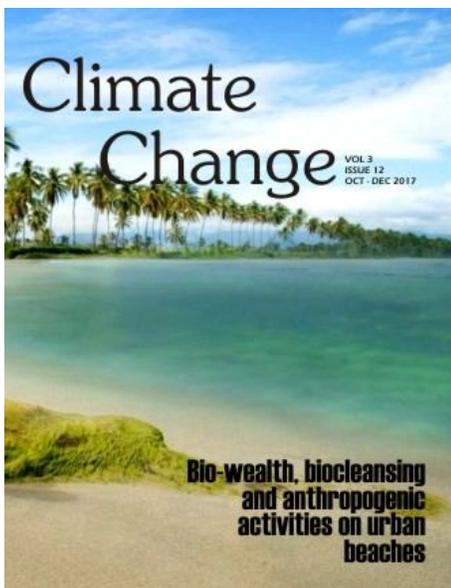# Climate Change

## About the Cover



Urban beaches play prime roles for the recreation of urban rush and hectic life as well as in the ecological balance. They provide livelihood to the locals and are home of diverse flora and fauna. In the present study, two urban beaches of Trivandrum, Kerala were selected for the pilot study on the flora, fauna and anthropogenic activities. A survey was carried out for the documentation from November 2016 to April 2017. Results revealed that the areas are home of 41 major plant species and 11 avifaunal species. Beach biocleansing agents were studied and their role in the beach ecology was documented. The visible man made activities were noted and found that plastics are the major problem on both beaches. The present study highlights the importance of urban beaches and tried to bring attention on the anthropogenic activities. The survey recommended that there is urgent need to clean these urban beaches to check the negative impacts on ecological balance and for sustainable living (Ref: Padma Mahanti, Sanjeet Kumar. Bio-wealth, biocleansing and anthropogenic activities on the two urban beaches of Trivandrum: Shankumugham & Veli. *Climate Change*, 2017, 3(12), 852-860).

## Survey

**Bio-wealth, biocleansing and anthropogenic activities on the two urban beaches of Trivandrum: Shankumugham & Veli**

Padma Mahanti, Sanjeet Kumar

Urban beaches play prime roles for the recreation of urban rush and hectic life as well as in the ecological balance. They provide livelihood to the locals and are home of diverse flora and fauna. In the present study, two urban beaches of Trivandrum, Kerala were selected for the pilot study on the flora, fauna and anthropogenic activities. A survey was carried out for the documentation from November 2016 to April 2017. Results revealed that the areas are home of 41 major plant species and 11 avifaunal species. Beach biocleansing agents were studied and their role in the beach ecology was documented. The visible man made activities were noted and found that plastics are the major problem on both beaches. The present study highlights the importance of urban beaches and tried to bring attention on the anthropogenic activities. The survey recommended that there is urgent need to clean these urban beaches to check the negative impacts on ecological balance and for sustainable living.

## Analysis

**Climate change and its impact on agricultural cropping pattern of the Old Brahmaputra floodplain in Bangladesh**

Muhammad Rezaul Rakib, Md. Nurul Islam

Bangladesh is highly vulnerable to climate change which has become a challenging issue for agriculture. Agricultural crops of Bangladesh are especially sensitive to the different variables of climate such as temperature, rainfall, humidity, day-length etc. as well as different natural disasters like floods, drought, salinity and storm surges etc. From the analysis the changing trends of climatic variability in the Old Brahmaputra floodplain, it is clear that temperature is increasing from 1975 to 2015. On the other hand rainfall and humidity has decreased. Consequently, the climate of the Old Brahmaputra floodplain is changing which has adverse effects on ecosystem, agricultural activities and also cropping pattern. Crops are destroying due to periods of extreme heat and less rains. Farmer has been losing their crops for increasing temperature, less rainfall, semi-drought, flood which are occurring for climate change. As a result farmer of the Old Brahmaputra floodplain face economic loss. Adaption strategy can consider these problems. Farmers have been adapting for changing conditions and this study suggests some adaptation strategies to climate change.

**Assessment of rate of deforestation and change of forest cover for the implication of REDD+ in Chhattisgarh over the two decades**

Deep Narayan Singh, Omprakash Madguni

Development, in developing countries, has been attained at the cost of land and forest degradation. Increasing population, poverty along with development activities exerts pressure on forest resources causing deforestation and degradation. Deforestation can be measured as there are several agencies monitoring the change in forest cover by using optical remote sensing. Reducing emissions from deforestation and degradation (REDD) has been projected as a low cost and effective strategy to mitigate deforestation and degradation process through financial incentive to depended communities. The present study is an effort to assess the rate of deforestation at district level in the state of Chhattisgarh, India between 1989 and 2015 using biannual forest cover data produce by Forest Survey of India. Over the two decades, considered in the present study, the forest of Chhattisgarh state faced various levels of Deforestation and Forest degradation due to various anthropogenic pressure build up by land diversion for industrialization and mining. However managing approximately 33,190 sq. km. of forest area were managed through village committees, which could be vital for effective implementation for REDD+ and further revise the degradation process.

