EUROPEAN INTERNATIONAL CONFERENCE

on

TRANSFORMING URBAN SYSTEMS

Environment · Sustainability

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PROCEEDINGS

Organised by ZAEU

26 - 28 June 2019

Université de Strasbourg, France

EICTUS 2019

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Designed by:

Sajjad Hussain SAJJAD (PhD)
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Laboratoire Image Ville Environnement
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Zone Atelier Environnementale Urbaine

The Zone Atelier Environnementale Urbaine (ZAEU, https://zaeu-strasbourg.eu) is an interdisciplinary research network. It is part of the Réseau des Zones Ateliers (RZA) of the Institute of Ecology and the Environment (INEE) of the National Center for Scientific Research (CNRS), France. It is also part of the Long-Term Ecosystem Research in Europe (eLTER, http://www.lter-europe.net). Long-Term Ecosystem Research (LTER) is an essential component of world-wide efforts to better understand ecosystems. ZAEU is supported by the University of Strasbourg through the involvement of 100 research scientists working in 13 research laboratories covering several fields and disciplines (LIVE – UMR 7362, ICPEES UMR 7515, LHyGes – UMR 7517, GMGM – UMR 7156, GESTE, CAMB – UMR 7199, IPHC – UMR 7178, ICUBE – UMR 7357, AMUP, DynamE – UMR 7367, E3S – EA 1342, BETA – UMR 7522, Herbier de l'Université de Strasbourg) and several services of the Strasbourg city authorities, Strasbourg Eurometropole (EMS). The main objective of the ZAEU is to co-build common knowledge to face current and future environmental issues in a logical sustainable urban development. This co-understanding is based on a long-term observation of the processes and dynamics of the eco-social system. This involves understanding through the analysis of information collected, measured or simulated, the validation of these processes, the proposal of scenarios for the future, but also the exchange of information with local authorities to quickly applied results.

Six groups were formed to initiate this joint work. They bring together, of course, the local skills and the interested actors. Major research groups of the ZAEU are as under:

- Energies, Pollution de l'Air, Climat / Energies, Air Pollution, Climate
- Evolution urbaine et occupation des sols / Urban evolution and land use
- Risques et eau / Risk and water
- Biodiversité et agriculture urbaine / Biodiversity and urban agriculture
- Rudologie et filière déchet / Rudology and waste industry
- Mobilité – Activité physique – Santé / Mobility - Physical Activity – Health



Welcome message of EICTUS 2019 organisers

Dear colleagues,

On behalf of the "Zone Atelier Environnementale Urbaine (ZAEU)" and the Organizing Committee of EICTUS 2019, we are highly delighted to welcome you all in the European International Conference on Transforming Urban Systems (EICTUS 2019) and in the city of Strasbourg, the European Capital for three days from 26-28 June 2019.

The objective to organize the EICTUS 2019 is to bring together all the actors working on urban environment at national and international scale. It aims at sharing the experiences and create an international dynamic to find collective solutions to environmental and social problems that are arising progressively in many cities of the world.

We wish and hope that you will enjoy this beautiful city through sharing knowledge, learning on new research topics, developing new research networks and providing the real solutions for the development of sustainable cities during the conference.

We wish you a wonderful stay and thank you all.

Sincerely,

Nadège BLOND (PhD)
EICTUS 2019 Conference Chairperson
CNRS Research Scientist & Deputy Director ZAEU
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EICTUS 2019 Context

Global trends show that the world population is growing with 250,000 new human beings per day, or 100 million a year. This significant growth of the population, coupled with a phenomenon of globalization and an increase in the average standard of living of individuals, first of all poses the problem of energy resources. In fact, major part of this energy, almost 96%, is produced from fossil fuels (petrol, natural gas, coal). These fossil fuel resources are limited, and they are likely to become scarce because of their extensive consumption. Without a major transformation in our lifestyles, associated with the use of other energy resources, a scarcity of fossil resources is to be expected in less than a hundred years, which could lead to economic and social troubles. Thus the magnitude of these future issues are still difficult to predict.

The use of fossil fuels also poses environmental problems (pollution of water, soil, air, and all that results from it - loss of biodiversity, reduction of vital resources, etc.). Its combustion notably releases gaseous and particulate species into the atmosphere that are highly harmful to human health and ecosystems, and greenhouse gases (GHGs) that warm the climate on a global scale. The consequences of air pollution on health and associated costs are well identified. The possible consequences of climate change on our societies are also clearly identified. The scenarios to reduce the Greenhouse gas are proposed to prevent the atmosphere from global warming by more than 1.5°C compared to the pre-industrial era. The current legislation should lead to a warming of 3 to 5°C. If those values are not reviewed, according to the specialists, it pushes us towards a very uncertain future. The observations made on different areas across the world already show very significant impacts on the water resources (strong droughts), on the crops (lower yields) and thus on the basic food of our food chain.

Another observation is that the population is more and more concentrating in the cities. Since 2007, the population of cities represents more than 50% of the world population. By 2030, this percentage is expected to exceed 60%. Today almost 75% of total global energy is consumed in urban areas. Favored by the dense presence of polluting activities and urban objects, very localized peaks of concentrations of a large number of harmful pollutants such as particles, nitrogen oxides and certain hydrocarbons are observed in urban atmosphere. If the reduction strategies of air pollution are not associated with the significant growing of the urban population, it will pose even more health problems.

Urbanization, through the alteration of natural land into artificial surfaces, the horizontal and vertical extension of buildings, the activities they generate, and the amount and type of energy they consume, also raises the problem of local warming of cities, the urban heat island, which tends to make cities populations even more vulnerable to climate change and air pollution. Some advantages of these urbanized spaces are to be exploited: they concentrate the activities, well developed thus they can limit the needs of energy and resources through sharing these resources; urban heat island reduces winter energy needs in the coldest countries, and increases the atmospheric mix of air pollution.

