu, Zimbabwe**

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<sup>2</sup>Environmental Management Agency (EMA), Masvingo, Zimbabwe

### **Abstract**

The study aimed at understanding the geological factors that led to the formation of Mutubuki wetland in the Gutu District of Zimbabwe. Most studies of dryland wetlands focus on contributions from ecology, biology, and hydrology ignoring their structure and geology. As a result geology of wetlands have remained little understood yet improved understanding of the geological and sedimentological processes governing their development, is vital for the design of sustainable management guidelines for these diverse and fragile areas. The study used field surveys to gather data at a micro-catchment level and GIS techniques to combine and analyse the digital elevation model derivatives and geological map of the area. The results showed that the wetland was located at the point of contact of gneiss and granite basement rock, the wetland also sits at an interfluvial which is its major recharge zone, it also occurs on a depression at the edge of higher ground has gentle slopes. It was also observed that the wetland contained a thick layer of clay and the interfluvials contained sandy soils.

**Keywords:** Wetland geology, Interfluvials, Digital Elevation Model, GIS Techniques

2012, Herald Journal of Geography and Regional Planning, Vol. 1(2), pp. 036 – 042

## **Impacts of dam construction on tree species diversity in semi-arid regions: the case of Ruti Dam in Zimbabwe**

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### **Abstract**

The aim of the study was to assess the impacts of Ruti dam construction on tree species diversity. The study focused on a comparative impact assessment between two localities which are the upper catchment and the lower catchment. A total of 30 quadrats were sampled, 15 on each part of the catchment. Data on the tree species present and their relative abundance was collected from each quadrat. Next, we estimated tree species diversity by calculating the Shannon Weaver Index (H) for each quadrat. The Mann-Whitney U test was then used to test for significance in differences between tree species diversity in the two sections of the catchments. The results showed that tree species diversity, was significantly lower in most quadrats on the upper catchment as compared the downstream of the dam wall. This shows that dam construction despite its importance to agricultural production in semi arid regions can cause a decline in tree species diversity.

**Keywords:** biodiversity, dam construction, Shannon weaver index.

2013, Greener Journal of Environmental Management and Public Safety, Vol. 2(1), pp. 016-021.

## Omics Open Access Scientific Reports

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### **Abstract**

The aim was to produce a land suitability map which shows new agro-ecological zones in Masvingo province. The current agro-ecological regions, developed in the 1960s are now ineffective and outdated mainly due to climate change, technological change has brought new methods and tools that have a more realistic and practical classification of regions according to their agricultural potential. The input parameters, which are climatic features, soil characteristics, physiographic features and water body availability, were populated into a GIS database for processing. The different parameter maps were then weighted and combined to produce a land suitability map of Masvingo.

**Keywords:** Agro-ecological zones; Land resources database; Factor suitability classification; Analytical hierarchy process; Fussy logic and GIS.

### **Open Access**

<http://dx.doi.org/10.4172/scientificreports.318>



## **The Socio-Ecological Impacts of Mushandike Dam, Masvingo, Zimbabwe**

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### **Abstract**

Demand and supply of water over space and time is being influenced by changes in land use, population growth, industrial development and construction of dams. In this study, we focus on Mushandike dam located in Mushandike Sanctuary, Zimbabwe, and evaluate the socio-ecological impacts associated with this dam. We gathered data through interviews with local farmers and agricultural extension officers. We also retrieved historical data on rainfall, water levels, fish harvest and irrigated agricultural production linked to Mushandike dam. Following Mushandike dam construction, several people were relocated and a resettlement scheme adjacent to Mushandike Sanctuary was established with water from the dam being used for irrigation. The relocation had positive impacts in the early years of the irrigated agricultural schemes as the standard of living for the families improved. However, the situation has recently changed as the farmers are now faced with water scarcity for crop irrigation. The irrigation scheme has failed to operate for over a year now due to competing demands on the water resource. This study attributes the main cause for the water level decline in Mushandike dam to the increasing losses of water as it flows from the dam and to the irrigation canals. Water scarcity has resulted in the reduction in crop production and decreased aquatic life in the dam. There is need therefore, to improve water management in Mushandike catchment to allow for sustainable conservation and development.

**Keywords:** dam, hydrology, irrigation, land use, sustainable development, water scarcity

2012, Journal of Sustainable Development in Africa, Vol. 14,(6).

## Effect of Litter Quality and Inorganic-N on Decomposition and Nitrogen Release in Alley Cropping from Three Leguminous Agroforestry Tree Species

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### Abstract

The effects of litter quality and inorganic nitrogen (N) on rate of decomposition and N release pattern by three leguminous woody species were investigated under field conditions by the litterbag technique. The research was carried out in Zambia. The alley trees were *Leucaena leucocephala*, *Senna siamea* and *Flemingia macrophylla*. Maize was the companion crop. Dried leaf litters were placed inside litterbags and buried into the top 10-15 cm depth of soil. The four inorganic N levels were 0, 34, 68, and 112 kgNha<sup>-1</sup>. Samples were drawn at intervals of 2, 4, 8, 12, and 16 weeks and were analysed to determine remaining dry matter weight, N, lignin, cellulose, polyphenol and carbon. Major findings were that *L. leucocephala* and *S. siamea* decomposed significantly faster than *F. macrophylla*. It was also observed that the level of inorganic N had a significant effect on decomposition rate. These results show that both the chemical composition of plant residues and level of inorganic fertiliser N applied increased the rate of plant residue decomposition.

**Keywords:** Decomposition, Nitrogen release, Litterbag technique, Leguminous woody species, Alley cropping.

2013, Greener Journal of Agricultural Sciences, Vol. 3(5), pp.417-426.

