



**Editor**  
Aida Bulucea



# **Recent Advances in Environment, Ecosystems and Development**

*Proceedings of the 13<sup>th</sup> International Conference on  
Environment, Ecosystems and Development (EED '15)*

*Kuala Lumpur, Malaysia, April 23-25, 2015*

**Recent Advances in Environment, Ecosystems and Development**

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**Preface**

This year the 13th International Conference on Environment, Ecosystems and Development (EED '15) was held in Kuala Lumpur, Malaysia, April 23-25, 2015. The conference provided a platform to discuss environmental protection, pollution control, quality of water, waste water treatment and management, urban development, ecology, cleaner energy systems, renewable energy systems, biodiversity, waste management etc. with participants from all over the world, both from academia and from industry.

Its success is reflected in the papers received, with participants coming from several countries, allowing a real multinational multicultural exchange of experiences and ideas.

The accepted papers of this conferences are published in this Book that will be sent to international indexes. They will be also available in the E-Library of the WSEAS. Extended versions of the best papers will be promoted to many Journals for further evaluation.

Conferences such as this can only succeed as a team effort, so the Editors want to thank the International Scientific Committee and the Reviewers for their excellent work in reviewing the papers as well as their invaluable input and advice.

The Editors



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## Plenary Lecture 1

### Conceptual Design of Products from Environmentally Friendly Biocomposite Materials



#### Professor S. M. Sapuan

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**Abstract:** In this lecture conceptual design of products from biocomposite material is presented. Biocomposite material is an emerging important class of composite materials that offers various advantages such as light weight, low cost, available in large quantity, renewable, environmentally benign materials, with acceptable specific strength and stiffness properties. Despite many research works have been conducted on characterization of biocomposites, limited work is reported on conceptual design of biocomposite products. Various idea generation techniques to develop biocomposite products are reported. In addition, concept evaluation techniques are also presented. Design for sustainability, which is related to conceptual design is also discussed in the context of biocomposite materials.

**Brief Biography of the Speaker:** Professor S.M. Sapuan was born on 25 September 1965, in TelukIntan, Perak, Malaysia and earned his B.Eng degree in Mechanical Engineering from University of Newcastle, Australia in 1990. Afterward he continued his study and obtained his MSc from Loughborough University, UK in 1994 and finally Ph.D from De Montfort University, UK in 1998. Later on, he has managed to pursue other qualifications including Life Fellow, International Biographical Association (LFIBA), Fellow, Institute of Materials Malaysia (FIMM), Fellow, Malaysian Scientific Association (FMSA), Life Member, Institute of Energy, Malaysia (LMInTeM), Member, International Association of Engineers, Member, Society of Automotive Engineers Inc. (MSAE), Fellow, Plastics, Rubber Institute Malaysia (FPRIM) and Honorary Life Member, Asian Polymer Association (HLMAPA), Member, International Network on Engineering Education and Research (iNEER), Member, National Professor Council, and Professional Engineer, Board of Engineers, Malaysia (PEng). Professor Sapuan is a Head, Laboratory of Biocomposite Technology, Institute of Tropical Forestry and Forest Products, Universiti Putra Malaysia (from August 2014) and Professor of Composite Materials in Department of Mechanical and Manufacturing Engineering, Universiti Putra Malaysia (UPM); the position he took up since May 2007. Prof Sapuan's contribution to his research field is evidenced by his publications. To date he has authored or co-authored more than 1000 publications on mechanical engineering, specializing mainly in composite materials, natural fibre composites, materials selection, concurrent engineering, total design and design methods including in national and international journals (450 papers published/accepted), books (11), edited books (5) and conference proceedings/seminars (385). He was invited to present keynote lectures at 11 conferences organized by various organizations such as UPM, Universiti Kuala Lumpur, Universitas Malahayati, Indonesia, and STRIDE, Ministry of Defense, Malaysia. In addition he presented 55 invited lectures in conferences and seminars. The books that he authored titled Engineering Design, Polymer-Based Composites, Product Design and Concurrent Engineering, Industrial Management, Glossary of Composite Materials, Concurrent Engineering for Composites, Materials Selection and Design, and Tropical Natural Fibre Composites. He also edited five books titled Research in Natural Fibre Reinforced Polymer Composites, Composite Materials Technology: Neural Network Applications, published by CRC Press, USA, Simulation for Undergraduates, Engineering Composites: Properties and Applications and Manufacturing of Natural Fibre Composites by Springer. His current h-index is 28 with 2917 citations. Professor Sapuan has successfully supervised 21 PhD as main supervisor and 20 PhD students as co-supervisor and is now supervising 13 PhD students. He has also successfully supervised 16 MS as main supervisors and 29 MS students as co-supervisor and is now supervising 6 MS students. In addition, he has supervised six postdoctoral researchers. Over the years, Prof. Sapuan has received numerous awards and honours, among others, 2001-2006 and 2008, 2009, 2010 and 2011 (ten times), Excellence Service Awards, UPM; 2002, Anugerah Karyawan Putra Cemerlang, UPM ((Excellent Putra Publication Award); 2002, Who's Who Award of achievement; 2005, Excellence Researcher Award (the highest number of papers published citation indexed journals); 2005, Excellence Award, science Publications, New York; 2006, Silver Medal, Malaysia Technology Expo; 2007 and 2008, Excellence Researcher Award, UPM, (publication incentive award; the highest in the category of Professor); 2007, Certificate of Excellence Award in Teaching 2007, Faculty of Engineering, UPM; 2008, Honorary

