

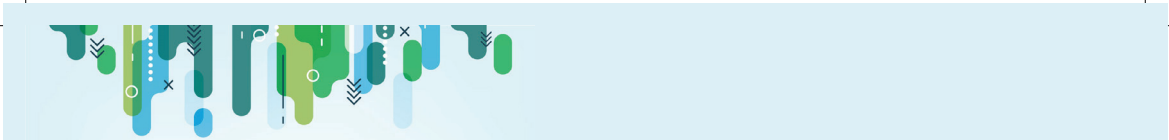


مؤتمر عجمان الدولي للبيئة
AJMAN INTERNATIONAL CONFERENCE OF ENVIRONMENT

AIEC2018

Ajman 5th International Environment Conference on
CLIMATE CHANGE & SUSTAINABILITY

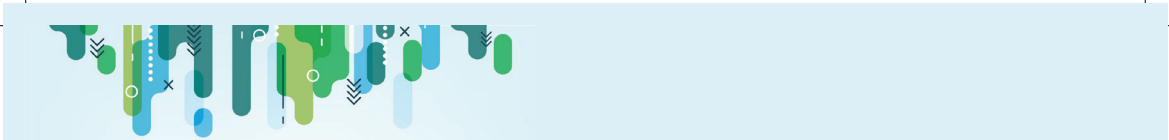
BOOK OF ABSTRACTS





His Highness Sheikh Khalifa Bin Zayed Al Nahyan

President of the United Arab Emirates

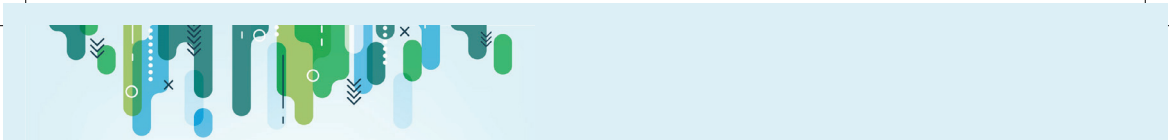




His Highness Sheikh Humaid Bin Rashid Al Nuaimi

Member of the Supreme Council

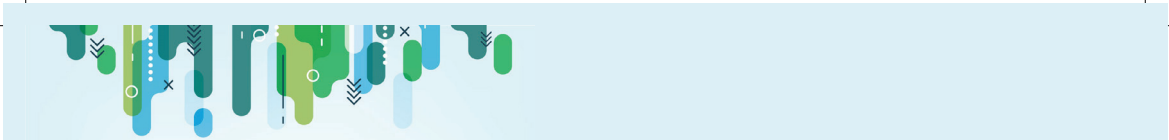
Ruler of Ajman





His Highness Sheikh Ammar Bin Humaid Al Nuaimi

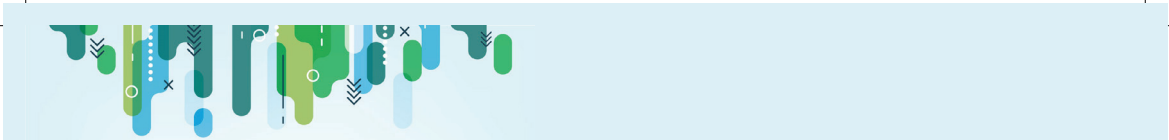
Crown Prince of Ajman,
Chairman of the Executive Council





H.H. Sheikh Rashid Bin Humaid Al Nuaimi

Chairman of the Department of Municipal and Planning
Ajman





Abdulrahman Al Nuaimi

Director General of the Department of Ajman Municipality
and Planning Department



LEGEND OF ABSTRACTS:

[KA] Keynote Address

[AM] Climate Change Adaptation and Mitigation

[BP] Best Practice

[CB] Connecting Biodiversity and Climate Change

[SC] Climate Change & Sustainable Cities

[SD] Climate Adaptation and the UN Sustainable Development Goals

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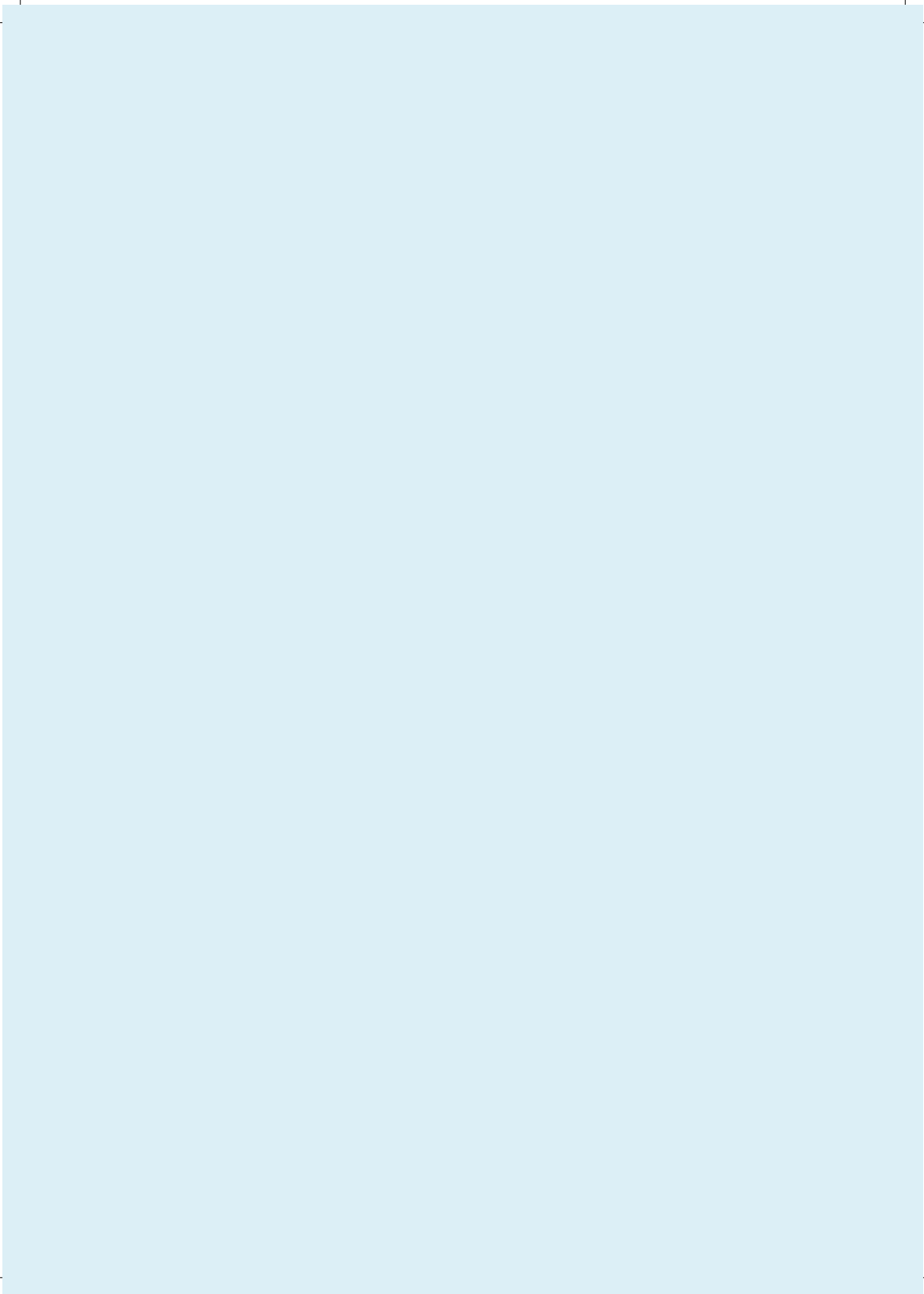
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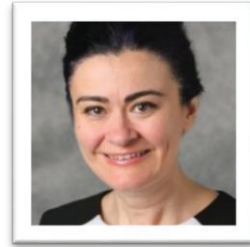


KEYNOTE SPEAKERS



Prof. Banu Örmeci

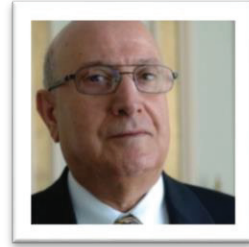
Professor and Jarislowsky Chair in Water and Health, Director of Global Water Institute, Department of Civil and Environmental Engineering, Carleton University, CANADA



Prof. Banu Örmeci received her Master's and PhD degrees from Duke University in the US. She is a full professor and Canada Research Chair in Wastewater Treatment Engineering in the Department of Civil and Environmental Engineering at Carleton University. She leads an internationally recognized research program on wastewater and biosolids treatment, and is the recipient of several research, teaching, and mentoring awards. She is also the Chair of the International Water Association's Sludge Management Specialist Group. Her research on optimization of treatment processes has resulted in several patents and new processes in the market.

Prof. Ali Sayigh

*Chairman of WREC & Director General
WREN, Chairman IEI and Med Green
Forum, UK*



Professor Ali Sayigh graduated from London University and Imperial College, BSC DIC, PhD, AWP, CEng in 1966. He is Fellow of the Institute of Energy, and Fellow of the Institution of Engineering and Technology (previously called IEE), Chartered Engineer, and Chairman of Iraq Energy Institute.

He has been Founder and Chairman of the ARAB Section of ISES since 1979, was chairman of UK Solar Energy Society for 3 years, and consultants to many national and international organizations, among them UNESCO, ISESCO, UNDP, ESCWA, and UNIDO.



Prof. Vladimir Smakhtin

United Nations University Institute for Water, Environment and Health (UNU-INWEH) Hamilton, Ontario, CANADA



Experienced manager and researcher in the broad area of water resources assessment and management, with various assignments in Russia, Ukraine, Lithuania, South Africa, Canada, Sri Lanka, India, Pakistan, Afghanistan, Bangladesh, Nepal, Viet Nam, Cambodia, Laos, Iran, Morocco, Ethiopia, Ghana, Uzbekistan, Myanmar, and other countries. He is the author of over 200 research publications.

Specialties: Large multi-disciplinary research program design and management; climate change and water resources, river hydrology, environmental flow assessments and tools development, low flows and droughts, global water scarcity, basin processes' modeling, hydrology of ungauged basins, water-related disaster risk reduction, water storage planning, and agricultural water management.

Prof. Nicholas Stow

Senior Planner in the Resiliency and Natural Systems Planning Unit at the City of Ottawa, in Ontario, CANADA



Dr. Nicholas Stow works as a Senior Planner in the Resiliency and Natural Systems Planning Unit at the City of Ottawa, in Ontario, Canada. Dr. Stow and his colleagues lead the development of the City's climate change and energy policies, conduct watershed-based land use planning, and protect natural ecosystems and biodiversity. Key policies and programs of the unit are the Air Quality and Climate Change Management Plan, Energy Evolution: Ottawa's Community Energy Transition Strategy, the Urban Forest Management Plan, the Water Environment Strategy, and the Ottawa Conservation and Stewardship Vision. Dr. Stow obtained his PhD in Ecology from the University of Ottawa, where he studied the sustainability of selection-cut forest management in northern hardwood forests. He has expertise in conservation planning, environmental planning, forest ecology, and wetland ecology and restoration.



Dr. Michael D'Andrea

*Chief Engineer and Executive Director -
Engineering & Construction Services - City
of Toronto, CANADA*



Dr. Michael D'Andrea is Chief Engineer and Executive Director of Engineering and Construction Services for the City of Toronto, where he leads almost 600 professional and technical staff and is responsible for the design and construction of the City of Toronto's municipal infrastructure, valued at over \$500 million CAD annually. Previously, Michael was the Director of Water Infrastructure Management for Toronto Water, where he was responsible for infrastructure planning, capital programming, asset management, and policy development in support of the City of Toronto's water, wastewater, and stormwater management infrastructure. In this role, he led several environmental stewardship initiatives, including the City's climate change adaptation strategy to reduce the risk of flooding from extreme storms; and, the development and implementation of Toronto's Wet Weather Flow Master Plan and guidelines, which promote green infrastructure approaches and low impact development in support of Toronto's Green Standard. Michael D'Andrea has more than 30 years of experience in the municipal engineering, water, wastewater, and construction services industry, having worked in engineering consulting, the Province of Ontario's Ministry of the Environment and Climate Change, and the City of Toronto.

Prof. Ralf Klingbeil

*Senior Expert Water, Environment,
Sustainable Development -BGR - Federal
Institute for Geosciences and Natural
Resources, GERMANY*



Dr. Ralf Klingbeil is a senior expert for water, environment, and sustainable development with extensive experience in environmental and water policy advice and management in the Middle East and Africa. Initially trained as a hydrogeologist, geophysicist, and geoscientist, with more than 20 years of professional experience in university research, teaching, private consultancies, public institutions, advisory services for UN agencies, and German federal ministries, worked as groundwater specialist and adviser for water and land resources management in Africa, Europe, and the Middle East.



Eng. Xavier Mathieu

Technical and Assistant Manager of Ajman Sewerage Concession (ASPCL), Ajman, UAE

Eng. Xavier Mathieu. Ajman Sewerage Concession (ASPCL).



Xavier Mathieu is an Engineer with 28 years of experience in water and wastewater, construction and operation, either for Public Authorities or for Industries. After his Master of Science in Electrical Engineering from Grenoble Institute of Technology, France, Xavier hold several positions in the world leading environmental company ranging from Engineering, Project Management, Consulting to Business Development. His wide expertise covers the full range of services in the water industry. Currently Technical and Asset Manager of Ajman Sewerage Concession (ASPCL), a Public-Private Partnership, Xavier is focusing on Master Planning, Infrastructure Investments required to cope with the growth of the city, improvement of the performance of the Concession and re-use of the Treated Effluent and by-products

AIEC 2018 ORGANIZING COMMITTEE



Eng. Khalid Al Housani, *Chairman of the Organizing Committee, Executive Director, Environment and Public Health, Department Ajman Municipality & Planning Department*



Eng. Humaid Al Mualla, *Co-Chairman of the Organizing Committee, Director of Public Health & Environment Department, Ajman Municipality*



Ibrahim AlShehhi, *Member of the Organizing Committee, Head of Public Relations and Media, Department Ajman Municipality & Planning Department*



Eng. Yaser Omar Kayed, *Member of the Organizing Committee, Head of Studies & Planning Unit Environmental Protection Section Ajman Municipality & Planning Department*



Dr. Eslam Alhogaraty, *Member of the Organizing Committee, Professor of Environmental Engineering – Algonquin College – Ottawa – Canada*



Eng. Shaikha Hassan Al-Shehhi, *Member of the Organizing Committee, Head of the Environmental Protection – Municipality and Planning Department – Ajman*

**AIEC2018
SCIENTIFIC
COMMITTEE**



Mirela Tase, *Physical Geography Lecturer - Albanian University, ALBANIA*



Hrabrin Bachev, *Professor - Institute of Agricultural Economics - BULGARIA*



Tag Elkhazin, *Professor - Institute of African Studies, Carleton University - CANADA*



Massoomeh Hedayati Marzbali,
Faculty Member and Program Coordinator - Islamic Azad University - ISLAMIC REPUBLIC OF IRAN



Basim Almayahi, *Professor of Environmental Science - Faculty of Science - University of Kufa - IRAQ*



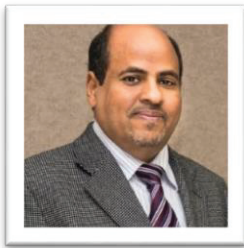
Abdul Salam Darwish, *Director and Professor at Phoenix Renewable Energy Centre - Manchester - UK*



Bassam Tawabini, Associate Professor at the Geo-sciences Department and Director of Environment & Sustainability Section at the EHS department - King Fahd University of Petroleum and Minerals (KFUPM) - KSA



Mohamed Abouleish, Associate Professor of Environmental Sciences - American University of Sharjah, UAE



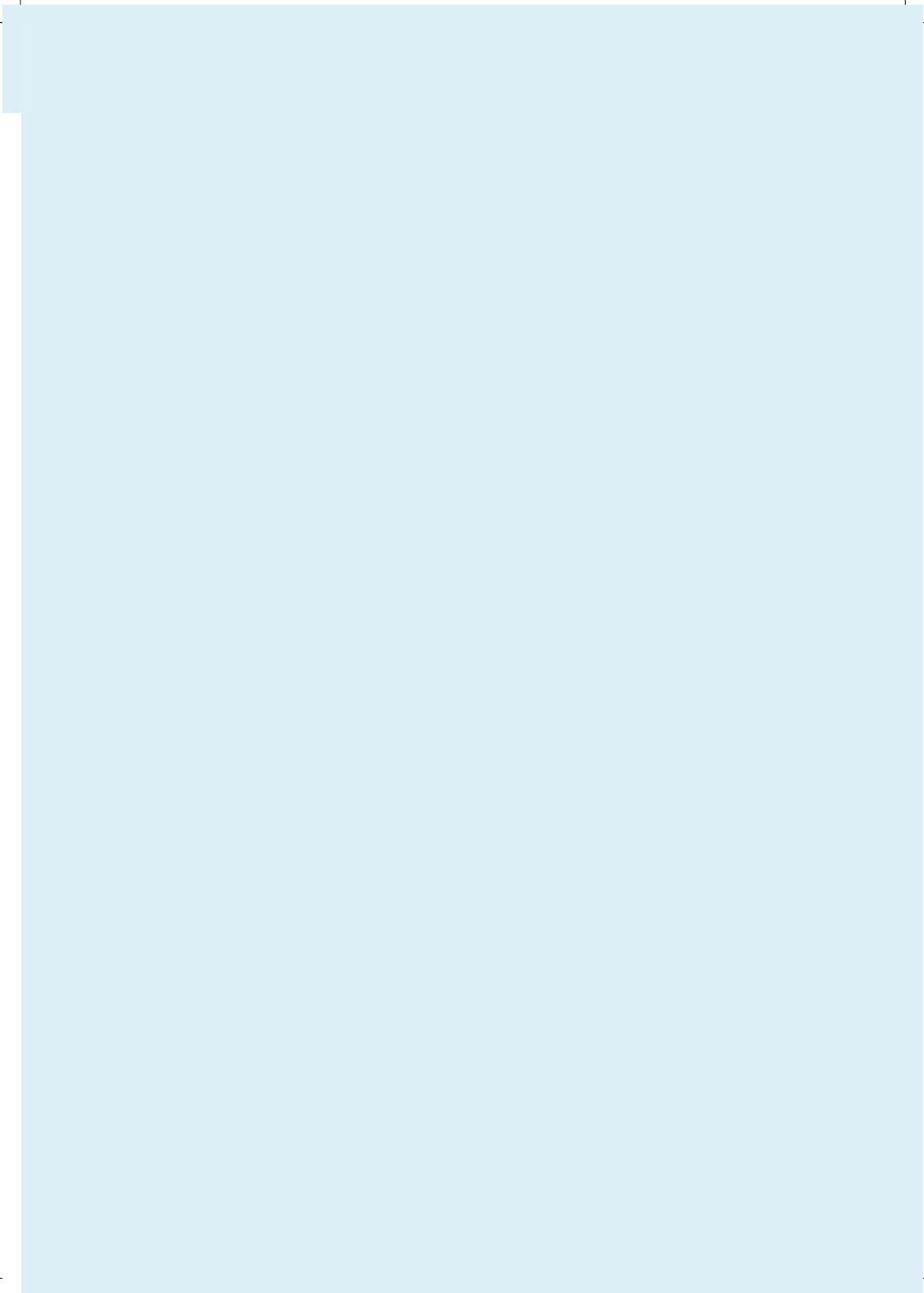
Dr. Ali Elwafi, Professor, Applied Research and Innovation, Algonquin Centre for Construction Excellence, Chairman Canadian National Capital Section (NACE), Ottawa, CANADA



Hameed Sulaiman Seyed Mohamed, Assistant Professor (Environmental Science) - Sultan Qaboos University - OMAN



Zaher Hashisho, Professor - Department of Civil and Environmental Engineering - University of Alberta – CANADA



AIEC2018
CONFERENCE
PROGRAM



Day I : Tuesday March 06, 2018

Venue: Sheikh Zayed Center for Conferences and Exhibitions,
Ajman University, Ajman – UAE