## **Baobab, (*Adansonia Digitata*): A Fallback Source of Livelihood in Semi-Arid Rushinga**

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### **Abstract**

A study of the exploitation of Baobab non-timber forest products (NTFPs) was carried out to show the potential of the resource as a safety net for Rushinga Ward 17. The study sought to analyse the potential uses of baobab non-timber products as a fall back source of livelihood in semi-arid region of Rushinga. Specifically the study seeks to identify NTFP extracted from the baobab tree in Rushinga District and determine of the role of NTFP in sustaining livelihoods in times of stress and the assessment of the sustainable utilisation of baobab NTFP as a safety net in Rushinga District. Questionnaires, interviews and observations were employed to generate data for the study. It was found that fruit, leaves, bark and seed were harvested as baobab NTFPs then used to produce porridge, drinks, coffee, butter, stockfeed and relish in Rushinga. The locals derived some income from the sale of NTFPs regardless of age, education level and distance from the Baobab forests. All members of the community in the study area had access to Baobab products. The baobab products offered a source of food and income to the locals, more importantly when yields from the traditional source of livelihood, agriculture, were low. The market for baobab products abounded within the local community and from outside. However the handy source of livelihood was threatened by overexploitation of bark, developing caves for burial in tree trunks and the production of mushroom from decomposed baobab materials. Both modern and traditional institutions had a pivotal role in ensuring sustainable resource *extraction*.

2011, Zimbabwe Journal of Geographical Research.

## **Exploring Estimation of Evaporation in Dry Climates Using a Class ‘A’ Evaporation Pan.**

**Matorevhu, A. & Simba, F.M.**

Great Zimbabwe University, Faculty of Sciences, Department of Physics, Geography and Environmental Science, Masvingo, Zimbabwe

### **Abstract**

The rate of evaporation in dry climates is a concern and needs to be assessed and quantified for planning in water management activities. The main objective of the study was to investigate evaporation rate of a bare ground in Masvingo district in Zimbabwe using a class A evaporation pan. Specific objectives include calibrating the pan using the FAO-Penman Monteith (P-M) method and obtaining typical evaporation rates for the area which could be extended to represent areas of relatively similar climates. To achieve these objectives an evaporation pan was installed on a wooden grid platform near a weather station that recorded wind speed, air temperature, humidity, maximum and minimum temperatures. Considering fetch dimensions the pan results were correlated against P-M method results to give pan calibration coefficient and the slope of the curve gave a  $K_{pan}$  of 0.91 and changes in water depths with respect to pan dimensions gave average evaporation rates of 4mm/day at mean maximum temperature of  $28.5^{\circ}\text{C}$ . The evaporation rates obtained were not sustainable in the long term if water harnessing and conservation strategies are not employed.

**Keywords:** evaporation, water, pan, dry-climate, Penman-Monteith and Zimbabwe

**Factors affecting the use of male oriented contraceptives: A case study of Mukarati Community, Zimbabwe**

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**Abstract**

The subject of male sexuality has long been shrouded by silence and secrecy in Zimbabwe. As such, where contraceptive uptake has featured as part of social studies inquiry, it has tended to do so in the context of a development discourse that focused exclusively on the experiences of women. Marshaling evidence from the survey, key informant interviews, and focus-group discussions (FGDs), this study unearthed factors underlying the uptake of male-oriented contraceptives from men's perspectives. This was done through an exploration of men's knowledge, attitudes, beliefs, and practices pertaining to male-oriented contraceptives and an assessment of the availability, accessibility, acceptability, and affordability of male-oriented contraceptives. The results indicated that despite the fact that men are knowledgeable about male-oriented contraceptives, such knowledge is not being translated into practice. Social construction of masculinity is the primary encumbering block to the uptake of male-oriented contraceptives. In addition, unavailability and unaffordability of vasectomy services in the Mukarati community results in no men opting for the method. The study has thus recommended that the government and other relevant stakeholders may formulate policies that promote information, education, and communication pertaining to male-oriented contraceptives in order to foster the utilization of contraceptives by men.

2012, Open Access Journal of Contraception, 3, pp. 37-48.

# **Effectiveness of Water Hyacinth (*Eichhornia Crassipes*) in Remediating Polluted Water: The Case of Shagashe River in Masvingo, Zimbabwe**

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## **Abstract**

The aim of this study was to investigate the effectiveness of water hyacinth (*EICHHORNIA CRASSIPES*) in remediating a polluted river. Triplicate samples were collected on three different points designated SR1, SR2 and SR3 along the Shagashe River. The course of the river stretching from SR1 to SR3 was covered by over 95% water hyacinth during the period of study. SR1 was located on the upper stream, SR2 centrally and SR3 furthest downstream. Analysis for electrical conductivity, total dissolved solids (TDS), sulphates, phosphates, total hardness, pH, nitrates, nitrites and total nitrogen on all samples was done. Statistical analysis was done to check if there was a significant reduction of the parameters moving downstream. The results indicate that water hyacinth was remediating the river as noted by the significant reduction of electrical conductivity (25% decrease), total dissolved solids (TDS) (26%), sulphates (45%), phosphates (33%) and total hardness (37%) between the sample points SR1 and SR3. Statistical analysis showed no significant changes for the other parameters.

2013, Advances in Applied Science Research

**Fitting a von Bertalanffy growth model to length at age data for larval *Limnothrissa miodon* from Lake Kariba**

**Mtsambiwa, M.Z.**

Great Zimbabwe University, Faculty of Agricultural Sciences, Department of Livestock, Wildlife and Fisheries, Masvingo, Zimbabwe.