Awareness of the environmental problems created by our lifestyles associated with their direct and indirect costs (present and future) is progressively increasing and regularly drives the policies to take measures to reduce the impacts of human activities and ensure the sustainable development of our societies. But what is a sustainable or durable future? How to qualify sustainability? Which indicators can be used? All of these questions need to be addressed quickly in order to evaluate the actions that should be taken.

The research (public and private) is currently strongly mobilized to ensure technological innovation in all sectors (building, materials, mobility, informatics, etc.), which will enable us to reduce our impacts. The actors involved in spatial planning must also accelerate the integration of energy and atmospheric issues in their development projects and in particular those affecting the cities (production and distribution of energy, mobility, buildings, agriculture, waste, tourism, economic development, etc.). They must ensure that all projects lead to a drastic reduction in our energy consumption, to a better air quality that respects

the health of ecosystems, to a climate protection and its effects, short and long term. Thus, the problems of the city become more and more multidisciplinary.

Today the cities are a place of all issues since they welcome, and will continue to host most of the population for a long time. However, tools and knowledge in urban areas have yet to be developed, as the urban environment is complex because of its heterogeneity, and its dynamics of evolution are strongly influenced by localized sectoral policies that are not always consistent.

In this context the EICTUS 2019 conference proposes to bring together all the actors working on different themes of the city and the urban environment on an international scale. The "European International Conference on Urban Transforming System" is a project that aims to create a dynamic European and International, to promote interdisciplinary research work and multi-sites, and to find collective solutions to environmental problems that arise in all cities of the world.

Scientific Committee

Air, Climate (risks, resilience, vulnerability, adaptation), Energy
- Dr. BLOND Nadège (LIVE, Université de Strasbourg, CNRS, France)
- Dr. SAJJAD Hussain Sajjad (LIVE, Université de Strasbourg, CNRS, France)

Mobility
- Dr. JOCHEM Patrick (DFIU & IIP, KIT, Germany)
- Dr. PIOMBINI Arnaud (LIVE, Université de Strasbourg, CNRS, France)

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- Dr. GRANDCHAMP Laurence (DYNAME, Université de Strasbourg, CNRS, France)

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- Prof. BARBIER Rémi (GESTE, ENGEES, IRSTEA, France)

Public initiatives, planning, society and environment and risks
- Dr. GLATRON Sandrine (DYNAME, Université de Strasbourg, CNRS, France)

Health and social inequalities
- Dr. KIHAL Wahida (LIVE, Université de Strasbourg, CNRS, France)
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Landcover landuse change, urban sprawl, urban forms
- Dr. HERRAULT Pierre-Alexis (LIVE, Université de Strasbourg, CNRS, France)
- Prof. PUISSANT Anne (LIVE, Université de Strasbourg, CNRS, France)

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- Dr. MASSEMIN Sylvie (IPHC, Université de Strasbourg, CNRS, France)
- Dr. GEORGES Jean-Yves (IPHC, Université de Strasbourg, CNRS, France)

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- Prof. GRIGOROVSCHI Andreea (AMUP, ENSAS, France)

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Smart, sustainable buildings and housing
- Prof. HAMMAN Philippe (SAGE, Université de Strasbourg, CNRS, France)
- Prof. WIRA Patrice (IRIMAS, Université de Haute Alsace, CNRS, France)

Major features of EICTUS 2019

The core principles aspects of the conference are as following:

Interdisciplinary

The major objective of this event is to organize an interdisciplinary international conference to bring together researchers, practitioners, and scholars from a wide range of research areas related to urban environment. People working in the fields of geography, built environment, engineering, architecture and town planning, atmospheric physics and chemistry, building and energy, transport, climate change, population and public health, air and water quality, sciences of urban models, urban ecology and green infrastructure, meteorology, public policy, urban governance, environmental and sustainable engineering and solid waste management are major participants of this conference.

Conference themes

Conference themes are selected in a way which may be interesting and have interdisciplinary concepts from different research areas. Although the major themes are focused on urban environment, there is a wider range of other interlinked topics related to urban environment which are considered and are included as ones of the themes. The objective of selecting number of themes related to urban environment will allow the participants to find the solutions toward sustainable cities through outcomes of multiple results which are being presented in this conference.

International

This conference offers a meaningful opportunity to engage with scholars participating from different countries of the world and to provide them a scientific forum to present their research work and to interact with other scientific persons to establish research network according to one's expertise. The delegates from almost 30 different countries are participating in this conference offering the diversity of cultures and perspectives.

Inclusive

The conference is open for everyone whose scholarly work is relevant to the conceptual themes. It provides the chance that all stakeholders (academia, students, urban planners, policymaker, city administration etc.) are willing to participate.

Framework of conference talks

The conference formal and informal sessions are framed as under.

Plenary sessions

There will be three plenary sessions in which the world's renowned scientists with expertise in urban climate, air pollution, architecture & sustainable designs will deliver their Plenary talk. Every day, the first session of the day is devoted to a plenary session lasting for one hour including questions and answers.

Themed Paper Presentations

Formal paper presentations will be grouped by the general themes of the conference and will be presented in different parallel sessions and in different conference halls. Each session will range from one hour to one hour thirty minutes depending on the selected theme. The duration of each themed paper presentation will be fifteen to twenty-minute including Q&A session. There will be a five to ten minutes' group discussion at the end of each session to summarize the talk of all presenters. Session Chairmen-women will take the responsibility of conducting the sessions of themed paper presentations. They will formally introduce the speakers, manage the time for each presentation and facilitate the Q&A session and concluding discussion.