08:30 Registration

09:00 Arrival of *H.H. Sheikh Humaid bin Rashid Al-Nuaimi*, Member of the Supreme Council, Ruler of Ajman

Inauguration of the Sponsors' Exhibition

OPENING CEREMONY: Venue: Theater Hall

09:15 National Anthem

Holy Quran

Opening Address: *H.H. Sheikh Humaid bin Rashid Al-Nuaimi*, Member of the Supreme Council, Ruler of Ajman, Patron of AIEC2018

Documentary Film

Conference Speech: *H.E. Dr. Thani bin Ahmed Al Zeyoudi*, Minister of Climate Change and Environment

Speech of Guest of Honor

Ajman Annunciation

Honoring Ceremony

09:45 COFFEE BREAK

SESSION I: Keynote Addresses – PART I: Venue: Theater Hall

10:15 001KA: Climate Change and Smart Water Management. *Prof. Banu Örmeci*, Professor and Jarislowky Chair in Water and Health, Director of Global Water Institute, Department of Civil and Environmental Engineering, Carleton University, CANADA

10:35 002KA: Solutions to Reduce the Effect of Climate Change in the UAE. *Prof. Ali Sayigh*, Chairman of WREC & Director General WREN, Chairman IEI and Med Green Forum, UK

10:55 004KA: Resilience, Biodiversity, and Adaptation to Climate Change: the Ottawa Example. *Prof. Nicholas Stow*, Senior Planner in the Resiliency and Natural Systems Planning Unit at the City of Ottawa, in Ontario, Canada, CANADA

11:15 006KA: Groundwater Management and Protection in Times of Climate Change: Challenges and Opportunities in the MENA Region. *Prof. Ralf Klingbeil*, Senior Expert Water, Environment, Sustainable Development -BGR - Federal Institute for Geosciences and Natural Resources, GERMANY

11:35 Q&A Discussion

12:00 LUNCH BREAK

SESSION 3: Venue: Theater Hall

- 13:00** 390AM: Assessing Environmental Impact of Climate Change on Desert Ecosystems: A Review. Latifa Saeed AIBlooshi, UAE University, UAE
- 13:15** 369AM: Energy Performance Resilience of UAE Buildings to Climate Change. Kirk Shanks, The British University in Dubai, UAE
- 13:30** 368BP: A Study to Assess Outdoor Water Evaporation in the Context of Alternative Water Reuse for Reducing Energy Consumption in a Medical Facility Case Study, Abu Dhabi. Geraldine Seguela, Cardiff Metropolitan University, UAE
- 13:45** 232SC: Constructability of an Estidama and Building Codes Compliant SIP System in Adaptive Public Housing in UAE. Khaled Galal Ahmed, UAE University, UAE
- 14:00** 147AM: The Political Economy of National and Energy Security: The Cases of the UAE and China. Panteleimon Sklias, American University in the Emirates, UAE
- 14:15** 116CB: High-Definition NDVI Sampling of Arabian Protected Areas to Assess Rangeland Condition. David Gallacher, Zayed University, UAE
- 14:30** 334AM: A Comparison between a Stand-Alone and Grid-Connected Roof Mounted PV Solar System under Abu Dhabi Net Metering Scheme Using HOMER. Issah M. Alhamad, Mechanical Engineering Department. UAE University, UAE
- 14:45** Q&A Discussion

SESSION 3A: Venue: Room A

- 13:00** 117AM: Opening the 'Pandora's Box' of North-South Transfers of Climate Change Mitigation and Adaptation Technologies: The Case of Domestic Biogas Technology (DBT). Hyrine Gesare Munga, University of Auckland, NEW ZEALAND
- 13:15** 168AM: Assessing Greywater Reuse for Home Gardening to Improve Household Food Security within Two Villages in Fetakgomo Local Municipality. Pabalelo Radingoana, University of Limpopo, SOUTH AFRICA
- 13:30** 179AM: Assessment of CO₂ Emissions from Major Industries in Saudi Arabia. Hussein Hoteit, King Abdullah University of Science and Technology, SAUDI ARABIA
- 13:45** 343AM: Policy Driven Solar Installation and Industry: Stakeholder Analysis towards Energy Transition in Japan. Yugo Tanaka, Kyoto University, JAPAN



- 14:00** 374AM: Addressing the Best Policies for Halal Ecotourism Management in Adapting Climate Change Challenges: The Philippine Case. *Mariam Saidona Tagoranao*, Universiti Sains Islam Malaysia, MALAYSIA
- 14:15** 141AM: Energy Policies for Environmental Issues and Climate Change in Turkey. *Hasan Arman*, UAE University, Al-Ain, UAE
- 14:30** 376AM: Autonomy in Building Process to Adapt the Climate Change Impact: A Study of the Coastal Settlements in Bangladesh. *Shantanu Biswas Linkon*, Khulna University, BANGLADESH
- 14:45** Q&A Discussion
- 15:00** End of Day
- 18:30** Gala Dinner (Venue: TBA)

Day 2: Wednesday March 07, 2018

Venue: Sheikh Zayed Center for Conferences and Exhibitions,
Ajman University, Ajman – UAE

08:30 Registration

SESSION 4: Keynote Addresses – PART II: Venue: Theater Hall

- 09:00** 005KA: The City of Toronto's Climate Change Adaptation Strategy to Mitigate Urban Flooding. *Prof. Michael D'Andrea*, Chief Engineer and Executive Director - Engineering & Construction Services - City of Toronto, CANADA
- 09:20** 007KA: Ajman Sewerage System. *Xavier Mathieu*, Ajman Sewerage Company; Ajman, Ajman Emirate, UAE
- 09:40** 003KA: Unconventional Water Resources as Climate Change Adaptation Measure. *Prof. Vladimir Smakhtin*, United Nations University Institute for Water, Environment and Health (UNU-INWEH); Hamilton, Ontario, CANADA
- 10:00** Q&A Discussion

10:20 Coffee Break and Poster Presentations Session*

SESSION 5: Venue: Theater Hall

- 11:00** 269BP: Environmental Best Practices, It Begins with Us: Business, Local Governments and International Community Should Work Together. *Jung Wan Lee*, Boston University, USA
- 11:15** 139BP: In Search of Feasible Environmental Policy Making Tools in the United Arab Emirates: The Multi-Goal Approach. *Ahmed Mansour*, UAE University, UAE
- 11:30** 148SD: The Leading European and American Quintuple-Helix Model for Inclusive Sustainable Transportation: Co-Creation with Businesses, Innovators, Policy Makers, Society and the Environment. *Adrian Solomon*, South East European Research Centre, GREECE
- 11:45** 188BP: Best Practices in Environmental Governance: The Nordic Experience. *Habibul Haque Khondker*, Zayed University, UAE
- 12:00** 110BP: Tragedy Associated with Environmental Commons – An Application of The Skinnerian Behaviour Modification Strategies in Teacher Training. *Olalekan Elijah Ojedokun*, Obafemi Awolowo University, NIGERIA



- 12:15** 107SD: Achieving Sustainable Industrialization: Critical Analysis of Egypt's Sustainable Industrial Development Strategy and Assessment of the Potential for EIPs. *Suzanna El Massah*, Zayed University, UAE
- 12:30** 101BP: Renewable Energy Utilization - Aspects and Innovations: Sustainable, Green, and Smart Buildings in the Emirate of Ajman. *Abdul Salam Darwish*, Phoenix renewable Energy Centre, UK
- 12:45** –Q&A Discussion

SESSION 5A: Venue: Room A

- 11:00** 229BP: Mechanical and Thermal Properties of Perlite and Rubber Insulation Cement Mortar: Experimentally and Analytically. *Ahmed Salem Al-Tamimi*, King Fahd University of Petroleum & Minerals, SAUDI ARABIA
- 11:15** 154BP: Deficient Legislations Sanctioning Oil Spill and Gas Flaring in Nigeria; A Need for a Review of the Petroleum Industries Bill towards Better Environmental Regulation in Nigeria's Oil and Gas Sector. *Chukwuemeka Chuks-Ezike*, Robert Gordon University, UK
- 11:30** 276BP: Assessment of water quality of River Assi by using WQI, Varanasi, India. *Sachin Mishra*, Indian Institute of Technology (BHU) Varanasi, INDIA
- 11:45** 250BP: Formation of Hierarchical Zinc Oxide Nanostructures for Solar Energy Converters and Photovoltaics. *Sergiy N. Lavrynenko*, National Technical University "Kh.P.I.", UKRAINE
- 12:00** 277BP: Analysis of cool roof passive techniques for residential buildings in subtropical humid climate. *K K Pathak*, Indian Institute of Technology (BHU) Varanasi, INDIA
- 12:15** 198BP: The Design of Public Health Management System Information Control Based on Software Define Networking (SDN). *Ayotuyi Tosin Akinola*, Centre of Excellence, University of Zululand, SOUTH AFRICA
- 12:30** 349BP: Green Energy is the future Energy. *Riadh H. AL-Dabbagh*, Ajman University, Ajman, UAE
- 12:45** Q&A Discussion

SESSION 5B: Venue: Room B

- 11:00** 138CB: Simulations of Conjunctive Use with MODFLOW in Agricultural Region of Colorado River Delta, Mexico. *Kedir Mohammed Bushira*, Universidad Autonoma de Baja California(UABC), MEXICO

- 11:15** 136CB: Use of Remote Sensing Data in Assessment Land Cover Changes, Land Use Patterns, and Land Capabilities in Al-Qassim Region, Saudi Arabia. *Yousef Nazzal, Zayed University, UAE*
- 11:30** 191CB: Mapping Cultural Ecosystem Services in Different Landscapes of the Uzbek Ugam Chatkal National Nature Park. *Madina Bekchanova, UNDP, UZBEKISTAN*
- 11:45** 308BP: Dibbin Transect Model: A New Framework for Mainstreaming Biodiversity Conversation into Land Use Planning. *Deema Mohammad Abu Thiab, Consolidated Consultants Group CCG, JORDAN*
- 12:00** 291SC: Impact of Green Spaces on the Urban Micro-climate through Landsat 8 and TIRS data, in Varanasi, India. *Ashwani Kumar Agnihotri, Indian Institute of Technology (BHU) Varanasi, INDIA*
- 12:15** 142CB: Ecological Niche Modeling of Important UAE Tree and Shrub Species using MaxEnt and Global Environmental Data. *Taoufik Saleh Ksiksi, UAE University, UAE*
- 12:30** 320SD: Assessing and Evaluating Above Ground Biomass (AGB) and Evaluating Carbon Sequestered Using Medium to High Resolutions Satellite Imagery. *Basam Dahy, UAE University, UAE*
- 12:45** Q&A Discussion

SESSION 5C: Venue: Room C

- 11:00** 316SC: How to Build a Smart Climate City Conserving and Using Biodiversity. *Gabriela Teodorescu, Valahia University of Targoviste, ROMANIA*
- 11:15** 333SC: Current and Alternative Scenarios for Reducing Carbon Emission: A Case Study from Muscat Express Highway Lighting System. *Ahmed Al-Mayahi, Sultan Qaboos University, OMAN*
- 11:30** 165SC: Increased Fossil Fuel Consumption: Implications on Energy Efficiency and Economic Growth. *Kehinde Damilola Ilesanmi, Department of Economics, University of Zululand, , SOUTH AFRICA*
- 11:45** 317SC: Sustainable City Transport Development and Reduction of Greenhouse Gases Emissions Through Introduction of Biodiesel Fuel. *Kakha Karchkhadze, Ilia State University, Georgia, GEORGIA*



- 12:00** 184SD: The Study of Product Obsolescence: Finding Optimal Lifespan of Electronic Product Using Game Theory Approach. *Rafika Farah Maulia*, University of Indonesia, INDONESIA
- 12:15** 265SD: Municipal Solid Waste Composition and Greenhouse Gas Emission Potential from a Landfill – A Case Study from Muscat, Oman. *Hameed Sulaiman*, Sultan Qaboos University, OMAN
- 12:30** Q&A Discussion

13:00 LUNCH BREAK

SESSION 6: Venue: Theater Hall

- 14:00** 280CB: Rehabilitation of Coastal Habitats to Protect Biodiversity and Livelihood from Climatic and Non-Climatic Factors - A Vital Management Tool. *J.K. Patterson Edward*, Suganthi Devadason Marine Research, INDIA
- 14:15** 284CB: The Ecological Impacts of Climate Change in Hot Regions: Can Nile Tilapia Adapt to Global Warming? *David L. Thomson*, Biology Department, UAE University, UAE
- 14:30** 305CB: Risk Assessment of Green Turtle Habitat through Geospatial Indicators A Case Study of Hawks Bay Beach, Karachi-Pakistan. *Farheen Khanum*, ECOBUILD Sustainability and Renewable Energy Consultants, UAE
- 14:45** 266CB: Protecting the Natural Ecosystems for Building Climate Resilient Cities as Carbon Sink. *Abdullah Al-Nadabi*, Sultan Qaboos University, OMAN
- 15:00** 120SD: Comparing Social Costs of Conventional Rice Production System and System of Rice Intensification: A Case Study of Indonesia. *Mohamad Maulana*, ICASEPS, INDONESIA
- 15:15** 298SC: Development of Ornamental Plants Modules Based on Outdoor Hydroponics. *Moustafa Fadel*, UAE University, UAE
- 15:30** Q&A Discussion

SESSION 6A: Venue: Room A

- 14:00** 358SC: Impact of building setback on environmental sustainability: A study of leftover space of residential building in Khulna. *Md Raihan Khan*, Khulna University, BANGLADESH

- 14:15** 241SD: The Expanded Bed Biofilm Reactor: Innovative Technology for Advanced Treatment of Used Water. *Michael J. Dempsey*, Manchester Metropolitan University, UK
- 14:30** 391BP: Behaviour of Nuclear Power Plant Wall under Different Aircrafts. *Pabitra Maiti*, Indian Institute of Technology (BHU) Varanasi, INDIA
- 14:45** 249BP: Synthesis of Highly Efficient Sorbents Based on Copper and Cadmium Sulfides for Water Purification. *Sergiy N. Lavrynenko*, National Technical University, "Kh.P.I.", UKRAINE
- 15:00** 382SC: A Proposal for A Sustainable Local Neighborhood/ Case Study of Mezyad. *Meera Khalfan*, UAE University, UAE
- 15:15** 270SC: Smart Mobility through the Integration of Land use and Transportation – A case study of Chennai Metro Rail station. *Sheeba Chander*, Hindustan Institute of Technology and Science, INDIA
- 15:30** Q&A Discussion

SESSION 6B: Venue: Room B

- 14:00** 118CB: Carbon Sequestration Implementation through Sustainable Agricultural Land Management (SALM) Methodology in Nigeria. *Idowu Oluropo Ologeh*, Dangote Projects, NIGERIA
- 14:15** 119BP: Study on Soil Erosion And Nutrient Loss of Nitrogen and Phosphorus in Sugarcane Cropping Systems. *Hongwei Tan*, Guangxi Academy of Agricultural Sciences, CHINA
- 14:30** 203CB: The Forest Heritage and Sustainable Development of Morocco (Cedar-Barbary Macaques): Is There a Link Between the Degradation of the Cedar Forest, the Barbary Macaques and Climate Change? *Faical Boutlib*, Université Sidi Mohamed Ben Abdellah, MOROCCO
- 14:45** 273BP: Green Fodder Production and Effect of Different Saline Water Levels Under Hydroponic Barley. *Basel Awni Natsheh*, Palestine Technical University, PALESTINE.
- 15:00** 275SC: Sustainable Development in the UAE Through Cement-Free Geopolymer Concrete. *Hilal El-Hassan*, UAE Univeristy, UAE
- 15:15** Q&A Discussion



SESSION 6C: Venue: Room C

- 14:00** 392AM: The Role Of Climate Change and Agricultural Practices on Deterioration of Groundwater in Wadi As-Sirhan Basin, Al Jouf, Kingdom Of Saudi Arabia. *Ibrahim Bin Muhammad Aboabat*, Watania Agriculture, SAUDI ARABIA
- 14:15** 321AM: Application of Smart Cities Techniques in Integrated Planning and Sustainable Urban Energy Systems in Ijapo Housing Estate, Akure Nigeria. *Kolawole Atinuke J.*, Toyinks Planning Associates, NIGERIA
- 14:30** 133AM: Predictors of recycling behavior: A survey-based study in the city of Sharjah, UAE. *Lutfi Kawaf*, University of Sharjah, UAE
- 14:45** 159CB: Human Demand on Nature: Where Do We Stand vis-à-vis World Scenario? *Tareefa Alsumaiti*, UAE University, UAE
- 15:00** 367SC: Receding wetlands in peri-urban area and urban vulnerability to climate change: A case study of Lucknow City, India. *Kashif Imdad*, PPN PG College, INDIA

Closing Ceremony

- 15:45** Wrap-up, Recommendations and Closing Ceremony
- 18:30** City Sightseeing Tour (Ajman and Dubai)

10:20-11:00 POSTER PRESENTATIONS Venue: TBA

- 131BP: Drone Ecology Research Network. *David Gallacher*, Zayed University, UAE
- 140SC: Groundwater Potential Evaluation Based on Integrated GIS and Remote Sensing Techniques, Bilate River Catchment: South Rift Valley of Ethiopia. *Tesfaye Tessema Gintamo*, University of the Western Cape, SOUTH AFRICA
- 149SD: Role of Information and Communication Technologies (ICTs) in Flood Risk Mitigation. *Javed Ali*, UNESCO-IHE, NETHERLANDS
- 346SC: Assessment of Climate Changes Impacts on Groundwater Recharge in Eastern UAE. *Mohamed Mohamed*, UAE University, UAE
- 377SC: Optimization of Double Skin Facades for High Rise Buildings in Hot Arid Climates. *Ann Johnny*, Heriot Watt University, UAE
- 378SC: Air quality management through sustainable urban transport measures: A step towards climate change mitigation. *Pawan Kumar Singh*, National PG College, INDIA

KEYNOTE ADDRESSES



001KA: CLIMATE CHANGE AND SMART WATER MANAGEMENT

Prof. Banu Örmeci

Professor and Jarislowsky Chair in Water and Health, Director of Global Water Institute, Department of Civil and Environmental Engineering, Carleton University, CANADA

Abstract. Rapid population increase, urbanization, and climate change exert many infrastructure challenges to cities, and it has become increasingly challenging for municipalities to provide safe and financially sustainable water and sanitation services. Smart water management (SWM) has become an important tool in dealing with urban water challenges in a proactive rather than a reactive manner. Smart water management includes all aspects of resource water protection and drinking water, stormwater, and wastewater management. Climate change has put more pressure on water and wastewater infrastructure in cities in recent years due to floods, droughts, rising sea levels, and pollution, which will likely get worse in the future. The World Economic Forum's recent Global Risk Report has identified these water risks to have the largest global impact over the next few decades. Therefore, cities around the world need to get ready to face these new water challenges using smart, feasible, sustainable, and energy efficient management tools and approaches. Integration of information and communication technologies (ICTs) allow real-time monitoring and control of water and wastewater infrastructure and play an important role in achieving

water smart cities. However, there are many other cheaper and low-tech smart water management approaches that can be employed quickly resulting in substantial benefits and savings for cities dealing with climate change impacts. Prof. Örmeci's talk will focus on a range of smart water and wastewater management tools and approaches, and will provide examples from cities in North America in implementing these tools and becoming water smart cities.



002KA: SOLUTIONS TO REDUCE THE EFFECT OF CLIMATE CHANGE IN THE UAE

Prof. Ali Sayigh

Chairman of WREC & Director General WREN, Chairman IEI and Med Green Forum, UK

Abstract. I have lived in the region for 17 years and started research in Renewable Energy in Saudi Arabia in September 1969, where the extreme desert climate with solar radiation reaches 9.0 kWh/m²/day in July and August, while average solar radiation intensity throughout the year reaches 5 kWh/m²/day. Air temperature during the above months reaches 60°C. In an article on Saturday 19 August, 2017, it was reported that Kuwait temperature reached 54°C. This forced attention on people's homes; would air-conditioning be able to cool everyone? If an electricity power cut were to happen, then would everyone suffer? I remember a colleague (The President of Al-Ain University in Abu Dhabi) in 2007 telling me the story of how in June, same year, during a power cut, the only way for him to stay cool was to get into his American-made car and drive for three hours with the air-conditioning on. In July 2010, 10,000 old people died in Paris during an exceptionally high heat wave. Why is this happening? In short, the main reason is the ineluctable rise in CO₂ emissions which has set climate change in motion. Now, regrettably, we have reached the point where we cannot stop the reaction but we must address slowing it down and reducing its impact. A major action plan is to understand the situation and work towards creating GREEN CITIES.