## Research

**Analysis of current rainfall variability and trends over Bale-Zone, South Eastern highland of Ethiopia**

Fitsum Bekele, Nega Mosisa, Dejen Terefe

This study was mainly designed to explore current rainfall variability and trends in Bale zone for the period 1983-2015. We employed standard deviation, mean, percentage contribution and coefficient of variation for analyzing seasonal and annual rainfall variability. Results of Coefficients of variability demonstrates that kiremt (JJAS) rainfall total has the highest coefficient of variability (32.6-51.2%) compared to belg (FMAM) rainfall total (17-46.7%). The seasonal rainfall contribution to the annual rainfall totals varied largely over the study area mainly due to altitudinal change. In order to detect increasing or decreasing trends and its magnitude in a time series the non-parametric test were employed. We found that there is an observed statistically significant trend at 5 and 10% significance level over most of belg benefiting areas.  In addition, annually belg rainfall had decreased with the range of 2.6-4.8mm over Bale zone. The result further indicates that decreasing non-statistical trends of annual rainfall totals were observed over most of the stations except Dire-Shekhusen and Bidre. Due to annual and inter-annual rainfall variability and decreasing rainfall trends over the study area, it could be suggested that adaptation option should be implemented to offset the impacts related to it.

## Analysis

### Adapting smallholder farming to climate change and variability: Household strategies and challenges in Chipinge district, Zimbabwe

Emmanuel Mavhura, Desmond Manatsa, McDonald Matiashe

Africa is one of the most vulnerable continents to climate variability and change partly because of multiple stresses and low adaptive capacity. The need for robust climate change adaptation strategies appears to be much high among many African rural communities that depend on rain-fed farming. The adaptation strategies are needed to improve the resilience of the farming system and ensure food security. The study therefore, examines the household adaptation strategies of smallholder farmers in a poor agrarian district of Chipinge, Zimbabwe, and the challenges they face. The data came from questionnaires, interviews, focus groups and field observations. A thematic approach and descriptive statistics were used to analyse the data. The findings show four categories of adaptation strategies: crop management practices, land use management strategies, livestock management strategies, and non-climate dependent livelihoods. However, the smallholder farmers face challenges including lack of weather forecast specific to the study area, inadequate information to decide on crops and cultivars to plant as well limited finances. These challenges and others, reduce the smallholder farmers' adaptive capacity to climate change.

### Determinants for strategies to cope with climate-related flood hazards in Cameroon

Roland Azibo Balgah, Salliana Ateh Fondo, Theobald Mue Nji, Kester Azibo Ngwa

The increasing frequency of natural hazards and floods in particular as a consequence of climate change, and their impacts especially in developing countries cannot be overemphasized. The need for research to contribute to framing appropriate coping strategies in order to reduce downside effects especially on the poor is urgent. This paper empirically assesses the determinants for household coping decisions to climate-related flood hazards in Cameroon, fundamentally based on logistic regression analysis. The occupation of household head, livestock per capita, cash kept at household, group membership, leadership, marital status and the length of time living in the community are found to significantly influence household coping decisions. The research concludes by emphasizing the complimentarity between social community and market-based components before and after climate-related floods in order to reduce their downside effects.

## Review

### A critical review of human migration models

Hoda Rahmati S, Gurudeo Anand Tularam

Migration has always been a fundamental component of human history. During last decades several researchers have derived models for predicting mass migrations. This paper critically reviews the theories and models - qualitative structural and mathematical modelling of migration. It analyses the institutional causes of migration at the origin and the impacts of migration on destination. Migration as a consequence of climate change is also considered and modelled. Comparisons of different modelling processes provide a better understanding of migration modelling itself and the subsequent synthesis of models and variables show the differences and complementarities. The critical analysis conducted will greatly facilitate development of new more comprehensive models for migration in the future.

### Microalgae's potential of $CO_2$ sequestration and textile waste water treatment: a review

Muhammad Mubashar, Muhammad Mubashar Zafar, Muhammad Waqar Azeem, Ghulam Murtaza, Muhammad Muzamil Sultan, Muhammad Abdullah, Muhammad Saqib Mushtaq

Excessive use of fossil fuels for energy purposes leading towards climate change by emitting increased greenhouse gases level while changing climate has threatened water availability and food insecurity. On the other hand, available water resources are used unwisely. Textile industry is also contributing to loss of available fresh water resources. The textile sector consumes a large amount of water at different stages with the variety of chemicals and releases vast amount of wastewater. These effluents have serious harmful effects on ground and surface water resources and ultimately human health. Microalgae have potential to replace fossil fuel for energy purposes due to higher growth rate by sequestering atmospheric $CO_2$ in photosynthesis. Microalgal biofuel can play important role in replacing fossil fuel use by providing renewable energy. Some species of microalgae also have the ability to grow fast on polluted dye containing water and may lead towards pollution control by decreasing GHGs and wastewater treatment. Other potential uses of microalgae in food, pharmaceutical, and cosmetics industry is also discussed in this review paper.