**Abstract**

The von Bertalanffy growth model was fitted to length-at-age data of larval *Limnothrissa miodon* from Lake Kariba. These data were obtained by counting the daily growth increments in the otoliths of the larvae. The model was used on the assumption that its linear methods should be replaced by non-linear fitting techniques and that the age estimate obtained from the growth increments is a true non stochastic independent variable. It should be noted that the asymptotic length used in this model is one that applies to larval, not adult, fish which is usually the case when the von Bertalanffy model is used to describe the growth of fish.

1992, CIFA Occasional Paper No 19 FAO Rome.

**Evaluation of lift-net selectivity in the freshwater sardine *Limnothrissa miodon* fishery on Lake Kariba, Zimbabwe.**

**Mtsambiwa, M.Z.**

Great Zimbabwe University, Faculty of Agricultural Sciences, Department of Livestock, Wildlife and Fisheries, Masvingo, Zimbabwe.

**Abstract**

A study to evaluate the current minimum mesh size on the lift nets in the Lake Kariba sardine fishery was carried out. Data were collected from an experimental rig fitted with a mosquito net fishing next to a commercial rig using the current minimum mesh size of 8 mm. This mesh size generated an  $L_{50\%}$  (length at which 50% of the fish are retained by the net) of 21.7 mm with a selection range of 3.5 mm (20.0 – 23.5 mm). *Limnothrissa miodon* is reported to attain maturity at 35 mm when it is about 3 months old, which means a larger mesh size would be recommended. This would, however, not be necessary at the moment as long as the regulation that fishing is restricted to more than 20 m deep is observed. As only the adult population inhabits these areas, there will be no danger of recruitment overfishing. However, it will be necessary to appraise the minimum mesh size and the appropriate depth from time to time.

**Key words:** Lift-net; selectivity; *Limnothrissa miodon*; Lake Kariba

1996, Fisheries Research 26:373-379.



## **Management of Living Aquatic Resources**

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### **Abstract**

The Southern African Development Community (SADC) region is synonymous with national parks and wildlife, spawning a thriving tourism industry. Apart from the hippos and crocodiles the region's other living aquatic resources – such as turtles, fish, shrimps, seabirds, mangroves, seagrasses and coral reefs – are often forgotten in glossy tourism promotional brochures.

These resources are found in different habitat ranging from floodplains, rivers, natural and artificial lakes and dams to coastal areas. Both the resources and their habitats form an important part of the environment in the SADC region, contributing to biological diversity and the livelihood of millions of people in different parts of the region.

1996, In Chenje, M. And Johnson, P., (Eds) Water in Southern Africa, SADC/SARDC, Maseru/Harare, (Chapter 5) pp 99-124.

# **Transforming Protected Areas System Management During Turbulent Times – The Zimbabwean Experience**

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## **Abstract**

In an effort to reduce fiscal spending, Zimbabwe has dismantled its Department of National Parks and Wildlife Management and replaced it with a new commercialized agency, the Zimbabwe Parks and Wildlife Management Authority. The Authority has a mandate to undertake commercial activities for the purpose of financing the management of the protected areas system in Zimbabwe. The sustainable use concept, encompassing both consumptive and non-consumptive uses, and the adoption of adaptive management techniques are the guiding principles for this protected area commercialization.

Authority faces significant new corporate governance challenges, namely how to strike a balance between conservation objectives and commercial development objectives and how to simultaneously serve as both regulator and competitor of commercial enterprises. Moreover, Zimbabwe is going through very challenging times politically, economically and ecologically, and the Authority faces risks to both its fiscal stability and the ecological integrity of the protected areas it oversees. The last three years have seen political instability, a hyperinflationary economy, and a tremendous drop in eco-tourism and safari hunting, which at times have generated 92% of all park revenue. The country also faces a looming ecological disaster from an overabundant elephant (*Loxodonta africana*) population, estimated during the last aerial survey at 89,000, twice the country's carrying capacity.

The change from a government-funded department to a commercialized agency also poses new challenges with respect to human resources. Managing this change will be a major undertaking, given the resistance to change that is inherent in humans in times of uncertainty. Furthermore, in the absence of government funding, fiscal sustainability means putting in place viable business ventures that do not threaten conservation. Loss of market share resulting from external factors such as depressed tourism will also require careful management.

2004, Proceedings of the World Parks Congress. Durban, South Africa September 2003.

## **Park agencies, Performance and Society in Southern Africa**

**Mtsambiwa, M.Z.**

Great Zimbabwe University, Faculty of Agricultural Sciences, Department of Livestock, Wildlife and Fisheries, Masvingo, Zimbabwe.

### **Summary**

The commercial potential of wildlife has been increasingly demonstrated by the private and community sector, yet wildlife in the state sector is characterized by decline. As a response to this park agencies in southern Africa are undergoing considerable change, and this chapter looks at its political, managerial and performance implications.

2004, In Parks in Transition: Biodiversity, Rural Development and the Bottom Line (B. Child ed., 2004). Earthscan London, (Chapter 6), pp 125-163.