003KA: UNCONVENTIONAL WATER RESOURCES AS CLIMATE CHANGE ADAPTATION MEASURE

Prof. Vladimir Smakhtin,

United Nations University Institute for Water, Environment and Health (UNU-INWEH), Hamilton, Ontario, CANADA

Abstract. Freshwater scarcity is increasing and around 4 billion people already live under conditions of severe water scarcity for at least one month of the year. Given changing climate and rainfall patterns, global water scarcity will further intensify. The conventional water resources – surface water in rivers and lakes, as well as ground water in many regions, are becoming insufficient to meet the needs in water scarce areas even though water-use efficiency techniques improved over time. Thus, water-scarce countries and regions are expected to increasingly consider and rely on alternative (unconventional) water resources – to narrow the water demand-supply gap. Unconventional water resources are those that are generated as a by-product of specialized processes; they may need suitable pre-use treatment before use; they may require effective on-farm management when used for irrigation; or they may need special technologies to collect and access water. Examples of unconventional water resources include, but are not limited to: desalination of seawater and highly brackish groundwater; groundwater confined in deep geological formations; physical transportation of water through icebergs and tankers; micro-scale capture of rainwater where it otherwise evaporates; atmospheric moisture harvesting using



processes such as cloud seeding, fog water collection; and residual/used water from urban areas and agriculture.

Despite their multiple benefits, the potential of unconventional water resources is vastly under-explored. While the technologies on developing and using these new water resources are emerging, significant barriers to their adoption exist in most locations. Low awareness of the potential and options for unconventional water sources create a situation where countries lack flexible policy frameworks and clear policy action. Limitations in national institutions to appreciate how they can benefit from these new possibilities, or to do comprehensive economic analyses, create the perception that these water resources are too costly to pursue. Given the enormous task of achieving the SDG 6 goal (the “water goal”) and its targets, it is high time for water scarce countries to plan and implement activities beyond conventional water resources to address water scarcity, and as a climate change adaptation measure. The presentation will explore the global status and prospects of unpacking the potential of such water resources.

004KA: RESILIENCE, BIODIVERSITY, AND ADAPTATION TO CLIMATE CHANGE: THE OTTAWA EXAMPLE

Prof. Nicholas Stow,

*Senior Planner in the Resiliency and Natural Systems Planning Unit at the
City of Ottawa, in Ontario, CANADA*

Abstract. Successful climate change adaptation depends greatly on resiliency: the ability of systems – social, cultural, economic, or biological – to recover from stress and change. Resiliency, in turn, depends greatly on diversity, which increases the adaptive and the evolutionary potential of a system. Biological diversity, or biodiversity, increases the capacity of ecosystems to adapt successfully to climate change and to provide critical services to humans. Conversely, the overwhelming magnitude and speed of climate change threatens to reduce biodiversity through many different mechanisms. Conservation of biodiversity for its own sake and for protection of ecosystem services has become an important challenge in climate change adaptation.

The City of Ottawa, which sits securely in the northern, temperate zone away from the coast, faces a modest set of climate change challenges compared to most places. Nonetheless, even those modest challenges pose substantial threats to the health and safety of its citizens, as well as threats to the City's long-term economic security and sustainability. The threats include increased flooding,



extreme weather events, agricultural impacts, damage to infrastructure, contamination of drinking water, power disruptions, wildfire, and climate-related migration. Ottawa has developed an integrated approach to reducing the risks from these threats, which includes reliance on and protection of beneficial ecosystem services such as air quality improvement, urban heat island mitigation, flood reduction, drinking water protection, and pollination. In this context, I will discuss the policies, initiatives, partnerships, and investments that the City has made to protect the integrity and biodiversity of its supporting ecosystems.

005KA: THE CITY OF TORONTO'S CLIMATE CHANGE ADAPTATION STRATEGY TO MITIGATE URBAN FLOODING

Dr. Michael D'Andrea,

Chief Engineer and Executive Director - Engineering & Construction Services - City of Toronto, CANADA

Abstract. Toronto, Canada's largest city, is home to a diverse population of 2.8 million people living and working along the shores of Lake Ontario. Throughout history, Toronto has focused on the safety and security of its water services, but now safety and security increasingly means ensuring that the City's water systems have the adaptive capacity to respond to the changing climate and extreme weather events. To that end, in 2003, a comprehensive watershed based "Wet Weather Flow Management Master Plan" was adopted by City Council to address the water quantity and water quality impacts of wet weather flows. Subsequent to the adoption of the Plan, an extreme rainfall event in 2005 profoundly influenced the implementation of the Plan, placing a focus on basement flooding protection. Through the City's Basement Flooding Protection Program, upgrades are being made to storm drainage and sewer systems to meet new design standards, established to mitigate the impacts from extreme storms.

This climate change adaptation strategy has resulted in the investment of almost \$250 million CAD (as of the end of 2016) on infrastructure



and storm drainage improvements, with planned spending in the amount of \$1.5 billion CAD over the next 10 years. Chief Engineer Michael D'Andrea will present details about Toronto's Basement Flooding Protection Program, focusing on the adaptive management philosophy, infrastructure enhancements, and policy considerations of the Program.

006KA: GROUNDWATER MANAGEMENT AND PROTECTION IN TIMES OF CLIMATE CHANGE: CHALLENGES AND OPPORTUNITIES IN THE MENA REGION

Prof. Ralf Klingbeil,

Senior Expert Water, Environment, Sustainable Development -BGR - Federal Institute for Geosciences and Natural Resources, GERMANY

Abstract. For many years, the adequate management and protection of groundwater for future generations has been a challenge for many societies in the countries of the MENA region. With the additional impacts of climate change on the hydrological systems, it becomes even more urgent to address the traditional challenges for sustainable water and groundwater use in the necessary holistic and systematic way. For too long, unsustainable groundwater practices with short and long-term over-drafting of aquifers or increasing pollution from point sources and areal infiltration of pollutants have affected the future development perspectives. Based on the experiences from the past, a new paradigm for participative sustainable groundwater utilization has to develop to ensure a successful path into a sustainable future. This includes aspects of adaptation to and mitigation of climate change impacts and its relation to groundwater management.

The presentation intends to highlight some of the challenges and existing barriers to sustainable groundwater management. It discusses factors that influence groundwater availability and quality and



develops some suggestions for innovative ways forward to overcome current barriers - including measures to address groundwater in the context of adaptation to and mitigation of climate change - based on activities from BGR and others internationally.

007KA: AJMAN SEWERAGE SYSTEM

Xavier Mathieu

Technical and Assistant Manager of Ajman Sewerage Concession (ASPCL), Ajman, UAE

Abstract. The presentation will review the various ways that a WWTP could be seen as a factory, ultimate stage in the combat of climate change and improvement of Sustainability. It will highlight the hurdles to reach that stage and explain the step taken by Ajman Sewerage to produce green electricity at Ajman WWTP.

ORAL PRESENTATIONS

101BP: RENEWABLE ENERGY UTILIZATION - ASPECTS AND INNOVATIONS: SUSTAINABLE, GREEN, AND SMART BUILDINGS IN THE EMIRATE OF AJMAN

Abdul Salam Darwish

Phoenix Renewable Energy Centre, UK

Abstract. The Emirate of Ajman has substantial amounts of natural, clean energy resources. This paper surveys the renewable energy potential in Ajman and demonstrates that the amount of available alternative energy is capable of meeting both the present and future energy demand and could possibly be exported to other areas within the UAE. This work explores the economic and practical feasibility of harvesting this energy potential and determine that a proper execution will combine the introduction of Smart-Green-Sustainable buildings with societal expectations for comfort, liveability, and demographic adaptability. Self-powered buildings are the best solution for integrating the green-smart building concept into Ajman's urban landscape. These new structures must be designed in such a way that they optimize and capitalize upon the emirate's climatic challenges. The successful incorporation of sustainable, green, smart buildings involves a transition in technology application, environmental conservation, and social interaction. The technological aspect will certainly be affected by the ever increasing sophistication of automated remote and control systems and their expanding incorporation of digital communications. Innovations such as these will generate the advances needed in energy savings and power



generation to decrease environmental impacts. Smart building provides the means to simultaneously make the built environment more comfortable while reducing the carbon footprint. Green building technology strives to enhance water and energy efficiency, and uses green construction materials and procedures to produce smart buildings that will optimise energy performance. This paper presents a case study for an official Emirate building involving possible economic projects.demonstrates that the amount of available alternative energy is capable of meeting both the present and future energy demand and could possibly be exported to other areas within the UAE. This work explores the economic and practical feasibility of harvesting this energy potential and determine that a proper execution will combine the introduction of Smart-Green-Sustainable buildings with societal expectations for comfort, liveability, and demographic adaptability. Self-powered buildings are the best solution for integrating the green-smart building concept into Ajman's urban landscape. These new structures must be designed in such a way that they optimize and capitalize upon the emirate's climatic challenges. The successful incorporation of sustainable, green, smart buildings involves a transition in technology application, environmental conservation, and social interaction. The technological aspect will certainly be affected by the ever increasing sophistication of automated remote and control systems and their expanding incorporation of digital communications. Innovations such as these will generate the advances needed in energy savings and power generation to decrease environmental impacts. Smart building provides the means to simultaneously make the built environment more comfortable while reducing the carbon footprint. Green building technology strives to enhance water and energy efficiency,

and uses green construction materials and procedures to produce smart buildings that will optimise energy performance. This paper presents a case study for an official Emirate building involving possible economic projects.

Keywords: Ajman – UAE, smart buildings, green buildings, sustainable buildings, renewable energy utilization

About the Author. Prof. Abdul Salam Darwish. Visiting professor and lecturer at ESC La Rochelle, Groupe Sup de Co La Rochelle, France. Director of Phoenix Renewable Energy Centre, UK. He holds an MSc, PGCE, & PhD Aeronautical Engineering UK and is an expert in Renewable Energy Systems.

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107SD: ACHIEVING SUSTAINABLE INDUSTRIALIZATION: CRITICAL ANALYSIS OF EGYPT'S SUSTAINABLE INDUSTRIAL DEVELOPMENT STRATEGY AND ASSESSMENT OF THE POTENTIAL FOR EIPS

Suzanna El Massah

Zayed University, UAE

Abstract. This paper explores the prospects of Egypt in achieving SDG 9 (sustainable industrialization). It analyses the new government's efforts at a national policy level and finds that environmentally-sound industrial production and overall sustainable industrial development is a priority in the country's vision. Then, the article takes a closer look at three case studies of attempts of the Egypt's government to establish or develop eco-industrial parks as a manifestation of industrial symbiosis (Roibbiki Eco-Leather Park, El-Safaa metal foundries zone, and Shaq Al-Thu'ban marble technology park). The analysis of the three cases outlines a number of factors impeding success of these attempts, including weak policy and regulatory frameworks and lack of strong enforcement mechanisms, poor planning, lack of financial resources to support relocation of most vulnerable (smallest) enterprises, and the negative impact of informal economy and criminal elements. The paper ends with several recommendations to overcome these obstacles.

Keywords: eco-industrial parks, sustainable industrial development, developing countries, Egypt

About the Author. Prof. Suzanna El Massah. She received her PhD in Sustainable Development (2009) and MSc in Finance (2004) from Cairo University. She has 20+ years teaching experience at higher education, in addition to her involvement in mobile learning, academic courses' development, and industry consultation. Suzanna is the founder and advisor for the InveSlamic Club at Zayed University since 2016. She has multidisciplinary interest in research areas of Economics, Finance, Sustainable Development, Economics of Education, and Behavioural Economics. She has published several scholarly papers in prestigious international journals and sits on the Editorial Review Board for a number of peer reviewed journals. <http://suzannaelmassah.com/>

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I IOBP: TRAGEDY ASSOCIATED WITH ENVIRONMENTAL COMMONS – AN APPLICATION OF THE SKINNERIAN BEHAVIOR MODIFICATION STRATEGIES IN TEACHER TRAINING

Olalekan Elijah Ojedokun

Institute of Education, Obafemi Awolowo University, Ile-Ife, Osun State, NIGERIA

Abstract. Environmental “commons,” such as the atmosphere, oceans, rivers, fish stocks, national parks, advertising, grazing land, road networks, and even parking meters are under strain and create a lot of tragedies which always appear to humanity without notice. If Geography, Social Studies, and other Earth Science Teachers will impart knowledge, change attitude, and influence people’s behavior positively towards these commons, teacher educators have to orientate their teacher trainees on the techniques of teaching that could enhance their easy learning. One of such strategies is the behavior modification strategy propounded by B. F. Skinner in the 1950s, which still has relevance to date as it is based on the values of operant conditioning, whereby the undesirable behaviors are exchanged with more suitable ones and which has been successfully used to treat anxiety, obsessive-compulsive disorder (OCD), and enuresis (bed-wetting), among others. The theory posits that behavior can be weak, excess, or a deficit, hence relevant efforts could be made to increase, decrease, or manage the behavior, using

the SORCK Equation and behavior change techniques such as shaping, chaining, modeling, prompting, fading, and reinforcement. This paper therefore provides a socio-critical review of the theory and designs a pedagogic model that could guide teacher educators towards preparing their preservice and in-service trainees for further action that will facilitate aversion of the tragedy of the commons among the larger populace using the school as the link.

Keywords: tragedy associated with environmental commons, skinnerian behavior modification strategies, teacher training

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I 16CB: HIGH-DEFINITION NDVI SAMPLING OF ARABIAN PROTECTED AREAS TO ASSESS RANGELAND CONDITION

David Gallacher

Zayed University, UAE

Abstract. Vegetation indices are long-established tools for remotely assessing regional-scale crop yields, deforestation, desertification, and drought. NDVI (normalized difference vegetation index) assessment of arid rangeland vegetation is routine at the regional scale but its application has not been demonstrated at the local level, in contrast to agricultural industries and rangelands with higher rainfall. This presentation will discuss how high-definition NDVI, from drone-mounted sensors, could be used to improve our assessment of rangeland condition. Specific challenges include low values, high spatiotemporal variation, and the need to filter the NDVI for plant species of interest from the NDVI of other plant species and non-photosynthetic material. Interpretation of NDVI in this habitat requires mapping larger vegetation and establishing a baseline map of non-photosynthetic values for comparison. Assessment of arid rangeland vegetation is routine at the regional scale but its application has not been demonstrated at the local level, in contrast to agricultural industries and rangelands with higher rainfall. This presentation will discuss how high-definition NDVI, from drone-mounted sensors, could be used to improve our assessment of

rangeland condition. Specific challenges include low values, high spatiotemporal variation, and the need to filter the NDVI for plant species of interest from the NDVI of other plant species and non-photosynthetic material. Interpretation of NDVI in this habitat requires mapping larger vegetation and establishing a baseline map of non-photosynthetic values for comparison. Progress toward achieving this goal will be outlined, using the Dubai Desert Conservation Reserve as a test site.

Keywords: grazing, rangeland management, unmanned aerial vehicles, drones, NDVI

About the Author. Dr. David Gallacher teaches in the Department of Interdisciplinary Studies, Zayed University. He came to the UAE in 2002, and has conducted research on rangeland ecology throughout that time, most recently on the application of drones to rangeland management. He holds a PhD in plant breeding from James Cook University, Australia.

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117AM: OPENING THE “PANDORA’S BOX” OF NORTH–SOUTH TRANSFERS OF CLIMATE CHANGE MITIGATION AND ADAPTATION TECHNOLOGIES: THE CASE OF DOMESTIC BIOGAS TECHNOLOGY (DBT).

Hyrine Gesare Munga

University of Auckland, NEW ZEALAND

Abstract. Climate change presents the greatest global challenge and renewable energy technologies like DBT, when used as household fuel in rural regions of the south, not only provide mitigation and adaption solutions but also address the UN Sustainable Development Goals. DBT deconstructs methane greenhouse gas, and its use substitute firewood which is increasingly becoming scarce due to climate change induced and prolonged wet periods. Provision of such technologies to the south is usually donor funded with broader global objectives of tackling climate change. This paper investigated the nexus between attaining such global objectives and the local needs of poor rural households in the south. While a vast literature that links transfer of such technologies to socio-economic development in the recipient countries exists, the reverse of the same is largely unexplored. This paper contributes to this discourse by accounting for the influence of household gender-power relations and roles on adoption and use of DBT and conversely the gender injustices the same technology reproduces or reinforces in a household. I conclude

by arguing that for such technologies to serve both macro and micro interests, the socio-cultural contexts of the potential adopters ought to be incorporated in the innovation process through participatory technology development.

Keywords: gender, biogas technology, climate change mitigation, adaptation

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II8CB: CARBON SEQUESTRATION IMPLEMENTATION THROUGH SUSTAINABLE AGRICULTURAL LAND MANAGEMENT (SALM) METHODOLOGY IN NIGERIA

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Abstract. Climate Smart Agriculture (CSA) as an adaptation strategy that helps rural farmers adapt to climate change by making them resilient to its effects. SALM methodology is a CSA practice that promotes carbon sequestration which on the long run increase farmers' productivity.

This study assessed SALM methodology using RothC model to calculate the efficacy of CSA on Umar Lere farms. Activity Baseline and Monitoring Survey was used to acquire data for a period of three years of practicing SALM methodology. Results showed that after three years of SALM adoption, the farm produced maize (2.6), soybeans (0.7), guinea corn (1.1), and tomatoes (1.7) tons/hectare/year respectively in 2015 compared to maize (1.2),

soybeans (0.3), guinea corn (1.6), and tomatoes (0.7) tons/hectare/year respectively produced in 2012. The farm also recorded 56 trees sequestering 10.2 tons of carbon dioxide per hectare in 2015 compared to fifteen trees sequestering 2.6 tons of carbon dioxide per year in 2012. In three years, Umar Lere farm significantly increased its crop yields from the project; RothC model shows that the modeled soil carbon stock changes increased significantly as a result of the adoption of SALM practices from around 0:5 tCO₂ ha-1yr-1 in 2012 to 3:5 ha-1 yr-1 in 2015.

This study assessed SALM methodology using RothC model to calculate the efficacy of CSA on Umar Lere farms. Activity Baseline and Monitoring Survey was used to acquire data for a period of three years of practicing SALM methodology. Results showed that after three years of SALM adoption, the farm produced maize (2.6), soybeans (0.7), guinea corn (1.1), and tomatoes (1.7) tons/hectare/year respectively in 2015 compared to maize (1.2), soybeans (0.3), guinea corn (1.6), and tomatoes (0.7) tons/hectare/year respectively produced in 2012. The farm also recorded 56 trees sequestering 10.2 tons of carbon dioxide per hectare in 2015 compared to fifteen trees sequestering 2.6 tons of carbon dioxide per year in 2012. In three years, Umar Lere farm significantly increased its crop yields.

Keywords: climate-smart agriculture (CSA), SALM methodology, RothC model, sustainable land use management, climate change mitigation/adaptation



About the Author. Dr. Idowu Oluropo Ologeh (nee Ogunade) grew up in the academic town of Ile-Ife, where she studied Geography at Obafemi Awolowo University, Ile-Ife, Nigeria. She proceeded to study a Master's in Environmental Waste Management at University of Glamorgan, Pontypridd, Wales, United Kingdom in 2005, and immediately after, studied a Master's in Space Management at International Space University, Strasbourg, France in 2006. Passionate about academics, Idowu started her professional career as a Senior Research Officer in 2008 at National Centre for Technology Management, Obafemi Awolowo University, Ile-Ife, Nigeria. After six years exposure to the manufacturing world pursuing environmental, policy, and technology innovation in indigenous small scale companies, Idowu progressed to join Dangote Cement Projects in 2014 as a Principal Environmental Officer. She was moved to their Oil Refining arm in 2015 and was promoted to Assistant Manager, Environment in 2017. She bagged her PhD in Technology Management in 2016 from Obafemi Awolowo University, Ile-Ife. In her free time, Idowu loves to read, watch documentaries, and cook. She is married to veteran photographer Otuke Ologeh and has three boys.