Life Member and Vice President, Asian Polymer Association, 2008, Vice Chancellor Fellowship Prize, UPM and 2008 ISESCO Science Prize in Technology, 2008 where he received a gold medal, a certificate and cash prize of USD 5,000. For 2009, Professor Sapuan is awarded with UPM Excellence Researcher Award 2008 (Special International Award and Publication incentive award; the highest in the category of professor). In 2010, Prof Sapuan is awarded with Plastic and Rubber Institute, Malaysia (PRIM) Fellowship Award, First Prize, Forest Research Institute of Malaysia (FRIM) Publication Award (Category: Semi/Non Technical Publication), 2010 and Excellent Researcher Award, Faculty of Engineering, UPM, 2008, 2010 and 2011. In 2008, his paper won the best oral presentation award in the 8th National Symposium on Polymeric Materials held in Penang, and in March 2011, his paper won the Best Poster Award in the Eight International Conference on Composite Science and Technology held in Kuala Lumpur. Also, in December 2011, his paper won the Best Poster Award in the International Conference on Innovation in Polymer Science and Technology 2011 held in Bali Indonesia. In February 2012, his paper won the Best Scientific Paper and Oral Presenter Award in UPM-UniKL Symposium on Polymeric Materials 2012 held in Melaka and the Second Place in Poster Presentation Award in SAMPE 2012 Asia Conference held in Kuala Lumpur. Professor Sapuan is listed among the ISESCO Science Laureates and is ranked the 34th in UPM's Top 100 researchers in 2011. Professor Sapuan is the recipient of Rotary Research Gold Medal Award 2012. Professor Sapuan was awarded The Alumni Medal for Professional Excellence Finalist, 2012 Alumni Awards, University of Newcastle, NSW, Australia. In 2013, professor Sapuan was awarded Khwarizmi International Award (KIA). In 2013 he was awarded with 5 Star Role Model Supervisor award by UPM. He has been awarded "Outstanding Reviewer" by Elsevier for his contribution in reviewing journal papers.