Poster Sessions

During the poster sessions, the poster presenting author showcases his/her research. It will allow viewers to read the given information on poster, see the affiliation of researcher and discuss it with the presenting author. The poster session will combine text and graphics to make a visually pleasing presentation. As viewers walk by, the poster should quickly and efficiently communicate the importance of given research topic. The presenters are encouraged to think ahead about engaging ways that attendees can interact with the information or as they walk through the poster session section of the exhibit hall.

Workshop on Sustainable cities

On the 2nd day of the conference, there will be a Workshop Sessions of atleast one hour for the all the participants. It can be in one single room or it can be in two different rooms depending upon the nature of discussion and participation. The objective of this session is to offer an opportunity to the participants to discuss on topic of sustainable cities, nature, needs and plans and exchange the ideas, methodologies, results, experiences to find the solutions of future sustainable cities. It will be highly useful for all participating delegates to get the best implementable ideas from experiences of other participants coming from different countries. There will be a session chairman-woman who will introduce the topic of discussion. He/she will be responsible to supervise the discussion and provide chance to each participating member to share his/her point of view during this particular session.

E-Session

There are many researchers across the world who are really interested to participate and want to present their work before scientific community. However, some of them could not succeed to get the travel grant from their respective institutes/research labs/universities. Others could not succeed to get the visa. To facilitate all those researchers to present their work, the organizing committee has planned to provide them opportunity via online presentation. There is no registration fee for this session.

Innovative project discussion

The interested delegates, who wish to initiate innovative research projects and find the global research collaborators/team members, can present their project during the round table session. This is an optional part of the conference depending on the interest and request of the distinguished delegates.

Conference partners

Designing contribution

EICTUS Theme Logo:
Philippe Lapointe (Studio Lapointe), Bischheim – France.
Contact: http://www.studio-lapointe.com/contact/

Flyers, Posters, Kakémono Roll up, Conference name tags, Certificates, Proceedings and Programme's cover pages:
Nima Parood and Seyedeh Sara Saadati
Contact: nima.parood@gmail.com ; saadati.sara@gmail.com

Keynote Speakers

Prof. Dr. Valéry Masson works as senior member at National Centre for Meteorological Research - UMR 3589 associated with CNRM -GAME (URA CNRS & Météo-France), GMME/TURBAU. He is part of Mesoscale Meteorology Department, Turbulence, Fog and Urban Climate.

So far he has supervised 18 PhD thesis, with credit of more than 100 peer-reviewed publications in world renowned high impact factor journals, member of several research and scientific committees, incharge of many research groups across Europe and the world.

He was the Chief Organizer of 9th International Conference on Urban Climate (ICUC9) which was held in Toulouse (France) from 20th -24th July 2015 in which more than 400 participants participated (http://www.meteo.fr/icuc9/).

He is the founding Editor of Urban Climate journal and is now affiliated as Associate Editor of this journal (https://www.journals.elsevier.com/urban-climate/editorial-board). The scientific expertise of Dr. Valéry Masson includes

- Cities and Climate Change
- Interaction between cities and climate heating, energy consumption by human activities, economic activities in cities and its impacts on modifications of weather, growing cities and technology or inhabitants way of life evolution.
- What influences the urban growth and what could be the possible city expansion?
- What are the impact of these interactions in term of urban climate, energy consumption, CO_2 budget, in-city renewable energy production, inhabitants comfort?
- Coordinator of the CAPITOUL campaign dedicated to the observation of the urban climate and aerosol-dynamics interactions over Toulouse (France).
- The development of Town Energy Balance scheme
- Development of Surface-Vegetation-Atmosphere Transfer Models
- Development of Turbulence and Atmospheric models

For details, please browse the following web links:

https://www.umr-cnrm.fr/spip.php?article241&lang=en

Prof. Dr. Cristiana Mazzoni is an Architect, Urban designer and Professor of Architecture and Urban design in the National Architectural school of Paris-Belleville. During her academic career she has been teaching as visiting professor in Italy, Germany, France, Spain, USA and China. She is the director of UMR AUSser, in the framework of the French Scientific Research Center (CNRS) and member of the Metropolitan Development Council of Strasbourg. Still 2015 she is the scientific co-director of the Chinese and French "Innovative metropolitan mobility" IMM-Chair (ENSAS-SYSTRA-CAUP/Tongji).

For further details, please visit her web page at:
http://www.umrausser.cnrs.fr/umr-ausser-english-version

Prof. Dr. Alain Clappier is affiliated with Laboratoire Image Ville Environnement, Université de Strasbourg France. He is expert in air quality modelling and integrated assessment modelling. He is invited professor at the European Joint Research Center in Ispra (Italy), and at the Swiss Federal Institute of Technology in Lausanne (EPFL) where he also remained the leader of a research group specialised in air quality modelling from 1998 to 2008. His major tasks remained the development of different numerical models, the

meteorological model FVM (Finite Volume Model), the air quality model TAPOM (Transport and Photochemistry Mesoscale Model), the emission model EMISENS (Emission Sensitivity), SHERPA model (Integrated assessment modelling), and now energy model.

He has served as an invited professor and speaker at many of the international conferences and research institutes. He has vast academic, research and policy making experience about air quality studies, research in different cities, Milan (Italia), Madrid (Spain), Grenoble (France), Strasbourg (France), Los Angeles (USA), Mexico, Bogota (Colombia), Ho Chi Min (Vietnam).