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I 19BP: STUDY ON SOIL EROSION AND NUTRIENT LOSS OF NITROGEN AND PHOSPHORUS IN SUGARCANE CROPPING SYSTEMS

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Abstract. A field monitoring method to study the system of sugar cane under different fertilization and soil erosion caused by runoff of nitrogen and phosphorus loss characteristics. The results show that the dryland of Guangxi gently slopes under conditions of sugar cane, resulting from rainfall runoff coefficient of 10%. Processing sugar cane leaves cover the ground surface and runoff rarely occurs, indicating that the surface coverage of surface runoff is the most important factor. Runoff and the size of the dense growth of the degree of sugar cane, and cane growth whitespace, results in surface runoff. In the sugar cane, the annual sediment loss of 3,000 kg/ha (200 kg/mu), by surface runoff after fertilization of N, phosphorus rates are low. The loss of three-year average coefficient of nitrogen was 0.778–1.328%, the highest incremental was N treatment, and the lowest incremental was phosphorus treatment. Three-year average phosphate loss factor was 1.104–1.428%, the highest incremental phosphorus treatment, a minimum in order to optimize fertilization. N loss through runoff and rain water to land was roughly the same amount of N, P loss via



runoff is mainly sand away, the water-soluble phosphorus accounted for less than 10%. Application of higher N, P fertilizer could increase the runoff of N, P content, the absolute volume increase of 50%, and the loss factor increases slightly.

Keywords: sugar cane, nitrogen, phosphorus, loss coefficient

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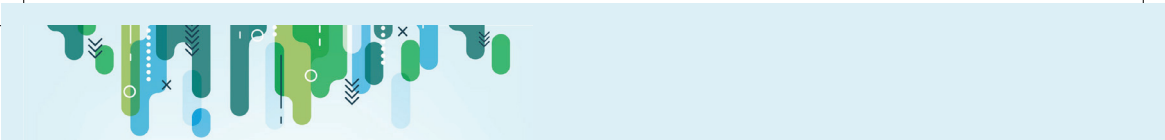
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I20SD: COMPARING SOCIAL COSTS OF CONVENTIONAL RICE PRODUCTION SYSTEM AND SYSTEM OF RICE INTENSIFICATION: A CASE STUDY OF INDONESIA

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Abstract. Rice production process generated negative environmental externalities. These externalities were considered as a cost and not accounted by market price and the economic value of externalities was indefinite. The objective of this study was to calculate and internalize negative externalities costs into production costs of the System of Rice Intensification and conventional rice production system. The quantities of externalities measured in this research were CH₄, N₂O, SO₂, NO_x, and PM₁₀. This research used Life Cycle Analysis (LCA), damage cost approach, and social costs concept. This research was conducted at Dlingo Village in Boyolali District, Central Java Province. The results showed that the private cost per kg unhulled rice was 1,529 IDR and damage cost was 9 IDR/kg. Social costs of producing 1 kg unhulled rice was 1,539 IDR or 9.60 million IDR/ha/season. SRI's farmers received net social benefit 18.04 million IDR/ha/season. Considering that the target of extended area for SRI in 2015 was 200,000 ha, the government could receive environmental benefits 44.51 billion IDR. The benefits can be



obtained through world carbon trading process and used as incentives for organic farmers.

Keywords: negative externalities, social costs, conventional rice production system, SRI

About the Author. Mr. Mohamad Maulana is an environmental economics and policy analyst. He has been working for ICASEPS (Indonesian Center for Agricultural Socio-Economics and Policy Studies) and serving as a researcher for more than 16 years. He accomplished his study in Environmental Economics from Wageningen University, The Netherlands. His study focused on internalizing and valuing environmental externalities. Working as researcher in ICASEPS, he has extensive experiences on policy analysis such as rice, sugar, maize, livestock, and environmental policies.

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133AM: PREDICTORS OF RECYCLING BEHAVIOR: A SURVEY-BASED STUDY IN THE CITY OF SHARJAH, UAE.

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Abstract. Background. Sharjah, the United Arab Emirates' (UAE) third largest city, is also the third highest waste producer (9.9% of \approx 26 million in 2012). Over \$1 billion has been invested into recycling programs aiming to achieve zero-waste to landfill by 100% recycling and conversion. Aside from providing infrastructure, assessment of people's knowledge, attitudes, and practices (KAP) is needed for an effective municipal solid waste (MSW) management.

Methods. A cross-sectional study of 400 selected subjects was conducted in public venues in Sharjah. Convenient sampling method was used for selection of Sharjah residents 18–55 years old. A pilot-tested, self-administered questionnaire was distributed. Participants' responses were entered and analyzed using SPSS 22 software. Results were then compared to those found in similar researches.

Results. The mean age of respondents was 28.0 years \pm 9.4 and 56.5% were females. Knowledge level was 51.8% \pm 18.1, with students reporting the highest (53.7%, $p = 0.007$). Respondents showed a mean attitude of 92.6% \pm 16.5 towards recycling; 51.1%



and 46.8% would recycle more if there was a financial reward or penalty, respectively. 70.4% (n=307) reported that they recycle. Logistic regression model indicates that knowledge and attitude were the only significant predictors (OR = 1.013 and 1.014, respectively) of practicing recycling, keeping demographic variables constant.

Conclusions. Although Sharjah residents have positive attitudes towards recycling, their knowledge is relatively lacking, leaving room for improvement. Innovative methods could be introduced in order to encourage higher recycling practice.

Keywords: recycling, solid waste, knowledge, attitudes, practices, UAE

About the Author. Mr. Lutfi Kawaf is a medical student from the University of Sharjah. He shows a great interest in research fields that emphasize on environmental health and global concerns.

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I36CB: USE OF REMOTE SENSING DATA IN ASSESSMENT LAND COVER CHANGES, LAND USE PATTERNS, AND LAND CAPABILITIES IN AL-QASSIM REGION, SAUDI ARABIA

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Abstract. The Qassim region of central Saudi Arabia is one of the most important agricultural regions in the country especially for date cultivation. In the present study, Landsat TM and ETM+ data for the period 1999–2013 are used to study the land use, land cover changes in the area. Satellite images from path/row 168/042 constitute the study area. Three major land use/land cover classes are considered: hilly areas (364,407 ha), vegetated land (1,776,698 ha), and sand dunes (1,523,669 ha). The vegetated land constitutes the class I, which is comprised of the wades mainly devoted used for for date production. Sand dunes are designated the class II and covered a large portion of the study area whereas the Hilly areas are unproductive and constitute as class III. The vegetative land are surrounded by sand dune which is the most fragile system of the area and leads to damage some productive lands in the area. It necessitates to study the area for suitable land management practices and for possible approach to stop the sand drifting or sand encroachment in the area.



The land use capabilities classification of the study area includes three main classes: LUC I, LUCII, and LUC III. Slopes ranging between 0° and 20° correspond to areas that are flat, gently undulating, undulating, rolling, strongly rolling, moderately steep, and steep, respectively. The slope categories dictate the usage patterns of the lands in the study area, which range from suitable to unsuitable to productive lands.

Keywords: remote sensing, satellite images land use, land cover, land capability, NDVI mapping, Al-Qassim region, Saudi Arabia

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I38CB: SIMULATIONS OF CONJUNCTIVE USE WITH MODFLOW IN AGRICULTURAL REGION OF COLORADO RIVER DELTA, MEXICO.

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Abstract. The Mexicali valley in Colorado River Delta has been one of the most productive agricultural regions in the area. The valley is also rapidly becoming an important area for Baja California's expanding urban population. Because of the importance of surface water-groundwater sources in the Valley, it's necessary to evaluate surface water and ground-water conditions based on historical water use. This study presents the hydro-geologically important surface and groundwater system for irrigation district of Colorado River Delta, with the aim of fully coupled simulation and analysis of the use and movement of water from surface water and groundwater sources using MODFLOW. After reasonable calibration, the model produced a holistic view of the storage changes impacted by the agricultural water use (agricultural pumping) and generated insights into the conjunctive spatial and temporal patterns of the surface water-groundwater in the study area. The results showed that if the irrigation demands continue to increase, the current situation would lead to an acceleration of the groundwater depletion, and therefore introduce ecological problems to the study area. Overall, the model



provides a detailed MODFLOW transient analysis of changes in groundwater availability.

Keywords: Mexicali valley, Colorado River Delta, MODFLOW- farm process, conjunctive use, simulation

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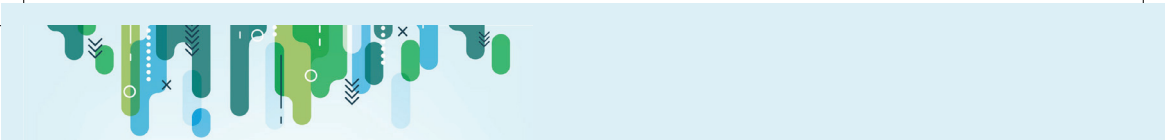
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I39BP: IN SEARCH OF FEASIBLE ENVIRONMENTAL POLICY MAKING TOOLS IN THE UNITED ARAB EMIRATES: THE MULTI-GOAL APPROACH

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Abstract. Public policymaking in general and environmental policymaking, in particular, are not conducted in a scientific manner. Public policy makers usually adopt piecemeal ad hoc and reactive approaches. Environmental problems are multifaceted and interdependent. This characteristic of interdependence means their impacts affect other public policy issue areas such as health, employment, and productions. Therefore, the impact of policies adopted to address environmental problems is not confined to the environmental issue area. Every public policy in any policy issue area is susceptible to have intended and unintended positive and negative side effects. Intended effects are goals policymakers intend to achieve by adopting specific public policies. Unintended positive and negative side effects result as byproducts of a specific policy being implemented. Hence, alternative policies considered to address any environmental problem should be weighed carefully against multiple sets of criteria and goals. Also, analysts must exert some efforts to look for potential negative side effects of policies. One possible rational policy tool is the multi-goal analysis which permits policy analyst to compare several alternatives against several criteria to



choose the one that attains the highest scores in these criteria. The Multi-Goal, as part of the rationalistic model of policy analysis, follows certain steps to address public policy problems. These steps are compiled into two main categories: problem analysis and solution analysis.

Keywords: public policy, environment, multi-goal analysis, intended impacts, unintended impacts

About the Author. Dr. Ahmed Mansour obtained his Bachelor's degree from Khartoum University in 1976 and completed his MA and PhD studies at Manchester University, UK, between 1978 and 1985. He worked in the University of Khartoum, Al Albayt University in Jordan, Qatar University, and United Arab Emirates University. He was promoted to the rank of associate professor in 2001 at Al Albayt University and promoted to the rank of full professor at United Arab Emirates University in 2013. His research interests include public policy and policy analysis, public management, public budgeting, total quality management in the public sector, and quantitative analysis.

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14 IAM: ENERGY POLICIES FOR ENVIRONMENTAL ISSUES AND CLIMATE CHANGE IN TURKEY

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Abstract. Turkey is an energy importing country; more than half of the energy requirement has been supplied by imports. Oil has the biggest share in total primary energy consumption. Due to the diversification efforts of energy sources, use of natural gas that was newly introduced into the Turkish economy has been growing rapidly. Turkey has large reserves of coal, particularly of lignite. In the last decade, the proven lignite reserves are 8.0 billion tons.

In Turkey, the primary energy supply is projected to increase from 64.5 mtoe (1995) to 332.0 mtoe (2025). Crude oil imports remained constant at 33.0 mtoe after 2004, when the domestic refineries were forecast to run into their processing capacity, resulting in a drop in crude oil share from 44% to 10% of total supplies. Once the refining capacity is reached, net imports of refined products will quickly grow from 2.6 to 52.3 mtoe (2000–2025), accounting for about 16% of total supplies by 2025.

Natural gas will quickly increase its share from 10% (6.3 mtoe) in 1995 to 42% (139.8 mtoe) of total supplies in 2025. It is expected that the clean and renewable energy will be increased double in 2025 in the country. On the other hand, in order to catch the targets of clean and renewable energy, Turkey is seeking support for the



development and economic potential of the clean and renewable energy by 2023, which is the 100th anniversary of the foundation of the Turkish Republic. This paper deals with clean energy for future energy policy in Turkey.

Keywords; clean energy, energy demand, energy generation, energy supply, energy policy

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I42CB: ECOLOGICAL NICHE MODELING OF IMPORTANT UAE TREE AND SHRUB SPECIES USING MAXENT AND GLOBAL ENVIRONMENTAL DATA

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Abstract. Here we use Ecological Niche Modeling (ENM) in the UAE to assess the extent of of historical distribution and future extent of Important UAE Tree and Shrub Species. We use MaxEnt and Global Environmental Data for such assessment.

Keywords: MaxEnt, WorldClim, ENM

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147AM: THE POLITICAL ECONOMY OF NATIONAL AND ENERGY SECURITY: THE CASES OF THE UAE AND CHINA

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Abstract. The aim of this paper is to study the crucial aspects related to the interconnection between the political economy of energy security and national security. A number of conceptual frameworks regarding the issue of energy security are examined to understand the relationships between relevant parameters and then to investigate their implications for the national security. Research needs to examine whether energy security is a threat to the national security and/or an opportunity for them. In this paper, the theory of economic nationalism is deployed . The fact that The Political Economy of Energy Security and the Political Economy of National Security are addressed as separate parts in the literature are among the main drawbacks on our effort to comprehend the issues concerned. The above results to a dichotomy that affects the ontological and epistemological essence of the two pillars of the issue in question, which is the Political Economy of National Security and the Political economy of Energy, which based on our working hypothesis should be addressed in a complementary and interconnected way. The development of such an analytical framework may result to an affective tool for the better comprehension of states' attitude and

stance in the global security and energy arena. The cases of the United Arab Emirates and China will be used in order to prove the argument.

Keywords: political economy, national security, energy

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I48SD: THE LEADING EUROPEAN AND AMERICAN QUINTUPLE-HELIX MODEL FOR INCLUSIVE SUSTAINABLE TRANSPORTATION: CO-CREATION WITH BUSINESSES, INNOVATORS, POLICY MAKERS, SOCIETY, AND THE ENVIRONMENT

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Abstract. Sustainable and resilient transportation (SRT) enables the achievement of the UN Sustainable Goals but requires a true multi-stakeholder approach (Govindan et al., 2015) by bridging eco-innovators, policy makers, businesses that incorporate eco-innovations, and the environment and society which act as core influencers.

Nevertheless, a systematic literature review on SRT (globally) shows a clear focus solely on institutional level drive of SRT (not accounting all the stakeholders [Fahimnia et al., 2015; Tajbakhs & Hassini, 2015]). As a response, Carayannis, Barth, and Campbell (2012) proposed and formalized the “Quintuple Helix Model (QHM)” for sustainable growth which aims at providing means for bridging the five types of stakeholders in co-creation to achieve enhanced environmental sustainability. This model is widely used in USA and Europe (Solomon

et al., 2017), however it has never been applied specifically for sustainable transportation.

In this context, this research applies the QHM in the field of SRT by relying on a valid sample of 311 transporters from Europe complemented by 6 interviews and 3 focus groups (with all five stakeholders).

The results show that quintuple helix co-creation positively influences SRT practice adoption by properly relying on market dynamics (i.e. eco-innovation adoption, competitive pressures, societal pressures, and so on). The role of environmental policy making for SRT becomes critical and regulators should include in their directives more insights from the other quintuple helix stakeholders in order to facilitate proper adoption of SRT. Lastly, specific directives for each stakeholder are being proposed/revealed to ensure a strong impact.

Keywords: environmental policy, eco-innovation, sustainable transportation, UN sustainable development goals

About the Author. Dr. Adrian Solomon. My expertise resides in environmentally sustainable and resilient organizations and in the diffusion of technology and innovations. In my current position as Project Manager at SEERC (Greece), I have completed R&D projects amounting to more than 4.7 million Euros (with companies, governments, universities, and NGOs). As a follow-up, I have received fully paid invitations to deliver presentations on these topics at conferences organized by the Romanian Government (Bucharest, Romania) and by the Municipality of Ajman (United Arab Emirates). Similarly, I was successfully involved in consultancy projects (i.e. for



COSTA Coffee UK and Transport Systems Catapult UK). Recently, I have also served as Business Development Manager at the Advanced Resource Efficiency Centre (United Kingdom), a knowledge and technology transfer center, where I overseeing the expansion of the customer and business partner portfolio. In the past, I have also worked in the technological innovation field at BOC Group (Austria) having, as customers, banks from Europe. Lastly, I have a high passion for academic teaching and I also lecture at the University of Sheffield International Faculty, CITY College (Greece). I possess a PhD in Environmental Sustainability from the University of Sheffield, UK, and a BSc in Computer Science from the same university.

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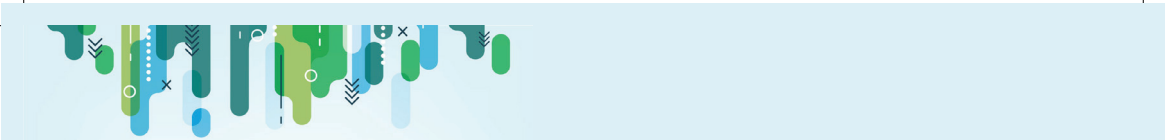
I54BP: DEFICIENT LEGISLATIONS SANCTIONING OIL SPILL AND GAS FLARING IN NIGERIA: A NEED FOR A REVIEW OF THE PETROLEUM INDUSTRIES BILL TOWARDS BETTER ENVIRONMENTAL REGULATION IN NIGERIA'S OIL AND GAS SECTOR.

Chukwuemeka Chuks-Ezike

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Abstract. The grave challenges of oil pollution have been over stated in several environmental journals. The extensive nature of the Nigerian pollution, together with the criminal nature of provisions sanctioning them have caused a classification of such pollution acts as criminal. Thus, an address of such pollution acts will be as environmental crime. A bulk of the Nigerian environmental crime seems to be reflective in the numerous oil spill disasters and continued gas flaring activities in the country, despite existing legislations sanctioning both pollution crimes in the country.

Indeed, these oil and gas related legislations gain their onus from the Nigerian constitution that creates a superior obligation on environmental protection. It has, however, been observed that despite legislative provisions around these areas that seem to have caused the most environmental damage in the country, the environmental damages have persisted in extensive levels making it seem as if there was no legislation sanctioning such pollution acts ab-initio. This paper, therefore, seeks to review these legislations and



their deficiencies, as well as the perceived inability of the Petroleum Industries Bill (PIB) to yet do the sanctioning jobs that these legislations have failed to do. It is the view of the author that a review of these deficiencies might encourage the legislative arm of the Nigerian government to seek stricter measures either within the current legislative provisions sanctioning oil spill and gas flaring, or the PIB.

Keywords: pollution, policy, environmental crime, legislation, constitution, environment.

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I59CB: HUMAN DEMAND ON NATURE: WHERE DO WE STAND VIS-À-VIS WORLD SCENARIO?

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Abstract. The key drivers of global change are population growth and climate change. The world population reached 7.2 billion in mid-2013 and is expected to reach 11.2 billion in 2100. Which will result in a subsequent increase in human demand on nature, that is measured as Ecological Footprint (EF) and nature's capacity to meet the demand as Biological Capacity (BC). Both EF and BC are reported as Global Hectare (gha) representing a biologically productive hectare with world-average productivity. As of 2013, we have a deficit of 8.38 billion gha (EF = 20.62 billion gha vs BC 12.23 billion gha) and hence annually we are consuming the resources of 1.68 planets and degrading further. Most of the world's soil resources are in poor condition and are not improving. Around 33% of agricultural lands are moderately or highly degraded and pose a big challenge to global food security. We are using the world's soils as if they were inexhaustible. Therefore, to be sustainable we must appreciate that healthy soils are prerequisite to meeting diversified needs e.g., food, fiber, fodder, energy, and ensuring the provision of ecosystem services. However, we are facing unprecedented pressures on soils and eco-resources. We face a challenge that by 2050, agricultural production must increase by 60% globally, and by almost 100% in developing countries, to meet food demand alone. In this



presentation, we will present a global overview of eco-resources and discuss options to narrow the gaps between EF and BC in changing climate scenarios.