# **Perspectives in Climate Change and Gender Issues: A Case Study of Masvingo Province in Zimbabwe**

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<sup>2</sup>. Department of Curriculum Studies, Faculty of Education, Great Zimbabwe University, Zimbabwe

## **Abstract**

This study focuses on the perspectives on climate change and gender issues in Masvingo. Specifically, the study sought to determine climate change scenarios for Masvingo and relate these to the views men and women have on climate change. The study is a result of climate data collected from Zimbabwe Meteorological Services Department, a questionnaire survey for Masvingo Province and interviews of key informants. Desktop studies were also carried out to supplement the change are gendered with the privileged sex. The climate change scenarios for Masvingo Province show that total annual rainfall amounts are decreasing with time while mean temperatures are increasing. This study also showed that there are significant differences ( $p < 0.05$ ) between the views of men and women on climate change in Masvingo Province. Responses to the impact of climate change will therefore need to be gender. Otherwise government policies and development policies aimed at mitigating the impacts of climate change could further entrench existing gender inequalities. Further, there is the climate change debate if policies are to promote rather than hamper gender equity.

**Keywords:** Gender, Climate Change, Mitigation, Zimbabwe

2013, Sacha J. Environmental Studies, UK. Vol. 3(1), pp 1-10.

# **An Investigation into the Effectiveness of Albizia Amara and Aloe Excelsa on Wounds**

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<sup>2</sup>Great Zimbabwe University, Faculty of Science, Department of Physics, Masvingo, Zimbabwe

## **Abstract**

The purpose of the research study was to investigate the effectiveness of traditional herbs, particularly Albizia Amara and Aloe Excelsa on the treatment of burn and open wounds. Conditions necessary for the treatment of the herbs to be effective on treatment of wounds were also considered. Interviews were used during data collection. The interviews targeted key informants which included a nurse aid, two nurses and three practioner herbalists who used the two herbs for the treatment of open and burn wounds. Laboratory experiments were later conducted at the University of Zimbabwe's Faculty of Medicine in the Pharmacy Department using Albizia Amara and Aloe Excelsa plants from Harare's National Botanical Gardens. Rats were used in conducting the experiments. The research findings were that the two plants are effective on the treatment of burns and open wounds. However, the chemicals in the plants were not established and could form the basis for further studies by researchers in the appropriate field.

## **Environmental Education and the School Curriculum in Zimbabwe: Problems and Suggested Solutions**

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### **Abstract**

Environmental Education is one of the key responses dealing with environmental problems globally. In Zimbabwe Environmental Education has undergone refinement and change as focus has shifted from nature and biophysical aspects to also incorporate other interrelated issues like social, political and economic aspects. The teaching of Environmental Education at primary school level is through the interdisciplinary approach where the main vehicle for teaching is through a course known as Environmental Science. At secondary level Environmental Education is incorporated in other courses like Science, Art, and Geography among other relevant courses. In the teaching of Environmental Education a number of problems have arisen at both levels. Chief among these include lack of resources, lack of funding, lack of clear cut policy and strategic framework and the absence of continuous staff development and recruitment. Understaffing remains one of the major challenges of many Zimbabwean schools trying to put more emphasis on Environmental Education. It is realised in this paper that there is need to improve Environmental Education teaching at secondary schools through capacity building and training of many teachers in environmental issues. The local languages should be promoted as a vehicle for promoting Environmental Education at both primary and secondary schools. This paper concludes by encouraging the strengthening of motivation, commitment, methodologies and teacher training so as to fully utilise the opportunities available in the teaching of Environmental Education in schools in the country.

2010, Zimbabwe Journal of Geographical Research, pp 62-73

## **Addressing Environmental Issues through the School Curriculum: The Zimbabwean Experience**

**<sup>1</sup>Murwendo, T., <sup>2</sup>Tshuma, D., <sup>2</sup>Chinyani, H. & <sup>2</sup>Moyo, N.**

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<sup>2</sup>Great Zimbabwe University, Faculty of Education, Department of Curriculum Studies, Masvingo, Zimbabwe

### **Abstract**

This paper seeks to contribute to a better understanding of the environmental crisis by examining the nature and extent of the environmental crisis and then exploring, in detail, how environmental education, in general, and a re-conceptualized environmental education, in particular, could, within the framework of schooling, be made a potent weapon in the war against an environmental crisis, similar to what has happened in the war against HIV/AIDS pandemic. While the paper readily acknowledges that the environmental crisis is a global crisis, it focuses quite specifically on Zimbabwe's school system and thus gives the paper a much-needed developing world perspective. It is also a reaffirmation of the fact that developing countries cannot be spectators to the environmental crisis. It establishes that Zimbabwe has responded to the environmental crisis by incorporating an integrated subject in the name of environmental science at the primary school level. However, environmental education becomes fused with other disciplines at the secondary level. The paper advocates a revision to the handling of environmental education at the secondary school level to establish a continuum from the primary school. In that way pupils will constantly be reminded of the need to care for the environment throughout the school system

2010, Journal of Sustainable Development in Africa, Vol. 12(8), pp. 1-9.

## **The Value of Backyard Trees to People's Lives in Masvingo City**

**Murwendo, T. & Munthali, A.**

Great Zimbabwe University, Faculty of Science, Department of Natural Sciences, Masvingo,  
Zimbabwe.

### **Abstract**

Most studies in urban agriculture are directed towards the growing of agricultural crops like maize while disregarding the growing of trees. The major objective of this study was to investigate the use of backyard trees by low-income residents of Masvingo City to promote the quality of life. Specifically, the study aimed at identifying the types of trees found in the properties and how the residents benefit from the trees in their properties. Opportunities on how trees could be managed were also examined. The study was carried out between June and October 2006. The study concentrated on the low income residential suburbs of Mucheke, Runyararo and Rujeko. A questionnaire survey was conducted in the suburbs. Stratified random sampling was used to identify the households. It was established that most of the properties in these suburbs had all of, or some of the exotic fruit trees, indigenous fruit trees, ornamental trees and other types of trees. The residents benefited from the products of the trees like fruits nutritionally or economically, as they would sell the tree products. Similarly, it was established that backyard trees could play important ecological functions. Numerous challenges existed which militated against the growing of fruit trees in the concerned suburbs. It was recommended that studies on urban agriculture should incorporate trees in their studies in general and concerted efforts are needed from stakeholders in nurturing trees in urban environments.