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A comparison between two urban-scale methods for the assessment of heat energy demand and photovoltaic potential in New York City, USA

Ahmed Hussein * [1], Prof. Dr. Ursula Eicker [1], Joshua R. New [2], Brett Bass [3]

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The building sector constitutes 39-45% of the primary energy consumption for most countries. Enhancing energy efficiency in buildings can significantly reduce energy use and greenhouse gas emissions. Urban-scale energy analysis can identify cost-effective mechanisms for heat demand reduction and responsible renewable deployment, but is currently challenged by a lack of quality data sources for key building attributes. In the US, most relevant building data is stored in tax assessor's data in each of 3,242 counties with data formats (e.g. only PDFs), fields, nomenclatures, and sharing policies (e.g. not allowed to be shared) that vary by county. To address the scalability challenges of such heterogeneous data sources, a combination of satellite imagery, LiDAR, street-level and other data sources have been leveraged with computer vision, artificial intelligence for big data mining, and high performance computing resources by the authors to move toward nation-scale building energy analysis. While scalable approaches are needed, urban-scale literature currently lacks detailed comparisons and empirical validation needed to assess the plethora of data, algorithms, assumptions, methodologies, and scale-based tradeoffs employed. Using an initial set of common input data and key performance indicators, this paper compares two different methodologies from European and US teams for estimating photovoltaic potential and forecasting district heat demand for a neighbourhood in New York City, USA. Measured open data provided by New York City are used for validation of the two methodologies and to introduce best practices for consideration by the urban-scale energy modeling community.

Keywords: Urban, scale energy modeling, validation, space heating and cooling demand, photovoltaic potential, best practices

*Speaker

A data-driven approach for user behavior prediction to boost productivity and sustainability of data centers and cloud-supported working environments

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Cloud computing allows anybody to easily access to mobile working environments and online services at a speed, cost, and scale previously reserved for the largest companies. It is based on desktop and application virtualization. This work proposes an industrial scale solution which relies on a data-driven approach for user behavior prediction. It consists in using a complete probabilistic approach that is able to self-adapt according to data from the users. Periodical patterns of the users are automatically extracted from users' recordings. Once trained, the probabilistic approach allows predicting the applications that the user will open and this allows reducing the launching time and at the same time saving energy on the server-side. The probabilistic approach was fully integrated in a commercial virtualization tool. The prediction approach has been trained and tested by a 12-month long operation under real conditions with a sampling rate of 1minute on a 24/7-basis. The results indicate that energy can be saved, paving the way of the next step in designing, building, and maintaining IT infrastructures for both innovation in urban systems and environmental sustainability.

Keywords: cloud computing, behavior prediction, probabilistic model, training approach, periodical pattern extraction, user modeling, application virtualization

*Speaker

A supply chain model integrating emission factor for export commodities for Indian container goods

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Export and Import are the key indicators for countries development. The export commodity flow has a pattern in developed and developing countries. The flow is supply chain oriented in developed countries, while it is cluster oriented in the case of developing countries. In the case of developing country like India export commodities, flow from production base to warehouse and from warehouse, it goes to a dry port (where the commodities get customs clearance and consolidation of the commodities takes place). From the dry ports, commodities get transferred to a seaport. The decisions regarding the locations of these dry ports and warehouses are significant for a sustainable supply chain. The purpose of this paper is to formulate a warehouse/dry port location model for export commodities in the Indian context by incorporating the congestion factors. A 4-stage logistics model is considered in this study. The importance of warehouse/dry port location in the context of export commodities is explained first. Then, a general model is formulated by considering the locations of warehouses and dry ports as decision variables. The proposed model is validated using real-time data. The commercial solver LINGO is used to solve the model. The proposed model determines the optimum locations of warehouses and dry ports and the corresponding flow between various stages such that the emission factor in the network is minimum. The proposed model can be used for sustainably locating dry ports, which will be useful at policy level for sanctioning of new dry port locations in the future.

Keywords: Location planning, dry port, warehouse, supply chain

Keywords: Location planning, dry port, warehouse, supply chain

*Speaker

Activating spaces of common good and the possibilities of a new urban way of life: Considerations about a community garden in the city of Belo Horizonte, Minas Gerais. (Brazil)

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The need for subversion of hegemonic planning in Brazilian cities becomes evident when analyzing the clash between neoliberal interests in contrast to the real needs of urban citizens and environmental conflicts. The city of Belo Horizonte, in Minas Gerais, was built under the influence of the hygienist planning disseminated by Modernist Urbanism and, therefore, is born disregarding local environmental, social and economic conditions. Nevertheless, the consolidated environment of the city still claims for citizen expressions and for nature valorization. This article aims to characterize the occupation of a residual space in the neighborhood of *Lagoinha*, highlighting the environmental activism character in the appropriation of a degraded public space, whose landscape resignification is linked to the practice of urban agriculture. The theoretical approach is based on socio-spatial self-management, activation of spaces of the common good and understanding of the gradual process of resistance and insurgency established by urban community garden movements that bring the potential of rescuing the right to the city, traditional knowledge and strengthen the struggles against social inequality and expropriation of natural wealth and ancestral knowledge. In addition, the socio-cultural impacts caused by the occupation will be presented in the case study, as well as a preliminary mapping of the place and its network of actors involved throughout the process of occupation and implementation of the community garden. The research aims to contribute to the development of an initial debate about the perception of the biopolitical potentialities that make possible a new way of life in cities that are intensely urbanized and lacking in natural spaces.

Keywords: Landscape Resignification, Urban Agriculture, Socio, Spatial Self, Management, Insurgency, Common Good

*Speaker

Analysis of air pollution trends in Italy from 2008 to 2017

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The main objective of this study was to assess the air pollution temporal trend in Italy, over the 2008-2017 period, focusing on airborne mass concentration of selected pollutants: particulate matter (PM10 and PM2.5), nitrogen oxides, ozone. Time series analysis using Seasonal Kendall test was applied.
The study updates the analysis conducted five years ago (referring to the period 2003 - 2012), extending it to a greater number of sampling points, thus allowing a better spatial representation of trends throughout the country.
A statistically significant moderate decreasing trend was found in the majority of the PM10, PM2.5 and NO2 time series, though some exceptions should be investigated locally. Any downward trend was found in the large majority of ozone time series. This could be explained by the complexity of ground level atmospheric formation/depletion mechanism that seems to be not linearly dependent on precursor emission reduction. Our findings are in good agreement with those from studies carried out in Europe recently.