Keywords: climate change, human demand, eco-resources, soil, ecological footprint, biocapacity.

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I65SC: INCREASED FOSSIL FUEL CONSUMPTION: IMPLICATIONS ON ENERGY EFFICIENCY AND ECONOMIC GROWTH

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Abstract. Energy efficiency improvement is believed to be an effective means of reducing energy consumption thereby reducing greenhouse gas emission and as well promoting sustainable economic development. The impact of increasing fossil fuel consumption on the energy efficiency level and economy was examined. It was revealed in the study that increase usage of fossil fuel is inimical to the efforts aimed at combating climate change as well as the growth of the economy. Energy efficiency was seen as a mechanism for improving optimal energy utilization. Therefore, improving the level of energy efficiency will significantly assist in providing clean energy coupled with achieving sustainable development goals. This will benefit the nation in terms of ensuring energy security together with climate change mitigation.

Keywords: economic growth, energy, efficiency, sustainable development, South Africa



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I68AM: ASSESSING GREYwater REUSE FOR HOME GARDENING TO IMPROVE HOUSEHOLD FOOD SECURITY WITHIN TWO VILLAGES IN FETAKGOMO LOCAL MUNICIPALITY

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Abstract. Water reuse through greywater irrigation has been globally adopted as an alternative source, representing a possible beneficial use, which can contribute to household food supply. It has also been proposed as a potential sustainable solution to increased water demands. This study therefore aimed at assessing the reuse of greywater in relation to home gardening activities within two communities (Ga-Seroka and Ga-Nkwana) in Limpopo Province, South Africa. The study adopted a mixed methods approach. Ninety-five and seventy-eight households were randomly selected in Ga-Seroka and Ga-Nkwana villages, respectively. Data were collected from the selected households, using a structured questionnaire and statistical analyzed using SPSS. The key findings of the study showed that 66% of the respondents in Ga-Nkwana village reused their greywater for irrigation, as compared to 59% in Ga-Seroka. The



study concludes that although greywater for home garden irrigation is practiced in the two communities, its utilization is still with caution, especially when irrigating vegetables. The study therefore recommends that closer cooperation between the municipality and communities is required, particularly on educating the villagers on the possibility to improve food security through greywater reuse for home gardening.

Keywords: household, reuse, irrigation, home gardening, greywater, food security

About the Author. Mrs. Pabalelo Radingoana is currently a PhD student at the university of Kwa-Zulu Natal, South Africa. Her research interests include greywater reuse, risk and vulnerability assessment, poverty, as well as food security and livelihoods.

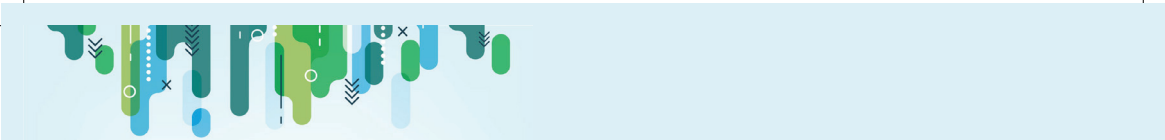
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I79AM: ASSESSMENT OF CO₂ EMISSIONS FROM MAJOR INDUSTRIES IN SAUDI ARABIA

Hussein Hoteit, Ahmed Nabil Abo-Khatwa, and Ali Hamieh

KAUST, SAUDI ARABIA

Abstract. The continuous influx of greenhouse gases (GHG) to the atmosphere from various human activities is a major environmental challenge facing the globe for years to come. Global warming is emerging as one of the 21st-century major challenges. The Kingdom of Saudi Arabia (KSA) has ratified the Paris Agreement and committed to taking measures to reduce CO₂ emissions. Alongside, the Kingdom rolled out the Saudi Vision 2030, which is a comprehensive and ambitious plan to address different national economic and development challenges. Some aspects of the Vision 2030 are dedicated to improving efficiency in different industry sectors, promote renewable energies, and safeguard the environment and natural resources. Reducing CO₂ emissions is a national milestone. To achieve this commitment, it is critical to establish a detailed CO₂ emission inventory of the main sources at the facility level including their geographical locations, flue gas characteristics, and emission rates. Such a detailed inventory is currently missing. In this work, we provide a comprehensive quantitative analysis of CO₂ emissions from stationary sources associated with the main six industries in KSA. We also provide a detailed map of CO₂ sources that can be helpful to assess the economic viability of CO₂ mitigation methods and to identify potential locations of CO₂ sinks in proximity to sources such



as in the case of CO₂ inject in hydrocarbon reservoirs to enhance oil recovery and subsurface CO₂ traps.

Keywords: carbon footprint, carbon sequestration

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184SD: THE STUDY OF PRODUCT OBSOLESCENCE: FINDING OPTIMAL LIFESPAN OF ELECTRONIC PRODUCT USING GAME THEORY APPROACH

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Abstract. Most of today's electronic products are used shorter than ever before. Obsolescence becomes the issue behind this phenomenon. Planned obsolescence is often seen as an economic strategy to improve sales by reducing the lifespan of the product. There are four kinds of obsolescence: material, functional, psychological, and economic. The main problem is that obsolescence creates more waste and excessive use of natural resources to produce goods. The objective of this study is to determine the combination of strategies between producers and consumers to create optimal lifespan of electronic products. The payoff function is empirically examined using regression method for robustness. Data is gained from both internet-based and on-site questionnaire to consumers in Indonesia. The results vary depends on the products. Using a Game Theory approach, optimal lifespan of electronic product can be reached out when producers are willing to create more durable products and consumers are able to be less consumptive and slightly closed to innovation. More expensive products tend to not be discarded. The younger users have a higher possibility to discard their electronics appliances. Functional and



psychological obsolescence are being the most affecting factors for smartphones and laptops disposal. On the other hand, material obsolescence affects more for TVs and washing machine disposal. Obsolescence is not only an issue that should be addressed to the manufacturers, but also as a responsibility for the consumers.

Keywords: product obsolescence, e-waste, waste management, game theory

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188BP: BEST PRACTICES IN ENVIRONMENTAL GOVERNANCE: THE NORDIC EXPERIENCE

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Abstract. The Nordic Europe, especially Norway, Denmark, Finland, and Sweden, have set examples in environmental governance. These four Nordic countries have formulated exemplary policies and institutional arrangements to govern their environment effectively by engaging their citizens. In addition to carefully formulated policies based scientific evidence, these countries have also been successful in generating a community awareness by means of education and public information often with the involvement of the civic organizations. In the present paper, we examine not only the official policies - focusing on how these policies have been globalized - but also examine the involvement of the non-governmental organizations in spreading the awareness of environmental care and sustainability. Environmental governance has a global dimension. The nation states around the world learn from each other in terms of adopting the best practices, not by simply imitating but refining and constantly improving these policies to best fit their national needs and priorities. The present paper will survey the best practices, identifying the challenges and the enablers for implementing those policies in the four Nordic countries. Based on the concrete, historical examples, and following case-study methods, this paper will outline a set of guidelines that can be considered in calibrating and refashioning the



environmental governance of the United Arab Emirates, especially in the areas of education and public awareness.

Keywords: environment, governance, Norway, Denmark, Sweden, Finland, civic engagement

About the Author. Prof. Habibul Haque Khondker, PhD (Pittsburgh) is professor at the Department of Humanities and Social Sciences at Zayed University, Abu Dhabi, UAE, and co-President of Research Committee 9 (Social Transformations and Sociology of Development) of the International Sociological Association. He has published articles on globalization, glocalization, environmental movement, migration governance, state and secularism, nationalism, national identity, internet and civil society, democracy and political culture, military in politics, famine in such international journals as *International Sociology*, *International Sociology Review*, *Protosociology*, *The British Journal of Sociology*, *International Migration*, *Globalizations*, *Armed Forces and Society*, *Asian Journal of Social Sciences*, *South Asia*, among others.

Khondker co-edited *Asia and Europe in Globalization: Continents, Regions, and Nations* (Brill, 2006) with Goran Therborn. He co-authored *Globalization: East/West* (Sage, 2010) with Bryan Turner. He also co-edited *The Middle East and the 21st Century Globalization* (Dubai and Abu Dhabi: Zayed University Press, 2010) with Jan Nederveen Pieterse. Khondker's recent publications includes, among others, "Class, Identity, and Insecurity: Bangladeshi Temporary Migrants in the UAE," *Current Sociology* (Forthcoming 2018); "Migration Governance: Global National Interface," P. Short, A. Khan,

and M. Hossain (eds.) *South–South Migration: Emerging Patterns, Gains and Losses*, (London and New York: Routledge, 2017), pp. 173–198; “Exit and Voice: Migration, Mobile Phone and Women’s Mobility in Bangladesh,” *Journal of Development Communication*, 26(2), 2015 pp. 48–59; and “Migration, Displacement and Precarity in a Globalized World,” *ISA e-Symposium*. <http://www.isa-sociology.org/publ/E-symposium/E-symposium-vol-3-1-2013/EBul-Khondker-March2013.pdf>.

Khondker is on the editorial board of several international journals and currently the editor-in-chief of *South Asian Journal of Social Sciences*.

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19ICB: MAPPING CULTURAL ECOSYSTEM SERVICES IN DIFFERENT LANDSCAPES OF THE UZBEK UGAM CHATKAL NATIONAL NATURE PARK

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Abstract. Landscapes provide many ecosystem services, such as food and fibers, carbon sequestration, recreation possibilities, and aesthetic beauty or spirituality. These latter three services are cultural ecosystem services, which are rarely studied and their spatial distribution is poorly known. I developed and applied a framework to classify and map the provision of cultural ecosystem services as experienced by tourists in the Ugam Chatkal National Nature Park, which is located in the Uzbek Tashkent region.

In this study, a photo-based questionnaire survey is combined with cartographic images of different landscape types to obtain hot and cold spot areas of cultural ecosystem services. The tourists' socio-demographic backgrounds on how they perceive these services are statistically analyzed.

Each cultural ecosystem service shows a distinct spatial pattern in its distribution and in the different landscapes (i.e. natural lakes, traditional meadows, and forests) in which they occur. Specifically, midlands landscapes between 1,200 masl and 3,500 masl are considered as hotspot areas for recreational activities, aesthetic

beauty, and spirituality. The highland zones above 3,500 masl mainly provide cultural heritage and recreational activities. The lowland plains below 1,200 masl do not provide major services.

My results demonstrate that the tourist perception is most influenced by nationality and degree of education. Other factors, such as gender, age, and environmental behavior are less important in defining tourists' perceptions.

Keywords: cultural ecosystem services, public perception, mapping, generalized linear mixed model, binomial regression model

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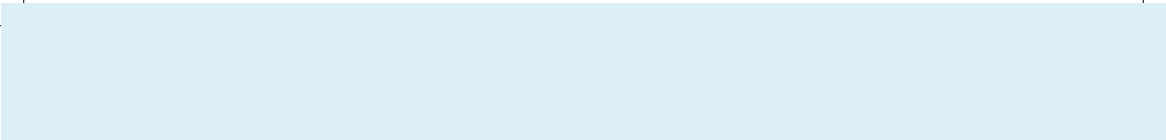


198BP: THE DESIGN OF PUBLIC HEALTH MANAGEMENT SYSTEM INFORMATION CONTROL BASED ON SOFTWARE DEFINE NETWORKING (SDN)

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Abstract. The improvement on the management of Public Health through the public health management system has become a bottleneck. The management of a large number of patient information has been a challenge, especially in storing and accessing the record system as well as during future references. With a view to bring about an efficient management system, the Software Define Networking (SDN) Technology came up with an interesting idea to properly manage the operation/control flow in the system. The SDN technology has brought a better solution in that it enables the controller to regulate the control flow in a logical manner, thereby enhancing an intelligent control of the public data/information. This design employs flexible, safe, reliable, programmable, and modern networking approach to improve public health management system information. Thus, this paper provides a solution to utilizing SDN technology to optimize the performance of large-scale public health management systems through proper analytic execution. As a measure for information management and better clinical records, it



promotes hospital community health service institutions via using the SDN Technology.

Keywords: PHMS, SDN, programmable

About the Author. Mr. Ayotuyi Tosin Akinola is currently a PhD student in the department of computer science at the University of Zululand, South Africa, who has written several papers on web service selection in Ad-Hoc Mobile Cloud Computing, with his area of specialization covering MCC, Ad-Hoc MCC, and SDN deployment in Networking Environments.

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203CB: THE FOREST HERITAGE AND SUSTAINABLE DEVELOPMENT OF MOROCCO (CEDAR-BARBARY MACAQUES): IS THERE A LINK BETWEEN THE DEGRADATION OF THE CEDAR FOREST, THE BARBARY MACAQUES, AND CLIMATE CHANGE?

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Abstract. The Barbary macaques (*Macaca sylvanus*) are a reliable indicator of the state of health and mortality of the Cedar Forest, as without its existence, this value cannot be attributed to it. These two species are part of the same ecosystem, in fact they undergo, consequently, the same threats. The cedar trees wither and are subject to numerous attacks, whose causes are multiple: climate change, anthropic action, lithological nature, specific diversity, density, epidemic, and the Barbary macaque.

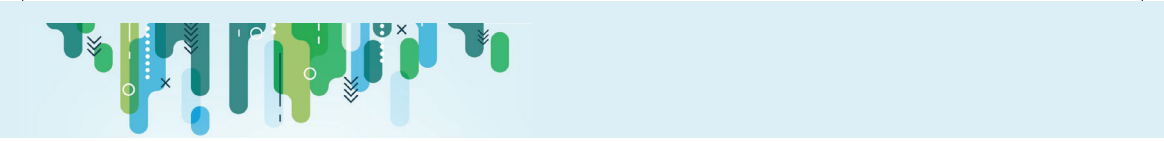
This study explains the dysfunctions observed. Thus, the results show that the Barbary macaque are not the origin of degradation of the cedar; this has only one understandable explanation. Climate change, overgrazing, and abusive logging are the main causes that reduce the annual distribution of cedar forests, destroying the habitat of the Barbary macaque and, therefore, the diversity of their diet. For this

reason, the Barbary macaques abandon the forest to feed outside. The results of this study give a more preventive strategy to protect the Moroccan cedars and the Barbary macaque, by betting on the long-term management of disturbances within the framework of the ecosystem.

Keywords: sustainable development, forest heritage, degradation, cedar-Barbary macaques, climate change

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229BP: MECHANICAL AND THERMAL PROPERTIES OF PERLITE AND RUBBER INSULATION CEMENT MORTAR: EXPERIMENTALLY AND ANALYTICALLY

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Abstract. The thermal analysis of the concrete walls showed that the connection mortar between the bricks works as thermal bridges, which transfer the heat to the interior wall surfaces. Therefore, in this research, insulation materials were used to produce insulation mortar. Powder perlite and fine rubber were substituted with sand with three dosages 5%, 10%, and 15% by weight. The compressive strength, thermal conductivity, density, and absorption were measured experimentally in the lab. The results showed that the maximum reduction in compressive strength was 44% and 63% for 15% substitutions of perlite and rubber, respectively. On the other hand, the absorption of perlite was higher than rubber mortar by 59%, for the content of 10%. The thermal conductivity results proved the higher efficiency of perlite and rubber, which reached around 50% and 30%, respectively for the contents of 15%. Finally, thermal analysis of a wall (0.82 x 0.64 m) was simulated for a hollow concrete brick using finite element model (FEM) with ABAQUS software. All heat transfer processes (conduction, convection, and

radiation) were included in the simulation for the exterior surfaces of the wall as well as the cavities. All thermal conductivities obtained from the experiments were used in the simulation to quantify the amount of reduction in the inner temperature of the wall. Perlite and rubber substitutions reduced the temperature by about 1°C to 2°C, which reduced the electricity consumption by 6% for each degree. According to ASTM C 270, the perlite and rubber mortars were satisfying the conditions.

Keywords: FEM, insulation mortar, perlite, rubber, thermal simulation

About the Author. Mr. Ahmed Salem Al-Tamimi. PhD student at the civil engineering department at KFUPM. He has carried out various research in thermal conductivity of concrete and masonry hollow bricks. He has two patents, written for six journals, and has presented at two conferences in Canada and Spain.

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232SC: CONSTRUCTABILITY OF AN ESTIDAMA AND BUILDING CODES COMPLIANT SIP SYSTEM IN ADAPTIVE PUBLIC HOUSING IN UAE

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Abstract. The current external wall construction systems of Emirati public housing in UAE are quite rigid, leaving residents with little or no options for undertaking the needed extensions and adaptations of their houses. On the other hand, Structured Insulated Panel (SIP) Systems have recently emerged in the global housing construction market, that can be used as relocatable external wall construction systems. This research aims to examine the SIP external wall construction systems to define which is more suitable for replacing the current rigid masonry one in UAE public housing from sustainability, constructability, cost-efficiency, and other construction-related perspectives. This would help achieve the desperately needed resilience of public housing and allow residents to have the lead in extending/adapting their houses without compromising sustainability and safety considerations.

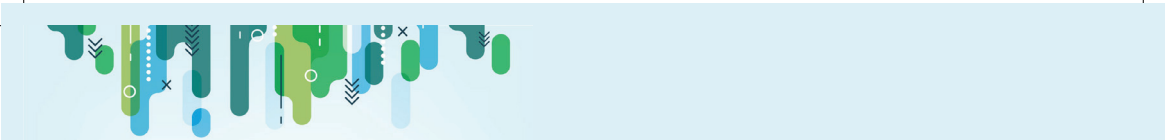
A comprehensive market survey for the available SIP Systems helped define the available SIP Systems. To select the best SIP relocatable system, the specs of the available systems have been compared as per Estidama and relevant Building Codes requirements. Afterwards, the research proposed a construction mechanism for fixing, relocating, or

removing the SIP panels without vast disturbance in the existing construction and finishing materials.

In this proposed construction paradigm, the public housing providers would be responsible for constructing the “fixed” modular skeleton besides the panels of a “core” house delivered to beneficiaries. The extension of this core house would be the responsibility of the residents according to their needs with the technical support and guidance of the local authorities, if and when needed.

Keywords: SIP Systems, Estidama, constructability, adaptive housing, UAE

About the Author. Dr. Khaled Galal Ahmed is Associate Professor at the Architectural Engineering Dept., College of Engineering, UAE University. In 2003, Dr. Khaled got his PhD in Architecture from The Welsh School of Architecture, Cardiff University, UK. Dr. Khaled has been the instructor and the developer of several undergraduate and postgraduate courses. Teaching experience of Dr. Khaled at both Mansoura University in Egypt (2003–2005) and UAE University (2005–present) includes Architectural Design Studios for all undergraduate levels, Sustainable Building Technology, Urban Planning and Housing, Social Environment, Building Construction, Working Details, and Graduation Projects. For the postgraduate level, Dr. Khaled taught both Master and PhD courses. He has supervised several MSc theses and two PhD dissertations at Mansoura University. In research, Dr. Khaled’s interests are mainly in the fields of Sustainable Community Development, Sustainable Urbanism, and Housing. His publication record includes several book chapters, journal articles in international journals, and referred papers in



international conferences, besides several presentations in regional and international workshops.

In 2007, Dr Khaled was awarded the UAE University Merit for "Recognizing Exceptional Service Through Work Assignments." In 2012, he received the Appreciation Medal from the Directorate of Planning and Survey, Sharjah Government, UAE, in 2013, Dr. Khaled received the Appreciation Certificate from Sheikh Zayed Housing Program, UAE, and in 2015, he received the Appreciation Certificate from Fujairah Municipality.

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24 ISD: THE EXPANDED BED BIOFILM REACTOR: INNOVATIVE TECHNOLOGY FOR ADVANCED TREATMENT OF USED WATER

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Abstract. Improved sustainability of used water (wastewater) treatment requires reduction of energy consumption and greenhouse gases emissions. Using innovative expanded bed biofilm reactor (EBBR) technology can help to achieve this aim. Suitable processes include tertiary treatment, sludge liquor (reject water) nitrification, denitrification, anaerobic digestion, and, possibly, phosphate removal.