## Plenary Lecture 2

### Soil-Based Vegetation Productivity Model for Mined Lands in Chippewa County, Wisconsin, USA



**Dr. Jon Bryan Burley**

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**Abstract:** Planners, designers, scientists, government agencies, and concerned citizens are interested in reliable and predictable methods to reconstruct soil resources disturbed by surface mining. In our study, we developed a predictive model to assess neo-soil reconstruction for Chippewa County, Wisconsin, USA, an area being mined for silica sand in glass production. We were developing a model to predict plant growth based upon soil characteristics for corn (*Zea mays* L.), corn silage, oats (*Avena sativa* L. (1753)), alfalfa hay (*Medicago sativa* L.), red clover hay (*Trifolium pretense* L.), Kentucky bluegrass (*Poa pratensis* L.), soybeans (*Glycine max* (L.) Merr.), northern white cedar (*Thuja occidentalis* L.), lilac (*Syringa vulgaris* L.), American cranberry bush (*Viburnum trilobum* Marshall), amur maple (*Acer ginnala* Maxim.), gray dogwood (*Cornus racemosa* Lam.), Siberian peashrub (*Caragana arborescens* Lam.), white spruce (*Picea glauca* (Moench) Voss), eastern white pine (*Pinus strobus* L.), red maple (*Acer rubrum* L.), red pine (*Pinus resinosa* Sol. Ex Aiton), jack pine (*Pinus banksiana* Lamb.), nannyberry viburnum (*Viburnum lentago* L.), and white ash (*Fraxinus americana* L.), all plants and crops commonly grown in the county. Our results indicated that potentially four dimensions plant growth could produce a predictive model, explaining 87.24% of the variance; however only the first dimension produced a viable model explaining 41.08% of the variance. This first dimension predicted plant growth across all plant types, containing all positive eigenvector coefficients. The regression model employed the variables: soil reaction, percent organic matter, percent slope, hydraulic conductivity, topographic position, percent rock fragments, and percent clay, each with a p-value less than 0.05. The equation (1) explained 78.65% of the variance in the first dimension and was significant at a value less than  $p < 0.0001$ .

$$\text{PLANT} = -34.282 + (14.587 \cdot \text{PH}) - (4.820 \cdot \text{OM}) - (0.004 \cdot \text{SL} \cdot \text{SL}) - (0.060 \cdot \text{HC} \cdot \text{HC}) - (1.432 \cdot \text{PH} \cdot \text{PH}) \\ + (0.007 \cdot \text{OM} \cdot \text{OM}) + (0.134 \cdot \text{TP} \cdot \text{OM}) - (0.064 \cdot \text{FR} \cdot \text{OM}) - (0.078 \cdot \text{CL} \cdot \text{HC}) \\ + (0.032 \cdot \text{HC} \cdot \text{PH}) + (0.111 \cdot \text{HC} \cdot \text{OM}) + (0.573 \cdot \text{PH} \cdot \text{OM}) \quad (1)$$

Where:

PLANT = predicted plant growth

PH = soil reaction

OM = percent organic matter

SL = percent slope

HC = hydraulic conductivity

TP = topographic position

FR = percent rock fragments

CL = percent clay

This equation can be relied upon to predict vegetation plant growth correctly 9999 times in 10,000 attempts. Such equations reduce the need for costly reference areas and the need to grow vegetation on the reclaimed land to assess soil reconstruction which can take up to 10 years to determine. The equation is also useful to assess soil reconstruction alternatives.

**Brief Biography of the Speaker:** Dr. Jon Burley is a registered Landscape Architect (Minnesota), an MSU SPDC Associate Professor, and a Fellow in the American Society of Landscape Architects (ASLA). He has accomplished professional planning and design work in the U.S., Canada, France, and Nepal. Dr. Burley has published nearly 300 articles and abstracts related to landscape architecture and one book in reclamation planning and design. His work has been published in English, Chinese and French. Dr. Burley has won numerous teaching, design and research

awards, including a Fulbright to Portugal in 2003, the 2005 ASMR Reclamation Researcher of the Year Award, a 2011-2012 Invited Pre-eminent Researcher Award in France, and nine state and two national ASLA awards. He has international connections at Nanjing Forestry University, Nanjing, China; Universidade do Algarve, Faro, Portugal; and Agro-campus Ouest-Paysage, Angers, France. Dr. Burley is the past Chair of the ASLA International Professional Practice Network, past member of the AFB40 Landscape and Environmental Design Committee Transportation Research Board National Academies, past Chair of the ASLA Restoration and Reclamation Professional Practice Network, and past Chair of Chairs for the ASLA Professional Practice Network. At MSU, he works with visiting scholars and students from China, Portugal, Turkey, and France. He has lectured in Nepal, China, S. Korea, Sweden, Estonia, Portugal, Germany, France, Switzerland, Italy, U.S., the United Kingdom (U.K.), Turkey and Canada; and has led overseas studies in the U.K., France, Spain, Portugal, Germany, Turkey, Morocco, Greece and Italy. He has been a frequent participant in WSEAS meetings in Greece, France, Portugal, and China.

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