Keywords: Air pollution, particulate matter, ozone, nitrogen oxides, trends

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Analysis of observed temperature trends over urban, town and rural areas of Pakistan

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The purpose of this work is to study the evolution of temperatures at several locations in Pakistan. In this study, daily minimum (*Tn*) and maximum (*Tx*) temperatures data averaged on an annual, monthly and seasonal basis from 1950 to 2013 from urban (16 stations), town (11 stations) and rural (9 stations) areas are analysed to establish the mean decadal rate of change in urban, town and rural temperatures. The homogeneity of the data was assessed by using HOMER 2.6. To measure the temporal intensity of change in temperature, the data was splitted into two different periods: 1950–1981 (P-1- phase of less urbanization) and 1982–2013 (P-2 – phase of highly urbanized period) and was analyzed separately for both phases of 32 years each. The analysis shows that overall the annual minimum and maximum temperatures (here and after dTn and dTx, respectively) over maximum number of stations are increasing. The trends of dTn and dTx observed over urban, town and rural stations during P-2 are significantly higher than the trends observed during P-1. The increase in minimum temperatures is more significant on urban stations than the town stations, while the maximum temperatures increase more on town stations than that of urban and rural stations. Overall the tendencies in temperatures reflect less change in summer temperatures than other seasons of the year over the whole studied period. In general, there is no set criteria of change in temperature at urban areas. If the city is larger, it does not mean the temperature at particular urban station must increase more than the smaller cities or villages.

Keywords: Urbanization, urban temperature, local changes, Pakistan.

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Avoiding exposure to air pollutants may reduce kidney damage in type 2 diabetic patients

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Kidney disease is a common comorbidity of type 2 diabetes. Exposures to air pollutants has been associated with chronic kidney disease. However, whether air pollutant exposure affects kidney function damage in patients with type 2 diabetes is unclear. We followed the patients with type 2 diabetes to evaluate effects of exposure to air pollutants on their kidney damage. Between 2003 and 2005, 1316 patients with type 2 diabetes were recruited and followed to December, 2012. Two indicators of kidney damage were used, namely, urinary albumin-to-creatinine ratio (ACR), and estimated glomerular filtration rate (eGFR) derived from The Taiwanese Chronic Kidney Disease Epidemiology Collaboration (CKD-EPI) equation. Higher ACR and lower eGFR suggested kidney damage. Exposure to air pollutants CO, NO2, O3, SO2, and PM2.5 was interpolated from 72 air-quality monitoring stations to residences by using the kriging method. When comparing eGFR and ACR changes with air pollutants, it was found that exposure to NO2 and PM2.5 was related to eGFR reduction, and exposure to CO and PM2.5 to annual ACR increment, adjusting for covariates including gender, baseline glycohemoglobin, and body mass index. It is concluded that avoiding exposure to air pollutants may slow down the process of kidney damage in type 2 diabetic patients. Recommendation to urban residents with diabetes to minimize exposure to air pollutants is warranted.

Keywords: air pollutants, urban air quality, kidney damage, diabetes

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CLEVER-Cities – Interlinking urban and European indicator data to monitor the effects of nature based solutions

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In the framework of a collaboration project involving Hamburg, London, Milano and five further cities, nature based solutions (NBS) are implemented to foster sustainable and socially inclusive urban regeneration. Monitoring the effects of interventions taken is a prerequisite for assessing their performance regarding innovation and sustainable urban development and their potential for cost-effective replication. Related parameters equally involve natural scientific and sociological information.
European data sources can provide ancillary data to local monitoring data, and, likewise, European databases can be enhanced through inputs from local sources. Thereby, the integration and analysis of socio-ecological metrics across multiple scales fosters the understanding of boundary conditions which influence the functioning of ecosystem services within the municipal areas, and, likewise, it shows how municipal areas influence the state of the environment in their surrounding regions. Data integration leads to gap-filling of data, quality testing, and obtaining complementary information for new insights bottom up and top down, in the framework of different policy processes (new urban Agenda, SDGs).
Several issues still need to be resolved, partly stemming from differences in spatial (and temporal) resolution, but, fortunately, even pan-European data products show increasingly smaller minimum mapping units. Common metadata standards must be implemented in order to be compliant with the European standards which most EU data platforms are using and to ensure interoperability, and open data sharing standards are required. Examples are provided for workflows and protocols of integration and interoperability of municipal information systems and European data sources, including Copernicus, EEA, and JRC sources.

Keywords: Nature based solutions, information management, ecosystem services, Copernicus, data sharing, urban regeneration

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Can forests take the heat? Managing pests and ecosystem services in urban landscapes

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Urban forests provide important benefits to urban residents and in mitigating climate change. However, US urban forests are shrinking due in large part to arthropod pests which are more abundant and damaging in urban than rural forests. Our hypothesis was that elevated temperatures and drought due to impervious surface cover drive arthropod pest abundance through several ecological mechanisms. We found that the urban heat island effect increases scale insect survival and that high temperatures create a phenological mismatch between scale insects and their parasitoids. This reduces biological control and increases scale reproduction. Finally, heat and drought stress combine to increase scale insect fecundity by 50 percent in sites with the most impervious surface cover. To counter these effects we developed impervious surface thresholds that planners and planters can use when designing sustainable urban landscapes.