By growing biofilm on small (1 mm) media particles of porous carbon, the EBBR offers the highest specific surface area of biofilm (up to 2,400 m² per m³ reactor) and highest biomass concentration (up to 42 kg per m³ reactor) of any process technology currently available. These attributes result in small-footprint, high-rate processes (nitrification rates of up to 1 kg NH₃-N per m³ reactor per day for tertiary treatment; up to 3.6 kg for sludge liquor treatment). ABD's nitrification EBBR uses counter-current aeration, which should reduce greenhouse gases emission. Furthermore, by using mineral-derived media, the risk of environmental pollution by plastic is avoided.



Although oxidation of ammonia (nitrification) requires a considerable amount of energy to supply dissolved oxygen, most of it can be recovered by recycling the nitrate-rich liquor and achieving denitrification. This strategy can also reduce odour.

Energy recovery can be significantly increased by anaerobic digestion of raw sewage, so that most of the organic matter is reduced to methane. This contrasts to current practice, where energy-intensive aeration is used to destroy organic matter, via oxidation to CO₂ and water, producing secondary sludge that needs energy-intensive thermal hydrolysis for improved treatability via anaerobic digestion. Low-energy EBBR technology is well suited to this new process.

Keywords: anaerobic-digestion, biogas, energy-efficiency, greenhouse gas reduction, innovation, nitrification

About the Author. Dr. M. J. Dempsey is an applied microbiologist with experience of biochemical engineering. He is Head of the Faculty of Science and Engineering Centre for Postgraduate Researchers at Manchester Metropolitan University. He is also Founding Scientist and Managing Director of Advanced Bioprocess Development Ltd, a university spin-out company set up to commercialise his research on expanded bed biofilm reactor (EBBR) technology. He is a technical innovator with three patents awarded for improvements to EBBR technology.

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249BP: SYNTHESIS OF HIGHLY EFFICIENT SORBENTS BASED ON COPPER AND CADMIUM SULFIDES FOR WATER PURIFICATION

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Abstract. Sorption processes are the most effective method of cleaning the aquatic environment from harmful impurities, including the heavy metals radionuclides.

Synthesis of highly efficient nano- and micropowder sorbents based on copper and cadmium sulfides and a comparison of their sorption properties are considered in this work.

The formation of micro- and nanostructures of metal sulfides from solutions is exerted by a number of factors: deposition temperature, pH, component concentrations, forms of activation, etc. The copper sulfide particles from aqueous solutions have a predominantly spherical particle shape. For cadmium sulphide, in addition to spherical particles, it is possible to forming of particles in the form of micro-flowers (especially with microwave activation)—thin plates with a thickness of up to 50 nm fused into large spherical agglomerates, up to 10 μm in size. An increase in the pH of the medium and temperature promotes the coarsening of the particles. The use of microwave radiation also contributes to the coarsening of the particles, but it makes it possible to significantly increase not only



the purity of the synthesized compounds, but also an increase in the yield of CdS and CuS which are respectively 93–95% and 95–97% by weight.

It is concluded that metal sulfides are stable and effective as sorbents at above 5 pH. Extraction of europium, cerium, copper, and their radionuclides by sorbents based on cadmium and copper (II) sulfides are the most efficient (more than 90%) at pH value above 7.

Keywords: sorbents, nanopowders, sulfides, water purification, radionuclides

About the Author. Prof. Sergiy N. Lavrynenko. He is an Academician Professor, a DSc, PhD University lecturer in Engineering and Materials Science for almost 25 years, and a professional scholar with several fellowships, monographs, and books. He is also an Academician of the Euro Mediterranean Academy of Arts and Sciences, Honorary Research Fellow of the Royal Society, Professor Honorary of the Swiss Montreux Business School, and Member of the PNTTE, IAAM, EUSPEN, and SPIE. He has published more than 220 scientific reports and is an Inventor with three patents. He took part in 92 international conferences with presentations and chair of 6 sections, and is a Member of two international conferences scientific committees. Areas of research: nanomaterials and metamaterials, synthesis of new materials, sintering of nanoceramics, sorbents for water purification from radionuclides and heavy metals, polymer optics, scintillators, and luminescent and photovoltaic technologies.

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250BP: FORMATION OF HIERARCHICAL ZINC OXIDE NANOSTRUCTURES FOR SOLAR ENERGY CONVERTERS AND PHOTOVOLTAICS

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¹The National Technical University "Kh.P.I.," UKRAINE

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Abstract. Zinc oxide is a promising material for fabrication of thin film layers for new generation of photovoltaic devices and solar thermal collectors due to the unique optical and electrical properties as well as propensity to form filamentous one-dimensional submicron structures, namely nanowires, nanorods, nanotubes, nanobelts, and hierarchical nanostructures with developed surface and projected superhydrophobicity.

We identified the possibility for a development of planar single-layer antireflection coatings and/or arrays of nanorods of this material as having the shape of hexagonal prisms, and demonstrating the moth eye effect on the substrates of transparent conductive tin dioxide and on silicon wafers with embedded homojunctions.

The optimization of the pulsed electrodeposition of zinc oxide arrays adjust the size of parabolic nanonipples for the implementation of antireflection coatings with the moth eye effect on various substrates, including flexible. The antireflection coatings will be developed for



thin film photovoltaic devices of substrate configuration based on kesterite, tin sulfide and fullerene layers, for the cadmium telluride based photovoltaic cells with bilateral sensitivity of superstrate configuration on the flexible substrates and for optoelectronic devices based on zinc selenide for the ultraviolet spectra.

We are developing design of multilayer selective coatings for the solar thermal collectors with record optical properties in which the selectivity will be improved by the use of zinc oxide arrays. The combination of the antireflection properties of the surface with its self-cleaning properties is particularly important in the operation of solar power products with large areas and will have a major economic effect.

Keywords: formation, nanostructures, zinc oxide, solar energy, converters, photovoltaics

About the Author. Prof. Sergiy N. Lavrynenko. He is an Academician Professor, a DSc, PhD University lecturer in Engineering and Materials Science for almost 25 years, and a professional scholar with several fellowships, monographs, and books. He is also an Academician of the Euro Mediterranean Academy of Arts and Sciences, Honorary Research Fellow of the Royal Society, Professor Honorary of the Swiss Montreux Business School, and Member of the PNTTE, IAAM, EUSPEN, and SPIE. He has published more than 220 scientific reports and is an Inventor with three patents. He took part in 92 international conferences with presentations and chair of 6 sections, and is a Member of two international conferences scientific committees. Areas of research: nanomaterials and metamaterials,

synthesis of new materials, sintering of nanoceramics, sorbents for water purification from radionuclides and heavy metals, polymer optics, scintillators, and luminescent and photovoltaic technologies.

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265SD: MUNICIPAL SOLID WASTE COMPOSITION AND GREENHOUSE GAS EMISSION POTENTIAL FROM A LANDFILL – A CASE STUDY FROM MUSCAT, OMAN

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Abstract. Muscat, the capital city of Oman, is influenced by increasing urbanization. This preliminary study was conducted in Al-Multaqaa landfill in Muscat. The main objective of the study is to generate baseline data by assessing the generation rate and composition of the disposed Municipal Solid Waste (MSW) and estimating the greenhouse gas emissions from it. The weight and volume of each component were measured and recorded. The daily generation of MSW works out to be 0.97 kg/day/person by weight, and 3.113×10^{-3} m³/day/person by volume with a density of 311.73 kg/m³. The composition analysis reveals that the MSW stream has large proportions of organic waste. Greenhouse gas emissions from the Al-Multaqaa landfill is estimated to be 2.25Gg (Giga-gram) of methane per year and is expected to increase threefold by 2022. If waste management practices such as composting and recycling could be practiced in the future, there is a potential opportunity for substantially reducing the quantity of waste being disposed currently in the landfill.

Keywords: municipal solid waste, Al-Multaqaa landfill, generation rate, waste composition analysis, greenhouse gas emission

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266CB: PROTECTING THE NATURAL ECOSYSTEMS FOR BUILDING CLIMATE RESILIENT CITIES AS CARBON SINK

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Abstract. Cities are the main sources of greenhouse gases (GHG) especially carbon dioxide (CO₂). Protecting the existing natural ecosystems in cities will help to improve the adaptive capacity of the cities to the impacts of climate change. Mangroves are typically found in some coastal cities across the globe. They have the potential to sequester atmospheric carbon. This paper focuses on the benefits of urban natural ecosystem as carbon sink and eventually reducing the impact of increasing carbon dioxide. Al-Qurm Nature Reserve in Muscat city of Oman is a mangrove vegetation protected by the national legislation as conservation area and also registered as the first Ramsar site in Oman. Carbon sequestration was estimated in three distinct zones of this natural mangrove vegetation. The mean carbon stock in the middle zone was 7.7 ± 0.3 kg C/m², and for the seaward zone 5.3 ± 0.7 kg C/m², and for landward 18.8 ± 0.1 kg C/m², which is 3.5 times higher than seaward zone and slightly more than 2 times the middle zone. The 0.82 km² of Al-Qurm Nature Reserve occupied by mangrove vegetation was estimated to sink about 8692 t C (0.0087 Mt C) equivalent to about 0.032 Mt of CO₂e. These estimates suggest

a high carbon storage and sequestration potential of mangrove in Al-Qurm Nature Reserve, despite the small area they occupy in the city.

Keywords: mangrove, carbon sequestration, carbon sink, cities

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269BP: ENVIRONMENTAL BEST PRACTICES, IT BEGINS WITH US: BUSINESS, LOCAL GOVERNMENTS, AND INTERNATIONAL COMMUNITY SHOULD WORK TOGETHER

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Abstract. The paper aims to provide some plausible explanations and best practices for the two specific questions of: First, what factors influence the adoption of environmental policies and regulations as a strategic asset? Second, how can local governments better manage their environmental policies on a global basis?

The United Nations has raised international awareness and has made their best effort to implement such plans to resolve climate change and global warming concerns. There are various talks about the connection between business and geopolitics in regard to climate change and environmental responsibility. Through these talks, we find that national culture and political forces can substantially affect all policy functions and there are many ways the national culture and geopolitics can affect the adoption of environmental policies. Interestingly, the environmental policies and regulations seem to favor rather big companies and developed countries that have the financial resources to adopt the policies while small companies, consumers, and developing countries are seemingly left in the dust. Considering the big difference of national culture, geopolitics, and

economic development, having strong understanding and flexible solutions to the problem is immensely required. Bringing all stakeholders into the environmental conversation can greatly benefit business, local governments, and international community as well. The findings of the study may help local governments predict the adoption of their environmental policies and regulations, and therefore formulate better effective environmental policies complying with the international standards.

Keywords: environmental policies and regulations, global standardization, global solution, global education, environmental best practices, environmental responsibility

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270SC: SMART MOBILITY THROUGH THE INTEGRATION OF LAND USE AND TRANSPORTATION – A CASE STUDY OF CHENNAI METRO RAIL STATION

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Abstract. Chennai, the capital of Tamil Nadu, is the biggest industrial and economic center of south India. There is an urgent need to revive the patronage of public transport system in Chennai, since it has reached its lowest level ever since its inception. One of the initiatives by the authorities is the introduction of Chennai metro rail, a combination of both underground and elevated rail network in a phased manner. In phase one, 54 kms is being planned with 32 stations, and out of which currently 20 stations are operational (28 km) and another 12 stations are in the final stages of construction. The household survey suggested that once the first phase is operational, the share of public transport trips will increase from 28.5% to 55%.

This research focus is to find out how far the goals targeted at the time of design of Chennai metro rail is achieved. A model station – Vadapalani, Chennai, which is currently operational, will be taken up for the research w.r.t., passenger facilities including its impact on pedestrian movement, surrounding land use, design features of the station, demographic and socio-economic profile, density, multi-

modal connectivity, integration facilities, and last mile connectivity it offers.

This research will identify the impact of metro station and the metro rail network as a whole to the city and its residents. It will also help the authorities to come out with better strategies and solutions to increase the patronage of public transport and enhance the quality of life.

Keywords: metro rail, impact study, public transport, smart mobility

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273BP: GREEN FODDER PRODUCTION AND EFFECT OF DIFFERENT SALINE WATER LEVELS UNDER HYDROPONIC BARLEY

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Abstract. The objectives of this study were to evaluate the effect of different saline water quality on barley (*Hordeum vulgare*) growth for green fodder production and saline water use efficiency under hydroponic conditions. The experiment has been conducted under temperature-controlled conditions ($24 \pm 1^\circ\text{C}$) and natural window illumination at growth room of Soilless Culture in the Laboratory Kadoorie Agricultural research center, Palestine Technical University (Kadoorie), Tulkarm, Palestine. Cultivation of tested seed started on 12 April 2017. The experimental work included two trails, first trail contained germination percentage using three Petri-dish and the number of seeds that were planted was 100 seeds and the number of average seeds that germinated was 92%. The other trial consisted of four treatments (F.w, 3,6,9 ds/m) carried out under room conditions to evaluate the length and weight and were all recorded and used to determine which saline water is the highest production between the treatments.

The results showed that green forage can be produced in 12 days from planting to harvest using hydroponic techniques. Highest values

for green were recorded for 3, 6, and 9 ds/m and were better grown in both measurements length and weight categories, length 20 cm and weight around 2,100 g, while the fresh water reached 15 cm, 1,746 g, respectively.

Keywords: barley, hydroponics, water salinity, germination percentage, green fodder

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275SC: SUSTAINABLE DEVELOPMENT IN THE UAE THROUGH CEMENT-FREE GEOPOLYMER CONCRETE

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Abstract. Industrial solid wastes are by-products of economic development and human activities. Rather than wastefully discarding them in stockpiles or landfills, waste materials can be reutilized in other applications. The construction industry is an ideal area to recycle industrial by-products in the form of a sustainable binder to alleviate anthropogenic emissions, reduce depletion of natural resources, and provide a recycling bin for industrial waste. This study examines the performance of cement-free geopolymers made with locally available fly ash, ground granulated blast furnace slag, and dune sand and activated by an alkaline activator solution (AAS) of sodium silicate (SS) and sodium hydroxide (SH). The effect of curing conditions and mixture proportioning on the rheological, physical, and mechanical properties of geopolymer concrete and associated mortar were evaluated at early and late ages. Heat curing was found to be essential for strength development of fly ash-based geopolymers, but could be eliminated by partially replacing fly ash with slag. The incorporation of 25% slag resulted in superior mechanical performance, owing to the activation of calcium-carrying compounds. Further increase in the replacement of fly ash by GGBS resulted in less workable mixes that set within a few minutes after casting. The

compressive strength was thus lower than fly ash-based counterparts. Nevertheless, the addition of superplasticizer improved the rheology of slag-based geopolymers, leading to comparable compressive strength. Experimental findings showed that compressive strength and setting time decreased as the amount of dune sand increased. Higher SS-to-SH ratios also led to higher compressive strength and lower setting times.

Keywords: geopolymer, rheological and mechanical properties, slag, fly ash

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276BP: ASSESSMENT OF WATER QUALITY OF THE RIVER ASSI BY USING WQI, VARANASI, INDIA

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Abstract. Rivers are a vital component of the biosphere with their higher ecological and social significance. However, they are being polluted by indiscriminate disposal of sewerage, industrial waste, and human activities. The Assi River, a tributary of River Ganga, Varanasi district, Uttar Pradesh (India) has been facing serious degradation due to direct discharge of domestic sewage, channel encroachment, and city urbanization. The present work has been carried out to identify the water quality status of the Assi River. For this purpose, six sampling sites have been selected for physico-chemical analysis in three consecutive months (i.e. October, November, and December 2017). Nineteen physico-chemical parameters-temperature, pH, DO, TDS (mg/l), electrical Conductivity (mS/cm), BOD (mg/l), COD (mg/l), chloride (mg/l), hardness (mg/l), alkalinity (mg/l), nitrate (mg/l) Na (mg/l), K (mg/l), Ca (mg/l) including heavy metals (Cr, Pb, Cd, & As) were analyzed for river water characteristics. The result reveals that the Assi River water is highly polluted, especially at the polytechnic sampling site, which shows high deterioration of water quality. Further, it is observed that direct disposal of domestic sewage to the river is one of the main causes of high values of BOD, TDS, EC,

Nitrate, and chloride in the river water. Water quality index (WQI) of the river has been evaluated and was 80.96, 81.22, and 80.95 in October, November, and December, respectively. These values are coming under a marginal category and indicating threatened water quality of the Assi River. Therefore, an urgent need of appropriate preventive measures should be taken to stop the deterioration of the Assi River water quality.

Keywords: Assi River, water pollution, WQI, physico-chemical parameters, Varanasi

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277BP: ANALYSIS OF COOL ROOF PASSIVE TECHNIQUES FOR RESIDENTIAL BUILDINGS IN SUBTROPICAL HUMID CLIMATE

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Abstract. The objective of this study was to provide the thermal comfort by means of passive cool solar reflective materials which have a high solar reflectance and high thermal emittance on the existing roof and thereby reducing the consumption of electrical energy. Experiments were performed by using locally available solar reflective materials to insulate the roofs. In this work, thermal performance of concrete roof and asbestos sheet roof with and without insulation has been analyzed by performing experiments to existing buildings. The results are verified by computer simulation using Computational Fluid Dynamics tools with FLUENT software. The result of using solar reflective paint with high reflective coating shows a fall of 4.8°C in peak hours and saves 303 kWh when considering the energy load with air-conditioners in the summer season, in comparison to non-insulated pitched and flat roof energy load of residential buildings in Bhopal. An optimum solution of insulator for both types of roofs is presented. The application is intended for low-rise or medium-rise residential buildings in subtropical climates like Bhopal.

Keywords: passive cooling, cool roof, thermal comfort, insulators, subtropical climate

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280CB: REHABILITATION OF COASTAL HABITATS TO PROTECT BIODIVERSITY AND LIVELIHOOD FROM CLIMATIC AND NON-CLIMATIC FACTORS - A VITAL MANAGEMENT TOOL

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Abstract. Coral reefs and seagrass beds are important for biodiversity and livelihood, but they are fast degrading due to climatic and non-climatic factors. The climate change impacts since 1998 and non-climatic factors, mainly destructive fishing practices, mining, pollution, and coastal development, altered the coral and seagrass community structure and health. The rehabilitation of degraded coral and seagrass areas are considered as viable management practice to restore the ecosystem services like fishery, coastal protection, and tourism. Low-tech and low-cost transplantation techniques have been successfully standardized and implemented in Gulf of Mannar (GoM), southeast India. Coral rehabilitation, started in 2002, including the perfected technique - site selection, identification of suitable native species, precision in fragmentation, fragment size and fixing position, and effective monitoring protocols resulted in 80% survival and good growth. The average annual growth in fast growing branching corals is 13.5 cm and 1.8 cm in massive corals. There is also considerable increase of coral cover, recruit density, associated

macrofaunal, and fish population. Seagrass rehabilitation started in 2008. Seagrass shoots in the rehabilitated areas showed good results within six months, a good survival rate of 85% with increased biodiversity. There was 9.7% coral mortality in 2010 and 16.2% in 2016 due to elevated temperature, but the ecosystem shows resilience due to the effective intervention like rehabilitation in the degraded areas in various islands in GoM since 2002.

Keywords: corals, seagrass, rehabilitation, transplantation

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284CB: THE ECOLOGICAL IMPACTS OF CLIMATE CHANGE IN HOT REGIONS: CAN NILE TILAPIA ADAPT TO GLOBAL WARMING?

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Abstract. As temperatures rise, there are multiple factors which will influence a species' ability to survive. As well as the pace of warming, species which are already living above their thermal optima will be more vulnerable than species which are still below, and species where these optima are fixed will be more vulnerable than species where they are flexible. Here, we examine this using the Nile Tilapia (*Oreochromis niloticus*); constructing thermal performance curves for different individuals by measuring breathing rates across a range of temperatures. We found that thermal optima were highly variable between individuals, ranging all the way from 21°C to 35°C. Temperatures in the native range are increasing more slowly than in cooler regions further north, but at least initially the impacts could be more negative because conditions for most individuals are already too hot. In the longer term, however, the species as a whole would appear capable of adapting because the thermal optima are flexible

and the population contains some individuals for whom the native temperatures are still too cold.