2008, Zimbabwe Journal of Geographical Research, Vol. 2(1), pp 24-37.



# **Application of GIS and Remote Sensing in Vegetation Cover Analysis and Risk Area Prediction**

**Murwendo, T.**

Great Zimbabwe University, Faculty of Science, Department of Geography and Environmental Studies, Masvingo, Zimbabwe.

## **Abstract**

The objective of this study was to determine the spatial and temporal variation of vegetation cover in Kadoma. Normalised Difference Vegetation Index (NDVI) was used to identify the potential areas of erosion and flood risks for the period between 1990 and 2002. Important factors used in the study included topographic variables like slope length, angle and shape and vegetation cover. Findings of the study revealed that there was deforestation within the built up area and the surrounding areas. Vegetation cover and slope angle were major indicators of flooding and erosion potential. The study also showed that modern tools of GIS and Remote Sensing could be effectively used in the study of urban ecology. It was recommended that urban forestry and greening of cities be encouraged in order to reduce deforestation, erosion and flooding risks.

2006, Zimbabwe Journal of Geographical Research, Vol. 1(1), pp 36 – 47.

# **The role of small-scale gold mining in promoting sustainable livelihoods among local communities in Kadoma District of Zimbabwe**

**Murwendo, T., Rusinga, O. & Zinhiva, H.**

Great Zimbabwe University, Faculty of Science, Department of Geography and Environmental Sciences, Masvingo, Zimbabwe

## **Abstract**

Small-scale gold mining increased phenomenally in Zimbabwe with the liberalisation of the economy in the early 1990s when the Government of Zimbabwe adopted the Economic Structural Adjustment Programme in 1991. It was initially concentrated along the Great Dyke which stretches from southwest to northeast across the Zimbabwean plateau but it later spread to all regions of the country due to the unspeakable economic crisis in the past decade. It became a viable livelihood strategy among poor families due to uncertainty and anxiety which characterise the Zimbabwean economic landscape. The study investigated the role of small-scale gold mining in promoting sustainable livelihoods among local communities in Kadoma District of Zimbabwe. The sustainability of small-scale gold mining is a contentious issue given the level of environmental degradation and the disruption of social relations taking place in the district. However, the sustainability of the sector mainly rests upon proper regulation by the national government in order to improve monitoring mining activities and remitting of revenue to the fiscal.

2011, *Journal of Sustainable Development in Africa*, 13(7), pp. 191-200.

# Improving Urban Livelihoods at Household Level Through Sustainable Utilisation of Peri-Urban Forests in Masvingo City

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## Abstract

on how urban residents can benefit from the existence of peri-urban forests. The purpose of the present study was therefore to highlight how urban livelihoods at household level can be improved through sustainable utilisation of peri-urban forests in Masvingo City. The objectives were to delineate the spatial extent of peri-urban forests area in the City of Masvingo and establish the present use of peri-urban forests by the low-income residents of Masvingo City. The period when demand for peri-urban forests products would be at its peak would also be assessed. Data collection was through household questionnaires, key informant interviews and direct observations. The areal extent of peri-urban forests was obtained from O/S 1: 50 000 maps of Masvingo. Other information on Masvingo City was obtained from the municipal offices. Major findings reveal that residents of Masvingo City use the peri-urban forests dominantly for the cultivation of crops to supplement their nutritional intake. The majority of the respondents also used the peri-urban forests for the collection of products like woodfuel, bark, poles, pit sand, medicine and food like honey and termites. However the residents of Masvingo City face problems in securing peri-urban products as the forests are disappearing fast and are sometimes harassed by the authorities. The paper presents pointers on the extensive use of peri-urban forests during the dry season but more importantly is the variability of peri-urban forests usage depending on the product in demand at given periods. Another important practical implication is the involvement of women and the youth in securing peri-urban products. The case study gives an insight on how urban residents can benefit and improve their livelihoods from well managed urban forests. There is need for stakeholders to educate residents on sustainable utilisation of the peri-urban forests.

**Keywords:** Per-urban, sustainable utilisation, benefits, Masvingo City, Urban residents

(2011), Journal of Sustainable Development in Africa, Vol.13, No. 4, pp 299-313, ISSN 1520-5509

**‘Traditional religion and natural resources’: A reflection on the significance of indigenous knowledge systems on the utilisation of natural resources among the Ndaу people in south-eastern Zimbabwe**

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<sup>2</sup>Great Zimbabwe University, Faculty of Arts, Department of Philosophy, Masvingo, Zimbabwe

**Abstract**

The depletion of natural resources is one of the greatest challenges with far reaching consequences if sustainable environmental management programmes are not properly put into practice in Zimbabwe. The major contending issue, however, is how the exigency of sustainable environmental management can be contextualised in light of the local indigenous knowledge systems. Although literature is abound on the recommended environmental conservation models, it is heavily influenced by western scientific discourses whose perspectives are far removed from the existential realities of local populations. In our observations, Africans were and still conscious of the devastating consequences of the unsustainable utilisation of natural resources, which the Shona people call, zvisikwa. This concept of zvisikwa is constitutive of a deep-seated symbolism whose interpretations and meanings are rooted in the religiocultural milieu of the locals. Specifically, this study is carried out among the Ndaу, a Shona linguistic group in south-eastern Zimbabwe. The traditional utilisation of natural resources is systematic and rational as people acknowledge the ability of land to continue to regenerate itself. It is this perceived paradigm of indigenous knowledge systems that the study embraces as it guarantees the continuity and harmony of the socio-cultural networks that ensure the survival of rural societies.