Keywords: Urban heat island, impervious surface, biodiversity, carbon sequestration, scale insects

*Speaker

Citizen community composting: a practice in the heart of transitions

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Unlike rural inhabitants, city dwellers hardly thing of composting their food scraps and gardening residues, as they generally face a mineral environment. However, cities are promoting composting as a good way of participating to the waste management. In many parts, community-scale composting is encouraged by the local authorities or citizens committies to become part of environmental citizen daily practices.
Taking Strasbourg as a study-case, we show how community composting is getting publicized as an environmental sustainable act linked with various resilience traits to resist to global changes and the environmental threats. This is to say, we emphasize how composting might be seen as an instrument to fight the global problems (climate change, resources depletion and even biodiversity degradation). For this matter, we will use various discursive sources and study the pitch developed in:

- the city plans (preventive waste plans) and policies that encourage composting practices,

- technical documents and advertisements published by local authorities to support composting;

- documents and discourses of the NGO acting on promoting composting and,

- interviews of citizens who are currently practicing.
While being a very local practice, we point out that composting can be seen an instrument of relocation of the economy, of production of local resources that participate to fighting global problems at various scale: individuals, activist groups and cities. Meanwhile, it is a good vector to link different knowledge: from lay people and ancestral ones to scientific and technical knowledge. Finally, composting might be seen as a practice as well as a political engagement as it appears in the discourses we examine.

Keywords: composting, transitions, discourses, political engagement, community practices

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Climate smart transformations in Asian cities: alternative approaches and future drivers for solid waste management case of smart cities in India

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Cities of developing countries particularly Asian are witnessing fast urbanisation. The correlation between growing urbanisation and the emission of greenhouse gas is quite high. India has undergone rapid urbanization over the last few decades and emerging as home to second fastest growing cities in Asia. Since India's urban population grows from 410 million in 2014 to 814 million in 2050, showing seeds of severe climate change effects. Solid waste management is emerging as one of the key contributors to climate change. It has become a daunting task to manage solid waste for municipalities in India. Therefore, an upsurge of 'smart city' movement towards effective solid waste management across the globe is witnessing. This article analyses the linkages and alternative approaches for solid waste management and smart city initiatives with reference to Solapur and Pune Smart City in India. The study relied on futures studies methods such as Delphi and scenario building to explore the problem under investigation. The study highlights the fact that under smart city initiatives local city municipalities are adopting decentralised bottom-up smart initiatives towards solid waste management. However, these efforts are at very preliminary stage and needs to recognise essential linkages such as urban poverty, participatory and democratic governance, and citizenship rights and state of art technology with innovative waste-wealth models for sustainable solid waste management.

Keywords: Climate change, Smart City, Futures studies, Solid waste management, India

*Speaker

Comparative assessment of temperature variability of two mega cities of South Asia: the case of Lahore in Pakistan and Dhaka in Bangladesh

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Lahore (11.13 million) and Dhaka (14.4 million) are two mega cities of South Asia located in Pakistan and Bangladesh, respectively. The present study focused to evaluate the tempera- ture variability. Rapid urbanization in both cities has severe environmental consequences. The primary objective of this study is to evaluate the variability in annual and seasonal minimum and maximum temperatures of both cities. Time series data of average monthly minimum and maximum temperature was collected from Pakistan Meteorological Department (PMD) and Bangladesh Meteorological Department (BMD) for Lahore and Dhaka, respectively. The data ranged from 1980 to 2013 for Dhaka and from 1980 to 2015 for Lahore for all temperature variables. The time series data was analyzed by using Autoregressive Moving Average Model (AMAM) and Autoregressive Integrated Average Model (ARIMA) by using Statistical Pack- age for Social Sciences (SPSS). The results of the study revealed that minimum temperature is increasing more rapidly that the maximum temperature at both cities. However, the seasonal variability in growth of minimum and maximum temperature is observed the highest in spring at both cities.
Key words: Variability, urbanization, minimum, temperature, maximum.

Keywords: Variability, urbanization, minimum, temperature, maximum.

*Speaker

Comparison of biological and nanofiltration methods to reduce the BOD5 of industrial wastewater for the reuse and access to sustainable water resources in urban areas, A case study of Najaf Abad in Iran

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Abstract

The rapid increase of human population accompanied by industrial growth and rising standards of living have resulted in heavy demand for water across all sectors. So, treated wastewater could be an unlimited and stable alternative for water supply to use in irrigation and industry and plays an important role to achieve sustainable urban development. Nowadays, finding an appropriate wastewater treatment & reuse method is one of the important issues which many research has been conducted in this field. The aim of this study was to compare the treated wastewater (industerial) by biological method compared to the nanofiltration method and determine more suitable method for industrial wastewater treatment. Thus, BOD5 of industrial wastewater was used for this purpose and the appropriate method was chosen by calculating the percentage and percentage of this parameter as well as analyzing the significance of the difference between the results of the two methods used by SPSS software. The nanofilter used in the study was made from carbon-neon and the pressure of its desired performance has been 10 times and the diameter of the stomata is 50-80 nm. Also, all experiments were performed weekly for a period of 11 weeks in Najaf Abad wastewater treatment plant. The results showed that the mean BOD5 = 6.87 mg / L measured by nanofiltration method while the mean BOD5 is 9.91 mg / L by biological method. According to the results, the nanofiltration method is more effective than the biological method. Nanofiltration method is suggested to prove the superiority and other water quality parameters are also tested.