Keywords: climate change impacts, tropical biodiversity, thermal performance curves, optimal temperature

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29 | ISC: IMPACT OF GREEN SPACES ON THE URBAN MICRO-CLIMATE THROUGH LANDSAT 8 AND TIRS DATA, IN VARANASI, INDIA

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Abstract. With the rapid global urbanization, the environment quality has been degrading day by day. Urban air temperature is gradually rising in all cities and some effective measures are needed to mitigate it. Planting of urban greenery is one of the main strategies to regulate urban microclimate. This study attempts to assess the effect of urban greenery on land surface temperature (LST) for the improvement of microclimatic conditions in the Varanasi city, India. The effect of urban heat island is analyzed using the Landsat-8 OLI/TIRS data in 2017 as a case study of Varanasi city, India. The spatial pattern of LST in the study area is retrieved to characterize their local effects on urban heat island. The correlation among LST, the normalized difference build-up index (NDBI), and the normalized difference vegetation index (NDVI) are analyzed to explore the impacts of the green space and the built-up land on urban microclimate. Results exposed that the central portion of the city exhibited the highest surface temperature compared to the surrounding open area, the areas having dense build-up displayed higher temperatures and the areas covered by vegetation and water bodies exhibited lower temperatures. This study shows that urban

green space will help to mitigate the urban microclimate and it is important for sustainable development of urban environment as well as to provide a healthy quality of life to the urban dwellers.

Keywords: LST, NDVI, NDBI, Varanasi, GIS, remote sensing, urban micro-climate

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298SC: DEVELOPMENT OF ORNAMENTAL PLANTS MODULES BASED ON OUTDOOR HYDROPONICS

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Abstract. Outdoor hydroponics offer a promising solution for green buildings to ornament urban constructions with highly efficient and clean ornamental modules. Harsh environmental conditions are the most critical hazards that plants grown in such systems may face specially in arid lands where ambient temperature and wind speeds would devastate the plants in minutes.

In this research, an outdoor hydroponic unit was developed and tested in the College of Food and Agriculture experimental farm from May to July 2016, where maximum ambient temperature ranged between 40°C and 44°C and wind speed was about 44 knots.

The module was designed to represent the UAE University in 3 inch PVC pipes where it was insulated with TNS glass wool insulator. Twenty of Vinca white, Gomphrena, Portulaca, and Vinca Red roses were planted and observed under one irrigation protocol.

Temperature in the plant canopy reached as maximum as 45°C while it was fluctuating between 44°C and 50°C following the irrigation pattern in the root zone. In May, plant health was monitored and it was found that in the first week after planting, Potrulaca experienced the highest level of welting where 30% of the roses were welted and

a third of them were unable to recover, while the White Vinca showed the best performance with 5% wilted roses, which was able to recover in a few days.

Keywords: hydroponics, green building, landscape

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305CB: RISK ASSESSMENT OF GREEN TURTLE HABITAT THROUGH GEOSPATIAL INDICATORS A CASE STUDY OF HAWKS BAY BEACH, KARACHI-PAKISTAN

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Abstract. Hawks Bay beach is amongst one of the famous marine turtle nesting beaches of Pakistan. It has significant geographical characteristics, which provides suitable nesting grounds for the marine turtles. Green Turtles (*Chelonia mydas*) nesting activity on this sandy beach is highly frequent throughout the year. Their nesting habitats are under many severe threats. Most of them are human induced. Satellite remote sensing techniques will be used for the evaluation of risks of the nesting habitat of Green Turtles in this study. It will be used to examine the factors for the depletion of nesting sites at the ground. Furthermore, the assessment through GIS techniques will be help full to quantify the nesting pits. This study will be helpful to monitor the marine turtle species activities through successive techniques, which would help to protect these distinctive creatures.

Keywords: risk analysis, Green Turtle, RS and GIS

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308BP: DIBBIN TRANSECT MODEL: A NEW FRAMEWORK FOR MAINSTREAMING BIODIVERSITY CONSERVATION INTO LAND USE PLANNING

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Abstract. Dibbin Forest represents the south-eastern distribution limit for the native Aleppo pine and evergreen oak. The forest is undergoing habitat fragmentation and biodiversity loss due to rapid urbanization, unsustainable human, tourism and agricultural activities, and lack of proper planning policies. Dibbin plan aims to guide the development in the surrounding area of Dibbin Forest Reserve while protecting the ecological resources and services. The plan provides a new framework for mainstreaming biodiversity conservation into land use planning using participatory and conservation-oriented approach.

The proposed framework outlines a standardized criteria for conducting biodiversity assessment. The method of assessment addresses conservation value and viability for conservation for all zones. On the basis of the assessment, a biodiversity sensitivity map ranking different zones within the area from most important to least important and identifying biodiversity "hotspots" and "coldspots" was developed. The map provide a solid foundation for the development of Dibbin transect-based plan.



A new set of land uses that better responds to biodiversity conservation needs and restricts development within biodiversity hotspots was proposed. In terms of spatial pattern, the plan embraced a transect-based model, a concept adapted from ecology and includes a series of zones that demonstrate changes from natural areas to urban areas. Accordingly, the transect model was applied in Dibbin plan to describe changes in land use pattern from native forest and to urban areas as a means to minimize threats and disturbance on biodiversity hotspots caused by human and agriculture activities as well as urban sprawl.

Keywords: biodiversity, land use planning, conservation, transect model

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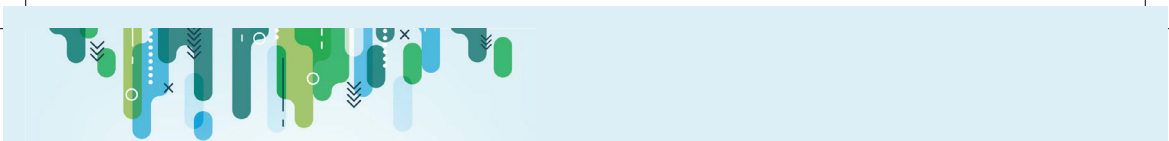
3 I6SC: HOW TO BUILD A SMART CLIMATE CITY CONSERVING AND USING BIODIVERSITY

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Abstract. Urbanization requires many challenges. It is placing environmental load on natural resources because cities account for 60–80% of energy consumption across the globe and for more than 70% of worldwide carbon dioxide emissions. As a result, to ensure better living conditions for present and future generations, cities need to adopt the smart route and at the same time focusing on the sustainability aspect. Cities needs to be both sustainable and smart. The sustainability aspect is not just in terms of environment but also economic, social, and governance. The three pillars of sustainable economic advancement, political involvement, and social emancipation are the fundamentals for a smart sustainable city. The management of green areas, the restoration of ecosystems, and biodiversity conservation allows cities to address the concerns of all three objectives: climate change, biodiversity, and land management (avoiding desertification). Innovation and digital technology must be oriented to minimize energy consumption and improve quality of life. Therefore, digital technology and information and communications technology need to address urbanization challenges and ensure sustainability.

Keywords: smart, urbanization, conserving, biodiversity, sustainability



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317SC: SUSTAINABLE CITY TRANSPORT DEVELOPMENT AND REDUCTION OF GREENHOUSE GASES EMISSIONS THROUGH INTRODUCTION OF BIODIESEL FUEL

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Abstract. Biodiesel, as one of the most effective, affordable, and carbon-neutral renewable fuel, can reduce the exploitation of fossil fuels, thus contributing to curbing greenhouse gases (GHG) emissions and reduction of anthropogenic global warming factors. Biodiesel can be especially useful in urban areas, where concentration of vehicles is high and the air is polluted with the harmful emissions from the internal combustion engines of vehicles.

Biodiesel has the possibility to be more widely used as alternative, eco-friendly fuel in various types of vehicles. The present work is focused on analysis of the most important characteristics of both biodiesel and conventional (oil-based) diesel fuel; based on the research and findings, the article gives the recommendations how to improve the nano-composition of biodiesel so that it could be more widely used in diesel engines.

The oil and acid composition of biodiesel fuel has been studied and identified through liquid chromatography and the functional groups of the fuel were analyzed using a Fourier IR spectrometer. Based on the



results of the research, an improved nano-composition of biodiesel has been offered, which, while maintaining the highest quality and meeting the demands of EN 14105, ASTM D 6751, and EN 590 standards, can significantly reduce harmful emissions.

The improved physical and chemical parameters of biodiesel will allow using of this eco-friendly, renewable biofuel and its blends in almost all kind of internal combustion diesel type engines serving as a reliable, alternative fuel for sustainable city transport and reduction of GHG emissions.

Keywords: biodiesel, sustainable transportation, GHG emissions, nano-composition.

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320SD: ASSESSING AND EVALUATING ABOVE GROUND BIOMASS (AGB) AND EVALUATING CARBON SEQUESTERED USING MEDIUM TO HIGH RESOLUTIONS SATELLITE IMAGERY

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Abstract. Date palm trees have been considered an important part of the farming systems in United Arab Emirates (UAE). It is strongly believed that palm tree plantations in Abu Dhabi are benefiting both the economy as well as the environment through the huge amounts of carbon sequestrations. Afforestation and plantations, such those relating to palm trees, contribute to reducing emissions resulting from deforestation and land degradation. Palm tree species are good source of carbon sequestration in such arid ecosystems. The study assessed the amount of carbon being sequestered by date palm plantations in the Emirate of Abu Dhabi, UAE, by determining the above ground biomass (AGB) and belowground biomass (BGB), estimating the total carbon content and evaluating the CO₂ sequestered. Geospatial techniques and the non-destructive field observation methods were used. The current and dynamics of soil organic carbon (SOC) was estimated with a spatially-enabled database of Abu Dhabi's climate. Several numbers of field plots of date palm plantations were selected for analysis and building allometric equation related to AGB of date palm biomass according to their



variables (crown cover and height) plus direct sampling of soils in these plots. Empirical regression models based on field plot data were established to determine wet and dry biomass (kg m^{-2}) of date palm plantations using different spectral bands and vegetation indices. Model evaluation and validation was conducted to determine overall accuracy.

Keywords: biomass, carbon sequestration, GIS, remote sensing, terrestrial carbon

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321AM: APPLICATION OF SMART CITIES TECHNIQUES IN INTEGRATED PLANNING AND SUSTAINABLE URBAN ENERGY SYSTEMS IN IJAPO HOUSING ESTATE, AKURE, NIGERIA.

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Abstract. Presently, nearly 80% of the world's population are under high energy demand. Developing countries of Africa are more affected with increasing urbanization. In Ijapo Housing Estate, energy infrastructure had deteriorated and alternative means of energy generation are not environmental friendly, the rate at which the air is being polluted as a result of CO₂ being emitted into the environment from generators and other energy infrastructures and brings negative effects on the environment. Emerging phenomenon to address these issues is the "smart cities" approach aimed at delivering a smart and integrated energy system. The basis of this paper aimed at developing a framework for smart energy supply and management in Ijapo using the inclusive/bottom-up approach. Indicators of smart energy systems, which include smart metering infrastructure, billing and usage, consumption, energy device monitor, disaster and emergency preparedness, and distribution automation were built into the variables of the questionnaires. A systematic random sampling technique was adopted to select 605 (50% samples) buildings after digitizing them with the aid of ArcGIS 10.5. The study developed an



energy network system for Ijapo and an integrated approach to its management with the use of ArcGIS Network Analyst and Schematics. Results highlight the willingness of residents to subscribe to the smart and integrated energy supply with emphasis on affordability, reliability, accessibility, and citizen engagement in decision-making. Issues of data/energy security and access through mobile applications for real time information on energy supply are major priorities for residents. Recommendations include feedback mechanisms, sustainability, funding, and a central solar farm for Ijapo.

Keywords: inclusiveness, smart metering, mobile applications, smart energy system, smart energy variables, urbanization

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333SC: CURRENT AND ALTERNATIVE SCENARIOS FOR REDUCING CARBON EMISSION: A CASE STUDY FROM MUSCAT EXPRESS HIGHWAY LIGHTING SYSTEM

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Abstract. Most of the lighting systems in the roads of the capital city of Oman are high pressure sodium (HPS), incandescent, and tungsten halogen incandescent. Although these lighting systems provide excellent brightness in streets, they consume a lot of energy, produce heat, have a shorter life span, and require frequent maintenance. From an enviro-economic prospective, Muscat Municipality is looking for efficient and environmentally-friendly lighting systems. The objective of this study is to estimate (i.) the amount of CO₂ emission based on energy consumption from natural gas energy source; (ii.) cost of electricity consumption; and (iii.) the number of plants needed to sequester the emitted CO₂ as a result of replacing Muscat express highway lighting system from HPS to light emitting diode (LED). Carbon dioxide emission scenarios and the number of trees required to sequester CO₂ emission was estimated by using Greenhouse Gas Equivalencies Calculator by EPA (EPA, 2017). The results of this study show that replacing Muscat express highway lighting system from HPS to LED would reduce CO₂ emission by 86% from 1206 metric tons



to 168 metric tons. This change in lighting system would also result in reducing the cost of electricity consumption from 50,561 to 7,028 USD. The number of trees seedlings grown for 10 years to sequester CO₂ emission would be also decrease from 31,245 to 4,343. The results of this study elicit LED as a promising prospect in making Muscat a green city.

Keywords: LED, Muscat express highway, CO₂ emission, energy efficiency, sustainable cities, Oman

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334AM: A COMPARISON BETWEEN A STAND-ALONE AND GRID-CONNECTED ROOF MOUNTED PV SOLAR SYSTEM UNDER ABU DHABI NET METERING SCHEME USING HOMER

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Abstract. The power consumption per capita in UAE is amongst the world's highest with 11,264 kWh/person in 2014. The Emirate of Abu Dhabi power consumption was estimated at 62,979,070 Mega-Watt hour (MWh) in 2016 of which 30,867 kWh was produced from renewable resources. The country mostly relies on fossil fuels for generating electrical power. In 2014, the carbon emissions from fuel-generated electricity was estimated to be 26.5 million tons of CO₂ equivalent. Therefore, the need to increase the share of renewable energy electricity production is of high importance. This study spots the light on a roof mounted PV system and compares between a stand-alone system and a grid-connected system under Abu Dhabi net metering scheme using HOMER software. A building was selected and the daily electric demand was found using Carrier HAP software, then HOMER was used to design and compare the two system arrangements. It was found that for a stand-alone system, the PV panels were able to produce 96,921 kWh/year with an initial cost of \$176,250, net present cost of \$319,037, and a levelized cost of electricity (LOCE) of \$0.345 per kWh. While a grid connected system



can utilize lower PV production capacity of 48,460 kWh/year with an initial cost of \$41,205, net present cost of \$98,544, and LOCE of \$0.107 per kWh. The attractive power generation numbers and costs associated with the grid-connected system can confirm that its application is justified both economically and technically compared to a stand-alone system.

Keywords: renewable resources, PV system, HOMER, grid-connected system

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343AM: POLICY DRIVEN SOLAR INSTALLATION AND INDUSTRY: STAKEHOLDER ANALYSIS TOWARDS ENERGY TRANSITION IN JAPAN

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Abstract. In order to mitigate climate change and overcome exhaustion of fossil fuels, the society is in need of “energy shift.” To be precise, the society needs to transition from the energy system that is mostly dependent on non-renewable sources such as coal, oil, and natural gas, to the energy system dependent on renewable energy sources. Since energy policy is one of the fields that tend to hold strong path-dependency, it can be easily understood that the transition is likely to face strong opposition from stakeholders of conventional energy systems. When we assume that policy decisions are the results of political processes between various stakeholders, designing policy options that can move energy systems forward towards sustainable ones, as well as reaching agreement among conflicting stakeholders are necessary.

This research conducts stakeholder analysis with comparative causal mapping, with regard to a renewable energy policy in Japan. It aims to figure out essential conflicts of value and interest that are usually hidden under debates focused on technical issues. As a result, we identified two stakeholder groups which hold completely different



views on the same issue, and analyzed the causes that lead to differences in value basis and interest between both stakeholders. In addition, we categorized various stakeholder groups of renewable energy policy in Japan, and discussed Japanese future policy direction in which most stakeholders can support for the transition.

Keywords: renewable energy, policy, stakeholder analysis

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358SC: IMPACT OF BUILDING SETBACK ON ENVIRONMENTAL SUSTAINABILITY: A STUDY OF LEFTOVER SPACE OF RESIDENTIAL BUILDING IN KHULNA

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Abstract. In the last few decades, excessive use of natural resources for the well-being of people has caused the continuous degradation of the built environment. Both professionals and researchers are working together to make the environment more sustainable and healthy, as the regulatory model of master planning approach failed to provide eco-responsive built-environment. Degradation of natural ecosystems, climate change, and conversion of green spaces into a paved area are major concerns for the cities. To this end, this paper makes a critical interpretation of building setback rules and depicts its condition that practice at field level. For the study, fifty residential buildings of Nirala have selected according to the process of random sampling. Being its geographical location, Khulna has already been declared as one of the vulnerable cities in Bangladesh. Over the last 15 years, Khulna has been experiencing the hostile impacts of climate change, such as excessive rainfall, water logging, heat stress, etc. Khulna Development Authority (KDA) includes many sections on planning regulation to keep green open spaces to mitigate climate change. Building setback is one of the rules that use universally at the



individual plot level. In reality, landowners violate the codes and regulations for maximizing the use of land. The outcome of the study helps development authority, professionals, and scholars to comprehend the current situation that prevails and practice at field level. At the same time, it depicts the significant role of building setback to ensure sustainable environments and authority can rethink the policy.

Keywords: built-environment, ecosystem, master plan, sustainability

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367SC: RECEDING WETLANDS IN PERI-URBAN AREA AND URBAN VULNERABILITY TO CLIMATE CHANGE: A CASE STUDY OF LUCKNOW CITY, INDIA

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Abstract. Urban land transformation has significant influence on changing wetland ecosystems surrounding the city area over the world. Land use/land cover change affects the spatial landscape of the wetland as well as the total ecology of wetlands. Wetlands across over the genetic plains are under increasing stress due to infrastructural development, rapid population growth, economic and urbanization growth, especially the wetlands around the Indian mega cities and peri-urban areas of the urban centers. Lucknow city is one of the important growing mega cities in upper Ganga plain with many important wetlands. In this context, we investigated the impact of urban sprawling and land transformation on degradation of wetland ecology of peri-urban areas and associated climate change vulnerability in study area. For this purpose we used remote sensing data and Geographical Information Systems (GIS) techniques to estimate land transformation for the period of 1990 to 2015. Urban patches were generated to understand the impact of these urban patches on spatial dimension of wetlands. From the spatio-temporal analysis of remotely sensed data, it was observed that the urban



expansion had an influence to decrease permanent open water surface over the study periods. Field data collection along with water quality analysis has indicated that increasing anthropogenic pressure coming from over exploitation, and encroachment and reclamation of vast wetland areas for residential, commercial, and industrial development, has led to fast shrinking of wetlands and has altered wetland functions and has increased urban vulnerability to climate change.

Keywords: urban sprawling, peri-urban area, wetland ecology, Lucknow City, climate change

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368BP: A STUDY TO ASSESS OUTDOOR WATER EVAPORATION IN THE CONTEXT OF ALTERNATIVE WATER REUSE FOR REDUCING ENERGY CONSUMPTION IN A MEDICAL FACILITY CASE STUDY, ABU DHABI

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Abstract. This paper presents the case for non-potable water energy nexus in a desert type climate healthcare environment, which is based on the need for Abu Dhabi to decrease desalinated water use to minimize energy consumption and greenhouse gas (GHG) emissions. Seguela et al. (2017) Abu Dhabi case study has shown that for a 21,600m² healthcare building footprint area surrounded by 36,310m² vegetated open space, on-site alternative water sources are less energy intensive for irrigation (0.22kWh/m³) and outdoor water feature use (39.09kWh/m³) than offsite produced desalinated water (55.68kWh/m³ average). Yet, energy is also wasted because the evaporation rate is 50 times higher in Abu Dhabi than precipitation. A solution studied by Rosa-Clot et al. (2017) to prevent water features evaporation is the installation of floating photovoltaic plants using evaporation models firstly, to reduce water waste, secondly, to control algae bloom, and thirdly, to reduce energy loss and GHG emissions to save on electrical consumption on a long term. The next steps are to take actual wind and solar radiation measurements at the



medical facility site to establish if floating photovoltaic could be a technical solution for the Abu Dhabi case to help reduce evaporation and thus GHG emissions. The results may be beneficial to the medical facility owner and to the relevant local authorities responsible for climate change initiatives and policies.