2010, *Journal of Ecology and the Natural Environment*, 2(9), pp. 201-206.

## **Political implications of building small dams in communal areas of Zimbabwe: The case of Mhakwe Dam in Chimanimani District**

**Rusinga, O., Murwendo, T. & Zinhiva, H.**

Great Zimbabwe University, Faculty of Science, Department of Geography and Environmental Sciences, Masvingo, Zimbabwe

### **Abstract**

The development of water resources in communal areas of Zimbabwe is now an integral part of the community-based natural resources management. The study sought to examine contentious political issues which characterize the politics of inclusion and exclusion in places with regard to claiming entitlements which resulted from the building of a small dam in Mhakwe Ward in Chimanimani District. A qualitative approach was used to select participants whereby interviewees were purposively selected on the criteria that they were once in the local dam committee, contributed labour during and after the construction of the dam and attended the meetings during the allocation of irrigated land. The study noted that although the government embraced the bottom-up approach to natural resources management and development in order to promote sustainable utilization of natural resources, the development of water resources in communal areas revealed that the success of such projects is beyond mere decentralization of power and authority to local institutions mainly because lack of respecting indigenous knowledge systems is an affront to sustainable development. It has been envisaged that local culture is a key component in attempts to improve sustainable livelihoods. The inequitable allocation of land revealed lack of respect for local dynamics of social and power relations in current sustainable rural development planning because the people who were displaced during the construction of the dam were resettled in the dryland instead of also being prioritised in the allocation of land in the irrigation project.

2011, *Journal of Sustainable Development in Africa*, 13(7), pp. 123-133.

## **Perceptions of deaf youth about their vulnerability to sexual and reproductive health problems in Masvingo District, Zimbabwe**

**Rusinga, O.**

Great Zimbabwe University, Faculty of Science, Department of Geography and Environmental Sciences, Masvingo, Zimbabwe

### **Abstract**

This article examined the perceptions of deaf youth about their vulnerability to sexual and reproductive health problems in Masvingo District of Zimbabwe. A quasi-survey was employed to carry out the field study. Therefore, a snowball sampling procedure was used to identify the respondents mainly because the target population constitutes one of the hard-to-reach groups. A sample of 50 deaf youth aged between 15 – 24 years was conveniently determined due to lack of comprehensive data of deaf population in the study area. Therefore, conclusions made in data analysis only referenced to the sampled population. Fifty questionnaires were administered among the deaf youth to collect quantitative data. Ten in-depth face-to-face interviews were carried out with deaf youth in order to qualify the magnitude of perceptions of deaf youth about their vulnerability to sexual and reproductive health problems. Sexual activity is taking place among the sampled deaf. The perceptions they had about vulnerability to sexual and reproductive health problems are mainly shaped by sexual socialization than their sensory conditions. Understanding the factors which influence the perceptions of deaf youth about sexual and reproductive health problems is significant mainly because the sexuality of people living with disabilities is poorly understood and neglected thereby putting them at risk of sexual and reproductive health problems as well as exposed to sexual violence. The study recommends that the government may adopt a human-rights approach to the provision of sexual and reproductive health services to ensure universal access information and inclusivity.

2012, African Journal of Reproductive Health, 16(2), pp. 271-282.

**Determinants of child malnutrition in Changazi Ward in Chimanimani District,  
Zimbabwe**

**Rusinga, O. & Moyo, S.**

Great Zimbabwe University, Faculty of Science, Department of Geography and  
Environmental Sciences, Masvingo, Zimbabwe

**Abstract**

Child nutritional status has been deteriorating in Zimbabwe since the early 1990s due to biological, behavioural, socio-economic, political and physical factors. A survey was used to carry out the study. A triangulation of quantitative and qualitative methods was used to ascertain the level and underlying factors of child malnutrition. A sample of 222 children under five years was determined for the anthropometric measurements. A total of 222 questionnaires were administered to caregivers of the sampled children. Qualitative data were collected using focus group discussions and in-depth interviews. The study noted high levels of chronic child malnutrition in the area. Insufficient food at the household level was the most important underlying factor of child malnutrition and had detrimental repercussions on dietary intake and diversity. The meals consumed by children were dominated by thick porridge (sadza) and green vegetables. The nutritional status of these children was being severed by high prevalence of infectious diseases such as diarrhoea, pneumonia and malaria.

2012. *Journal of Emerging Trends in Educational Research and Policy Studies*, 3(3), pp. 187-192.

## **Contested Alien Spaces and the Search for National Identity: A Study of Ethnicity in Light of Xenophobic Violence on Migrants in South Africa**

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<sup>2</sup>Great Zimbabwe University, Faculty of Arts, Department of Philosophy, Masvingo, Zimbabwe

### **Abstract**

Despite great strides made in transforming the State from authoritarian rule to multi-party democracy since 1994, the government of South Africa is facing the challenge of high influx of migrants especially from African countries north of the Limpopo River. The project of building a Rainbow Nation has been mainly centred on racial transformation but the high influx of migrants especially from African countries resulted in the reproduction of new forms of hatred and resentment. The new African migrants increased the competition of accessing national resources in a country with high inequalities yet with plenty of resources. It may be suggested that the increase in xenophobic violence since the early 2000s might be posited in a broader context. This study insisted on the argument that the xenophobic violence against African immigrants in South Africa is also embodied in the new ethnic constructions of nationalism in Africa in the era of globalisation where human mobility has become an important element in defining the African political landscape and access to resources. Historically, tensions and conflicts among ethnic groups in colonial and post-colonial sub-Saharan Africa, in general, also manifested the competitions resulted from the desire to control national resources and safeguarding social order. Xenophobic violence reflects discriminatory tendencies which are not only driven by the desire to legitimise entitlements to national resources but also of perceiving African non-nationals as a threat to social order and ethnic identity.