Keywords: Keywords: Nanofiltration, Biological, Treatment, Industrial Wastewater, Sustainable Development

*Speaker

Computer-assisted assessment of biodiversity in Strasbourg Eurometropolis (France): the case of the exotic freshwater turtles

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Biological invasions, considered to be the second major threat to biodiversity in the present context of global change, are driven by human activities, global exchanges and intercontinental transports. As a consequence, exotic species are flourishing in towns from where they eventually invade natural areas with dramatic impacts on native species and ecosystems. Beside their potential invasiveness, exotic species however may be benefit to citizens as they may contribute to their reconnection with nature. Exotic species mitigation and management are thus a complex issue for decision makers, and require, fist of all, a rigorous assessment of the situation. Because of the specific context of towns (e.g. citizens posture and sensibility) standard protocols commonly used in the natural areas need adjustments without affecting scientific rigorousness. We investigated the case of the exotic freshwater turtles in the public parks of Strasbourg Eurometropole. Turtles have been sold by millions as pets since 1950's and are nowadays found in public parks after they escaped or get released by their owners. In order to assess the species diversity and the number of individual of every species, while preventing any capture (commonly used in natural populations) for not offending parks users, we developed a computer-assisted photoidentification tool based on machine-learning. The Emys-box appears to be an efficient alternative to time-consuming visual inspection of hundreds of pictures. It reveals that the two major parks of Strasbourg (Citadelle & Orangerie) host 9 different, all exotic, species of freshwater turtles, for a total of about 100 specimens.

Keywords: Urban ecology : biological invasion : computer, assisted assessment of biodiversity

*Speaker

Contribution from vegetation and urban geometry to the mitigation of the urban heat island effect.

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In the context of global warming, the cities will be more affected by stronger and longer heat waves. The lack of vegetation in urban areas and their particular morphology create the urban heat island (UHI) effect, which strengthens the negative impact of these heat waves in terms of public health. There is also a particular need to prepare cities for more frequent heatwaves.
First this work attempts to study temporal and spatial dynamics of the UHI in Strasbourg. The second one will be analyzed using LCZ classification in order to build homogenous zones in terms of climatic behaviour and urban properties in Eurométropole de Strasbourg. This is to be followed by modelling the climate characteristics of test areas, which will be chosen because of their urban interest. The comparison between different simulated urban settings aims to test the impact of amount of vegetation which is introduced in a specified area, the role of different floor coverings or of density of the built fabric. This modelling will lead to concrete prescriptions for urban planners and also define the kinds of areas which are more suitable for the improvement of urban dwellers' living conditions.

This work builds on a database containing wide and diversified variables (air temperature, wind speed, heat flux...) of 48 stations spread along the EMS. The ENVI-Met model will be used for modelling.
Some results concerning temporal dynamics of UHI are already available (behaviour of temperature difference between an urban and a rural area) and will be shown.

Keywords: urban heat island, vegetation, urban geometry, LCZ, mitigation.

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Decision makers, scientists, and the public as stakeholders: the connection between traffic intervention policy and air quality in a local context.

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To ensure the sustainable future of urban mobility, local policies should aim to improve access to sustainable transport systems and enhance mobility opportunities, while at the same time addressing critical environmental and health targets. In order to assess whether these objectives are met, policies should be informed and evaluated from a social and environmental perspective. Citizens' opinions and the acceptance of environmental policies are key to successful implementation of urban mobility measures. In this context, our research group and the city department for traffic development collaborated to assess a planned traffic-reducing policy intended to address air quality exceedances. With the use of two questionnaires disseminated before and after the six-month trial implementation of the policy, public opinions of the policy, as well as awareness of air quality, environmental beliefs, and mobility habits were assessed. The results show that overall acceptance of the policy, both before and after its implementation, was very low (10% and 18%, respectively), even though nearly half of respondents indicated support for investments in traffic-reducing policies and the majority believe investing public money in environmental protection to be a 'high priority'. Furthermore, the policy sought to incentivize a shift from cars to public transit and bicycles, but of the respondents that experienced six months of the measure, the vast majority (> 80%) indicated that they did not change their mobility habits. It is clear that while there may be theoretical support for investing in a mobility transformation, its implementation will continue to face significant challenges due to the varying mobility habits and desires of urban citizens.

Keywords: air quality, urban mobility, public opinion, local, stakeholders

*Speaker

Effect of green technologies on urban microclimate

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Cities face a lot of problems such as air pollution, urban heat island, energy consumption due to the rapid development and population growth in recent decades. technologies and industrial development paly significant roles in solving these problems. One of the newest technology in developed countries is using green systems such as green walls and green roofs in urban areas. Hence, the main objective of this research is evaluating the effect of green roofs and walls on Tehran's microclimate. To do so, the temperature of green roof and green wall was compared with other types of material which are common in urban structures (asphalt and stone) using data loggers and thermal camera. The data loggers were installed in green and reference roof and wall of district 8 and17 of municipality of Tehran, Iran. Also, the thermal images were captured from both references and green systems of the studied area. Results of data loggers illustrated that air temperature around green roof and wall were almost 10 and 5 C cooler than the neighbouring conventional roof/wall during the day, respectively. Also, based on thermal images surface temperature of green roof and wall were 17 C and 6 C lower than neighbouring conventional roof/wall, respectively.

Keywords: Green Technology, Urban Climate, UHI, Tehran, Iran.

*Speaker

Effects of trace metal elements cocktail on physiological stress in a passerine bird (Taenopygia guttata)

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Emission of trace metal elements (TME) is a major stressor in urban areas. While numerous laboratory studies have demonstrated their toxicity on birds, few studies focus on the effects of more than two metals and do not reflect the actual exposure of urban wildlife, i.e. chronic exposure to a diffuse cocktail of TME. Furthermore, pollution in cities lead to soil acidification and limit calcium bioavailability in the environment. However, calcium can reduce the accumulation of trace metals and protect against their harmful effects. The first aim of our study was, therefore, to evaluate experimentally the toxicity of a TME cocktail, representative of medium-sized city exposure, on passerine birds. Our second goal was to evaluate the importance of calcium availability in combating the accumulation and toxicity of trace metals. We exposed zebra finches (*Taenopygia guttata*) to a cocktail of eight metals in drinking water, based on great tits faeces concentration measured in Strasbourg, with or without calcium supplementation. We have monitored the concentration of the different metals on blood and feathers to follow the mechanism of accumulation. We also measured the oxidative stress state of the individuals and telomere length, which is an indicator of longevity. Results showed an increase of metals concentration in blood and feather on cocktail-supplemented birds but no significant effect on physiological parameters was measured. Calcium-rich diet seems to limit the concentration of non-essential metals in blood and feathers whereas the concentration of essentials metals increases in feathers. One of the hypotheses proposed to explain the absence of effect of trace metals cocktail is the antagonistic relationships between essential and non-essential metals.