Keywords: sustainable healthcare buildings, non-clinical wastewater reuse, water energy nexus, greenhouse gas, Middle-East, alternative water reuse, renewable energy

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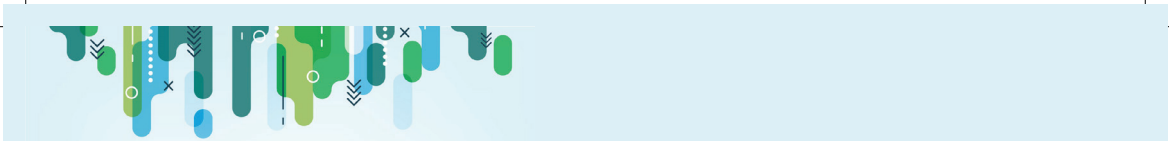
369AM: ENERGY PERFORMANCE RESILIENCE OF UAE BUILDINGS TO CLIMATE CHANGE

Kirk Shanks

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Abstract. A large proportion of electricity in the UAE is consumed in meeting air-conditioning cooling demands in buildings where up to 80% of a buildings total electricity demand is for cooling. With projected climate changes in the UAE predicting an increase in annual mean temperature of 2.8°C and minimal reductions in relative humidity and global solar radiation by 2050, cooling energy demands are set to increase. This paper reports on a study of how the climatic drivers of cooling energy demand change under a “business-as-usual” scenario of climate change. As annual energy demand for cooling per unit treated area varies across building types, a range of typical UAE commercial and residential buildings are simulated under generated annual hourly projected climate change weather datasets of 2020, 2050, and 2080. The results show an increase in cooling demand of 22.2% by 2050 and 40.0% by 2080 and a shift in the sources of these heat gains. The comparative effect of climate changes on the fundamental heat gain paths are examined and discussed to identify the most effective solutions for improving energy performance resilience to future climate change in the UAE.

Keywords: climate change, adaptation, resilience, retrofit, building energy demand



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374AM: ADDRESSING THE BEST POLICIES FOR HALAL ECOTOURISM MANAGEMENT IN ADAPTING CLIMATE CHANGE CHALLENGES: THE PHILIPPINE CASE

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Abstract. The impact of climate change on the natural environment has been a phenomenon affecting the ecotourism management. There are many challenges and threats facing the ecotourism development, in particular, mitigating natural hazard and preserving a Muslim-friendly environment. The government needs policies for a sustainable development, by improving access of transportation and infrastructures with less greenhouse gas emissions (GHG), and providing halal services and livelihood for poverty reduction to help the realizations of Millennium Development Goals (MDGs). Developing the ecotourism can overshadow the environmental risk and it will provide protection to the people as well as tourists to attain the highest standard of health. The findings will show that aside from the Tourism Act 2009 and the climate Change Act (Republic Act 9729), the presence of well-formulated policies and guidelines on ecotourism in adapting the climate change will widen the possibilities for the local people to further benefit from halal tourism development. In conclusion, it is of great importance that in facing the climate changes, the government must have strict environmental



standards compounded by a strict enforcement. However, for paradigm shift, it is necessary to be reminded that “we have to accept the evils of global development along with its blessings.”

Keywords: climate changes, halal ecotourism, well-formulated policies, sustainable development, environmental risks

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376AM: AUTONOMY IN BUILDING PROCESS TO ADAPT THE CLIMATE CHANGE IMPACT: A STUDY OF THE COASTAL SETTLEMENTS IN BANGLADESH

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Abstract. Geographically located in the deltaic region, Bangladesh is an ideal breeding ground of natural disasters. Climate change has also induced significant risks for Bangladesh, particularly for the coastal settlements, which face natural disasters of one kind or another, almost every year. Alongside the huge loss of life and massive destruction of human settlements, different built-environmental, economic, and social vulnerabilities also appear as the impact of climate change. As vulnerabilities to disasters are mainly contextual, however, people find ways to adapt these autonomously, using their local knowledge, which they have acquired over years, and decades through the process of trial and error. Besides, they have developed various unique strategies as a part of their survival tactics against climate change. To this end, this research aims to investigate two interrelated issues – firstly, how climate change affects the built environmental, economic, and social system in the coastal settlements, and secondly, how autonomy in building process helps to adapt different climate-change-induced vulnerabilities both at the dwelling unit and homestead level. From an ontological dimension by adopting a fact-finding case study approach and enquiring through



built-environment analysis and mapping, this qualitative research focuses on to illustrate, how climate change impacts are making the coastal settlements more vulnerable; and depicts their autonomous adaptation process. Based on the empirical findings, this paper argues that a lack of recognition of these autonomous adaptation results in deficient policy responses and, therefore, will help different institutions, working with climate change impact, to recognize these autonomy in institutional framework.

Keywords: autonomy, adaptation, climate change, coastal settlement

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382SC: A PROPOSAL FOR A SUSTAINABLE LOCAL NEIGHBORHOOD/CASE STUDY OF MEZYAD

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Abstract. Cities are the most responsible party of greenhouse gas emissions. The basic unit of a city is a neighborhood. Therefore, this paper will represent an alternative scenario to develop the local neighborhoods: the case of Mezyad/Al Ain Region to be sustainably oriented in term of energy consumption, social and cultural interactions, nature and general health. Principles of compactness, walkability, public transportations, and retrofitting will be applied. Surveying and literature reviews were used to conduct the research. The proposed scenario considers the main vision of the city and it engages different sectors such as the Municipality, Department of Transport, and Environment Agency. As a result, the proposed scenario highlights the significant role of sustainable urban planning to change the lifestyle of people to be more sustainable as well as to enhance the environmental effects of urbanization.

Keywords: urban sprawl, walkability, mixed use, connectivity, accessibility

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390AM: ASSESSING ENVIRONMENTAL IMPACT OF CLIMATE CHANGE ON DESERT ECOSYSTEMS: A REVIEW

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Abstract. Climate change is a systematic change in the long-term progression, describing the climate system that is continual over a number of decades or longer. The root cause of the recent global changes is the great acceleration of population since the 1950s. Changes to the Earth's climate system have arisen from the accumulation of GHGs in the atmosphere. The effects of climate change on biodiversity is generally slow, but these effects are expected to show high progress over the next 50 years. Increases in air temperature and in soil surface temperature associated with climate change will certainly defy populations of animals in the future. It is estimated that dry lands cover about 40% of the world's land surface and are home to more than 2 billion people. Terrestrial ecosystems sequester 20% to 30% of global anthropogenic carbon dioxide emissions and play a key role in global carbon cycling. In the coming decades, species will need to modify their distribution patterns, change their behaviors, and adjust their physiology, by acclimation throughout phenotypic flexibility or by evolutionary shifts in their physiological phenotype. This review paper aims to assess the

environmental impact of climate change on desert ecosystems with the aid of remote sensing tools and GIS.

Keywords: climate change, ecosystems, desert, soil, drought, temperature, carbon, RS/GIS

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391BP: BEHAVIOR OF NUCLEAR POWER PLANT WALL UNDER DIFFERENT AIRCRAFTS

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Abstract. In view of the recent nuclear disasters, safety concern in nuclear structures is on the rise. Nuclear energy presently contributes more than 17% of global energy demand. In this study, safety analysis of 1.2m thick outer containment of a typical Nuclear Power Plant has been carried out using ABAQUS/Explicit finite element code. A real nuclear containment BWR Mark III has been considered in the present study. The height and diameter of the containment wall is 46 m and 42 m respectively.

In order to evaluate the effect of strike location, numerical simulations have been carried out wherein four different locations at the outer containment of BWR Mark III type nuclear containment have been studied under the crash of Boeing 707-320 and Airbus A-320 aircrafts. The behavior of concrete and reinforcement has been incorporated using Concrete Damaged Plasticity model and Johnson Cook elastic-visco plastic model respectively. The most studied location in the available literature was the junction of wall and dome of the containment but the most critical location has been found to be the mid-height of the cylindrical portion of the containment. It was also observed that Boeing 707-320 is more destructive than Airbus A-320.

Keywords: impact, aircraft crash, nuclear containment

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392AM: THE ROLE OF CLIMATE CHANGE AND AGRICULTURAL PRACTICES ON DETERIORATION OF GROUNDWATER IN WADI AS-SIRHAN BASIN, AL JOUF, KINGDOM OF SAUDI ARABIA

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Abstract. The most detrimental effect of climate change is realized from its serious environmental threat to the development of agricultural communities in Saudi Arabia. The effect goes beyond the reduction in water availability as it affects the quality of little existing water in the aquifers. This review article focuses on farming activities in Wadi As-Sirhan, Saudi Arabia and discusses their contribution in exacerbating climate change effects on the groundwater in the valley. Several researchers suggested provision of necessary regulation on: 1) wells known to contain high nitrates and other deleterious elements, 2) rational use of fertilizers in agricultural activities, and 3) Wadi environment improvement. They also proposed adoption of eco-friendly farming methods (renewable recourse input) and greenhouse farming among others. Watania Agriculture, since its establishment, has invested heavily in water conservation technology and ecofriendly processes in crop production and animal husbandry.

The investment is currently yielding positive results at global and local crop production levels and its impact is obviously noticed. All strategies employed by the company and the impact of mismanaging the groundwater are discussed in detail.

Keywords: climate change, Wadi As-Sirhan, Watania Agriculture, water pollution, renewable energy, Saudi Arabia

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394BP: GREEN ENERGY IS THE FUTURE ENERGY

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Abstract. Renewable energy is already growing fast; of the 300 gigawatts of new electricity generation capacity added globally between 2008 and 2009, about 140 GW came from renewable sources, such as wind and solar power.

In 2012, the world relied on renewable sources for around 13.2% of its total primary energy supply.

In 2013, renewables accounted for almost 22% of global electricity generation, and the IEA Medium-Term Renewable Energy Report 2015 foresees that share reaching at least a 26% increase in 2020.

Among its key findings are that today's solar panels are all that is needed to supply the world with many terawatts of clean solar power by 2050 (a terawatt is equivalent to 1,000,000 megawatts). The other main point the study makes is that it will take political will to finally wean the world off fossil fuels.

In future, we think all new houses will generate and consume their own electricity and grid power will only be used for industry, meanwhile, some fossil fuel companies are starting to put serious money into green energy. That means our future energy is going to be green energy for a happy, sustainable Earth.

Keywords: solar panel, renewable energy, sustainability, fossil fuels, green energy

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POSTER PRESENTATIONS

131BP: DRONE ECOLOGY RESEARCH NETWORK

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Abstract. Ten ecologists from Dubai, Sharjah, and Abu Dhabi who use drones in their work, have come together to form the Drone Ecology Research Network. The group aims to share knowledge and ideas about data collection and interpretation, and to develop "best practice" in using this new technology for conservation of the UAE's natural heritage. This presentation will briefly outline current and completed projects of group members, and outline our plans and hopes for the future.

Keywords: drone, conservation, UAE

About the Author. Dr. David Gallacher teaches in the Department of Interdisciplinary Studies, Zayed University. He came to the UAE in 2002 and has conducted research on rangeland ecology throughout that time, most recently on the application of drones to rangeland management. He holds a PhD in plant breeding from James Cook University, Australia.

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I40SC: GROUNDWATER POTENTIAL EVALUATION BASED ON INTEGRATED GIS AND REMOTE SENSING TECHNIQUES, BILATE RIVER CATCHMENT: SOUTH RIFT VALLEY OF ETHIOPIA

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Abstract. The use of the integrated geographic information system (GIS) and remote sensing technologies have not been widely demonstrated as one of the efficient techniques in facilitating better data analysis to enhance the interpretations of groundwater potential controlling parameters for sustained utilization and management of groundwater resources. This paper discusses the results of the study that aimed at showcasing the application of the GIS and remote sensing techniques to delineate and classify possible groundwater potential zones in the Bilate River catchment, South Ethiopian Rift valley. Thematic layers of lithology, geomorphology, drainage, lineament, rainfall, soil, slope and land use/land cover were prepared in Landsat ETM+ imagery and ArcGIS software. Weights were assigned based on thematic layer's relative importance in groundwater occurrence. In addition, corresponding normalized weights were obtained based on the Saaty's analytical hierarchy process. Lastly, linear summation equation used weights to obtain a unified weight map containing due weights of all input variables. Thematic layers were further reclassified to arrive at groundwater

potential map using ArcGIS and IDRIS software. Key results included four different groundwater potential zones that were classed as high, moderate, low, and poor based on pairwise comparison of Satty's importance scale criteria. The resulting groundwater potential zoning map validated based on existing water sources point data of the study area. Finally, GIS and remote sensing technologies have provided an efficient tool for the identification of groundwater potential zones, suitable for use by local authorities and decision-makers responsible for groundwater resource management in the study area.

Keywords. Bilate River, spatial information system, western escarpment, thematic maps

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I49SD: ROLE OF INFORMATION AND COMMUNICATION TECHNOLOGIES (ICTS) IN FLOOD RISK MITIGATION

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Abstract. Floods are one of the deadliest natural disaster which cause huge economic, physical, and human losses. Besides the recurrent hydro-climate risks, the impacts of climate change in the wet/dry tropics are expected to include an increase in extreme daily rainfall events, mean evaporation rates, and mean temperatures which will increase in the number of floods. Prevention of floods is not possible but mitigation of the flood risk could be done. Presently, information technologies (IT) are so advanced and being used in many fields whether it's science, technology, social science, or biological sciences. Information and communication technologies (ICTs) play a crucial role in forecasting, decision-making for prevention and mitigation of the effects of disaster, communicating and broadcasting the information about the disaster event to inform the people to be prepared for it, and ensuring the safety of people, livestock, and infrastructures. ICTs can also be used after the disaster event for disseminating the information to governmental and non-governmental organizations for providing the relief materials. The application of ICTs has been increasing in raising the awareness which includes preparation and planning for diminishing vulnerabilities by

understanding the process of the event, modeling, monitoring, early warning system, forecasting, hazard risk mapping, and recovery. In this paper, the author tried to give an overview of the current ICTs which could be used for aforementioned purposes.

Keywords: ICTs, disaster management, climate change, flood risk mitigation, disaster risk reduction

About the Author. Mr. Javed Ali. Javed is an Erasmus Mundus Master's Student of Flood Risk Management and Hydroinformatics at the UNESCO-IHE Institute for Water Education, Delft, the Netherlands. He holds a Bachelor's degree in Agricultural Engineering (specialization in Water Resource Engineering) from G. B. Pant University of Agriculture & Technology, India. Since May 2017, he has been working with Resurgence (London) and GFDRR, World Bank, as an Open Modelling and Urban Flooding Consultant on the project "Design for Impact: Risk Communication Framework and Guide on Effective Use of Risk Data," where he is working as Research Lead on OpenDRI Initiative Projects and Risk Modelling and Communication Projects and supporting graphic generation for the Intellectual Framework and Process Diagram and other publication graphics. He is lead author for *Risk Modelling, Visualization and Communication Projects*.

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346SC: ASSESSMENT OF CLIMATE CHANGES IMPACTS ON GROUNDWATER RECHARGE IN EASTERN UAE

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Abstract. Despite the continuous increase in water supply from desalination plants in the UAE, groundwater remains the major source of fresh water satisfying domestic and agricultural demands. Additionally, groundwater has always been considered as a strategic water source towards groundwater security in the country. Quantification of groundwater recharge is a prerequisite for efficient and sustainable groundwater resources management in arid regions. Therefore, groundwater recharge from the ephemeral Wadi beds and subsurface flow from mountainous valley beds play an important role in water management. Although both surface and groundwater resources in UAE are scarce, the anticipated climate change impacts could make these resources even scarcer. As such, the main aim of this paper is to assess the potential impacts of future climate variability and change on groundwater recharge in the eastern region of UAE. This paper will explore rainfall characteristics in the region, their projections and their impacts on Wadi hydrology and groundwater recharge processes. Another objective of the study is to identify groundwater recharge regions to the shallow unconfined groundwater aquifer in the northeastern part of Abu-Dhabi Emirate.

Outcomes of this study will help to accurately estimate current and future sustainable extraction rates, assess groundwater availability, and identify pathways and velocity of groundwater flow as crucial information for determining the best locations for artificial recharge.

Keywords: groundwater, recharge, climate change, UAE

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377SC: OPTIMIZATION OF DOUBLE-SKIN FAÇADES FOR HIGH-RISE BUILDINGS IN HOT ARID CLIMATES

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Abstract. Adopting technologies to a region requires careful consideration of its functional performance in the given climatic condition. Without that, there would be disastrous effects on the energy consumption, aesthetics, and overall functional capacity of the building. With many high-rise buildings in the UAE having a high glazing-to-wall ratio, the concept of the double-skin façade (DSF) could offer a way to passively reduce cooling demand. The primary working principle of DSF is based on the thermodynamic properties of air in the cavity that separates the internal and external skins. DSF works in two modes, i.e. winter heating mode and summer cooling mode. This duality allows it to be used as a year-round energy saving system. This research studies the suitability of naturally ventilated DSF to the climatic conditions in UAE to suggest the most optimal configuration. Its primary aim is to optimize the external skin of DSF to enhance functionality in this region. This study revealed that the best configuration of DSF for this region is a multi-story type with a naturally ventilated outdoor air curtain of 1,000 mm cavity depth. With this configuration, study of various external skin configurations was conducted to analyze its impact on air cavity temperature and hence the cooling load and annual energy demand of a notional high-rise building in UAE. The study was conducted using a combination

approach of dynamic and CFD simulation in IES-VE and also looks into various modeling approaches to DSF modeling and dynamic analysis of Phase Change Material.

Keywords: double-skin façades, passive cooling, Phase Change Material, energy efficiency

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378SC: AIR QUALITY MANAGEMENT THROUGH SUSTAINABLE URBAN TRANSPORT MEASURES: A STEP TOWARDS CLIMATE CHANGE MITIGATION

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Abstract. Transport currently represents about 25% of global greenhouse gas emissions and the demand of urban travel is increasing day by day. This rapid growth in travel has increased motor vehicle numbers, which has created serious environmental issues in urban areas. Road transport contributes about one-fifth of the total emissions of carbon dioxide (CO₂), the main pollutant responsible for climate change. Thus, sustainable urban transport for people and goods becomes an important priority to tackle climate change. Vehicular emission is responsible for higher level of air pollutants like SPM, RSPM, SO₂, NO_x, and other organic and inorganic pollutants including trace metals and their adverse effects on human and environmental health. The present research analyses the impact of urban travel on air quality and suggests sustainable urban transport measures to combat environmental issues, especially climate change. For this purpose, air quality of Lucknow city, along with growth of transportation, has been analyzed for the period of 2006 to 2016. The results indicate deteriorating environmental conditions attributing to increased vehicular emission. The paper finally suggests sustainable urban transport measures for improvement of air quality. It also

attempts to advocate important policies for climate change mitigation in the field of transport.

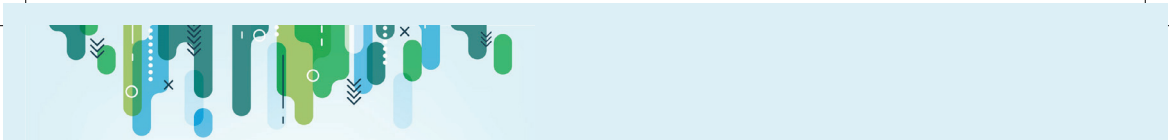
Keywords: Lucknow city, greenhouse gas, urban travel, transport, climate change

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