2012, *Migration and Development*, 1(2), pp. 206-215.



## **Prediction of Yield and Biomass Productions: A Remedy to Climate Change in Semi-Arid Regions of Zimbabwe**

**Simba, F.M.<sup>1</sup>, Mubvuma, M.<sup>2</sup>, Murwendo, T.<sup>1</sup>& Chikodzi, D.<sup>1</sup>**

<sup>1</sup> Great Zimbabwe University, Faculty of Science, Department of Physics, Geography and Environmental Science, Masvingo, Zimbabwe

<sup>2</sup> Great Zimbabwe University, Faculty of Agriculture, Department of Soil and Plant Science, Masvingo, Zimbabwe

### **Abstract**

One of the imminent threats posed by climate variability and change is food security in Zimbabwe's semi-arid regions like Masvingo. As an adaptive strategy crop forecasting was employed to improve crop productivity. The objective of the study was to investigate climatic characteristics responsible for yields in the maize, sorghum and millet and to calibrate FAO-AquaCrop for crop forecasting purposes. Crop forecasting entails prediction of yields using crop or statistical models and prescribes optimal conditions for attainment of high yields. Small grain crops like sorghum and millet are drought resistant and maize is a staple crop in Zimbabwe hence the choice in light of erratic rainfall patterns. AquaCrop model was used together with empirical results to see if the model could be relied on in crop forecasting. Seeds for the three crops were sown at the same time and were observed for five months from 1 November 2011 to 31 March 2012. Crop management practices were in place. An automated weather station was recording the soil moisture, air temperature and net radiation for the five months. The climatic data recorded by the station was used as input data in the model and it predicted yields for the crops. Comparison between simulated and observed parameters of the water balance, biomass production and final yield were used for the calibration of the model. The model gave a slightly higher harvest index (ratio of yield to biomass) than what had been obtained in the experimental treatments, with a 10% margin. The information from the station and model provided optimum temperatures and water requirements upholding water use efficiency especially where automated irrigation based on air temperatures is implemented assuming other management practices to be in place. The results from this publication are from the first year stage only and therefore are subject to improvement.

**Key words:** crop forecasting, aqua crop, model, adaptation, semi-arid, Zimbabwe

2013 International Journal of Advance Agricultural Research. Vol. 1(2) pp 14-21.

## Analysis of Trends in Dry Spells During Rainy Seasons for Masvingo Airport and Zaka Stations in Masvingo Province, Zimbabwe

Simba, F. M.\*, Seyitini, L., Murwendo T., Mapurisa, B., Chayangira, J.<sup>1</sup>, Matete, C., Chirima, J.<sup>2</sup>, Mashonjowa, E.<sup>3</sup> & Mufandaedza, J.<sup>4</sup>

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The study analyses trends in dryspell variables during the rainy season for two stations in Masvingo province, a semi-arid region in Zimbabwe. The primary objectives of study firstly to investigate the general trends in frequency and severity of dry spells, secondly to establish whether the occurrence of dry spells is random or it can be predicted and lastly to use the results to guide the decision making process on how to mitigate the problems caused by dry spells for two districts namely Zaka and Masvingo airport. Rainfall patterns have been erratic and failing to support crop production in the past two decades in rainfed farming. Incidences of droughts and floods have been prominent resulting in famines in many parts of Zimbabwe particularly Masvingo Province. Farmers now suffer the uncertainty of establishing the correct planting dates, as long dryspells or midseason drought characterize the seasons. The Zimbabwe Meteorological Services Department (ZMSD) is not fully capacitated to predict seasonal distribution of rainfall but can forecast total amount to be received during the season. Climatic data for five stations in the province was collected from the ZMSD. An investigation on trends of SNDSP and SMDSL dryspell variables was undertaken using time seriesplots. A dryspell was defined by ten or more consecutive days of no rainfall during the rainfall season. Data randomness was investigated with Minitab auto-correlation functions. The analysis established increasing dryspell frequencies and severities and data for one station was found to be random. These results are critical in crafting of coping strategies like choosing planting dates, seed varieties and ways of harnessing groundwater for irrigation purposes among others and to enhance informed planning in crop production.

**Keywords:** Seasonal length, Dryspells, Rainfed, Floods, Droughts, Zaka and Masvingo airport

2012, Journal of Environmental Research and Development, JERAD, Vol.7 No.1A. pp 218-228.

## **Environmental Changes and Farm Productivity: An Assessment of the Masvingo Province of Zimbabwe**

**Simba, F. M., Murwendo, T., Chikodzi, D.,<sup>1</sup> Mapurisa, B., Munthali, A.<sup>2</sup> & Seyitini, L.<sup>1</sup>**

<sup>1</sup> Great Zimbabwe University, Faculty of Science, Department of Physics, Geography and Environmental Science, Masvingo, Zimbabwe

<sup>2</sup> Great Zimbabwe University, Faculty of Science, Department of Mathematics and Computer Science, Masvingo, Zimbabwe

### **Abstract**

This study analyses the relationship between environmental change and farm productivity in the communal lands of Masvingo Province in Zimbabwe. Specifically the study highlights the current climate change scenarios for Masvingo, analyses the relationship between farm productivity and environmental changes and assess peoples awareness on climate change. The study is a result of records on climate from Zimbabwe Meteorological Services Department and Yields from the Ministry of Agriculture, Lands. A questionnaire survey was also conducted in the province. Two focus group discussions were held with selected members in the province. Lastly the study is a result of interviews with key informants. It was noticeable as indicated by climate data and peoples responses to the questionnaire. With the frequency of droughts increasing and the changes being the often cited symptoms for climate change. The climate change scenario in Masvingo has resulted in declining farm productivity. The people's perceptions climate change point out that the crop growing season is becoming shorter, temperatures are rising and rainfall amounts are declining, mid season droughts are also occurring frequently. The lessons learnt are that people are aware of these changes but rely less on scientific data to interpret climate change

**Keywords:** Climate Change, crop yields, drought and Zimbabwe

2012, Sacha J. Environmental Studies, UK. Vol. 2. No.1 pp 114-129.

**Climate Change Scenarios, Perceptions and Crop Production: A Case Study of Semi-Arid Masvingo Province in Zimbabwe**

**Simba, F.M., Chikodzi, D. & Murwendo, T.**

Great Zimbabwe University, Faculty of Science, Department of Physics, Geography and Environmental Science, Masvingo, Zimbabwe

**Abstract**

The paper analyses the impacts of climate change and crop production in the communal farms of Masvingo Province in Zimbabwe. The paper shows current climate change scenarios for Masvingo, analyses the relationship between climate change scenarios crop production and then prescribe adaptive measures to climate change. Historical monthly climate data from Zimbabwe Meteorological Services Department and crop yield data from the Ministry of Agriculture and Rural Development were used. A questionnaire survey was also conducted to gather farmers perceptions on climate change in addition two focus group discussions were held with selected farmers in the province. The results showed evidence of climate change through analysis of climate data, crop yields and farmers perceptions. Evidence was manifested through the increasing frequency of droughts, dry spells and the shifts of the rainfall season. It was the concluded that climate change occurring in Masvingo has resulted in significant decline in crop production. The people's perceptions shows that the crop growing seasons are becoming shorter, temperatures are rising, rainfall amounts are declining and mid season droughts are also occurring more frequently. The lessons learnt mean that people are aware of climate change and its impacts on crop production but lack the means to adapt to these changes.

**Keywords:** climate change, crop production, drought, dryspells, adaptation, Masvingo province

2012, Journal of Earth Sciences and Climatic Change Vol. 3(3), 124.

## **Analysis of Trends in Dry Spells During Rainy Seasons for Masvingo Airport and Zaka Stations in Masvingo Province, Zimbabwe**

**Simba, F.M., Seyitini, L., Murwendo, T., Mapurisa, B., Chayangira, J., Matete, C., Chirima, J., Mashonjowa, E. & Mufandaedza, J.**

Great Zimbabwe University, Faculty of Science, Department of Physics, Geography and Environmental Science

### **Abstract**

The study analyses trends in dryspell variables during rainy season for two stations in Masvingo province, a semi-arid region in Zimbabwe. The primary objectives of study firstly to investigate the general trends in frequency and severity of dry spells, secondly to establish whether the occurrence of dry spells is random or it can be predicted and lastly to use the results to guide the decision making process on how to mitigate the problems caused by dry spells for two districts namely Zaka and Masvingo airport. Rainfall patterns have been erratic and failing to support crop production in the past two decades in rainfed farming. Incidences of droughts and floods have been prominent resulting in famines in many parts of Zimbabwe particularly Masvingo Province. Farmers now suffer the uncertainty of establishing the correct planting dates, as long dryspells or midseason droughts characterize the seasons. The Zimbabwe Meteorological Services Department (ZMSD) is not fully capacitated to predict seasonal distribution of rainfall but can forecast total amount to be received during the season. Climatic data for five stations in the province was collected from the ZMSD. An investigation on trends of SNDSP and SMDSL dryspell variables was undertaken using time series plots. A dryspell was defined by ten or more consecutive days of no rainfall during the rainfall season. Data randomness was investigated with Minitab auto-correlation functions. The analysis established increasing dryspell frequencies and severities and data for one station was found to be random. These results are critical in crafting of coping strategies like choosing planting dates, seed varieties and ways of harnessing groundwater for irrigation purposes among others and to enhance informed planning in crop production.

**Key Words:** Seasonal length, Dryspells, Rainfed, Floods, Droughts, Zaka and Masvingo Airport.

2012, Journal of Environmental Research and Development, Vol. 7(1a).

# Determination of Angstrom Coefficients for Masvingo and Makoholi Stations, Zimbabwe

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Environmental Science

## Abstract

Coefficients of the first order and second order Angstrom model were obtained for Masvingo and Makoholi stations in Zimbabwe. Long term average ground measurements of sunshine hours and global horizontal solar radiation from the meteorological services were used as input data. Monthly average values of the clearness index,  $H/H_0$  and the fraction of sunshine hours,  $n/N$  were determined. Regression analysis was used to obtain the first and second order coefficients of the Angstrom model for the two locations. The estimates from the developed models were tested against measured values and results obtained were in agreement to within +/- 5%. The results also showed that the models performed better with these coefficients compared with coefficients suggested in previous researches. Also the first order model was found to perform better than the second order model for Makoholi station while the second order model works well for Masvingo.

**Keywords:** Global solar radiation, Monthly average sunshine hours, Clearness index,  
Fraction of sunshine hours.

2013, Journal of Basic & Applied Sciences, Vol. 9.