Keywords: Urban pollution, oxidative stress, feathers, telomeres, calcium

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Encouraging the eco-mobility in context of sustainable urban mobility planning evaluating the EcoMobility capacities of Bozcaada island in context of sustainable transportation

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Experiences show that urban mobility based on fossil fuels is not the way forward and cities that have prioritised private automobile mobility in their planning have turned out to be disadvantageous for people from a health, safety, and economic perspectives. It has been proven that building automobile friendly infrastructure will not solve the traffic challenges in cities. The development of sustainable urban transport systems requires a conceptual leap and paradigm shift. The purpose of transportation and mobility is to provide access to the desired places, activities, services and goods. Access is thus the ultimate goal of all transport. Besides this, in recent decades, efforts to create climate-friendly alternatives in the transport sector have increased. In this context, Eco-Mobility is a new application practice that covers all the policies and principles of sustainable transportation and as such, it is developed for the application of this transportation concept. Defined as 'a travel through safe, affordable, accessible, environmentally friendly and integrated transport modes' EcoMobility concept constitues the core of this research project, with the EcoMobility SHIFT indicators which will be used for measuring the sustainability and ecomobility level of our study case, Bozcaada Island, Turkey. Purpose of the project is to examine the Eco-Mobility approach and its 20 criterias/indicators. It also aims to determine the necessary steps should taken in order to help our study area, and other cities, to reach an adequate level of Eco-Mobility. Beside raising awareness of the existence of an instrument for assessing the level of EcoMobility of cities, it finally aims to prepare them for a transition towards sustaianable and eco-friendly ones.

Keywords: Sustainability, Sustainable Transport, Eco, friendly City, Eco, Mobility, Urban Mobility

*Speaker

Environmental impact assessments of land-use changes in suburb of Tehran city

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Physical-expansion of cities due to population growth and the relevant activities results in extensive land-use changes in urban and suburban areas. The horizontal expansion of Tehran and its destructive effect on agricultural lands, rangelands, and protected natural spaces surrounding Tehran are considerable threats.
The research used the images provided by the TM sensor of Landsat 5 for three years (1988, 2000, and 2010) to identify and detect the extent of changes in land use in urban areas of Tehran during -the 22-years period. After preparing the images, the areas were determined in six classes of humanities and natural lands. Then, three distinct methods were used for classification of satellite images - including Maximum-Likelihood, Mahalanobis Distance, and Minimum Distance. Furthermore, before analyzing land-use changes, the level of classification accuracy was calculated using the Kappa coefficient.

Analysis of percent land-use changes among the land-use types revealed that land-use has changed from bare tree lands to urban lands during 1988 and 2000, while it has changed from farm lands to man-made forest lands during 2000 and 2010. - Generally, land use has changed from bare and tree lands to urban lands during the entire studied period (1988-2010). A general trend analysis of land-use changes in Tehran revealed that urban land has increased in the western, northern, and southern directions. In fact, physical development in Tehran has occurred clearly and gradually during 1988-2010.
Results depicted that gradual physical expansion of Tehran from various directions has reduced rangelands and agricultural lands during the past three decades, so that this expansion has been more extensive from the west, and south.

Keywords: Land, use change, ENVI, satellite images, environmental impacts, Tehran

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Evaluating street centrality and its correlation with the land uses: The case of Abu Dhabi neighborhoods

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Neighborhood planning has been the subject of debate in urban design literature over the past decades. Specific attention has been given to the elements of urban form in design including streets, buildings, land uses, parcelization, and urban blocks. This research pays attention to two elements: the synergy between street design and land use system. Streets play an important role in attaining these qualities: the more connected they are, the higher the interaction they provide between people. It also creates areas that are more appealing than others for being more central, accessible, and reachable. Services located within these places would have a location advantage; they are more likely to be crossed by road users when traveling. This research studies the street layouts of Abu Dhabi's neighborhood and identifies the central locations within different movement radii. It also investigates the relationship of street centrality with the location of daily destinations, whether they are located within these central hot spots or not. Three neighborhood street patterns have been explored in this study, Gridiron, Interlocked, and Fragmented Loop patterns in literature. Street Centrality Assessment is used to identify the central location within a network using three metrics: Straightness, Betweenness, and Closeness. The results illustrate how the structure and design of each street pattern impact the location of centrality. Findings also show a low correlation between centrality locations and the existing land uses in Interlocked and Fragmented Loop patterns, and a high correlation in Gridiron neighborhood. Findings assist planners and city designers to designate land uses in central, more accessible, and efficient locations in neighborhoods.

Keywords: Centrality, urban network analysis, street systems, land use sustem, Abu Dhabi

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Evaluating the optimal Blue Cover for mitigating the urban heat island effect using ENVI-met Software

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'Development' and 'Climate change' are inextricably linked which are the main domains to be addressed in global climatic trends as witnessed in the recent Conference of Parties. With the onset of urbanization, there is a rampant replacement of the natural cover by the urban materials like concrete which have significantly altered the surface energy budget and have fostered the growth of 'Urban Heat Islands' (UHIs) which are defined as metropolitan areas which are significantly warmer than their surroundings with an adverse impact like human health and economy. Secondly, because of the increased impervious surfaces, the recharging of the groundwater is significantly reduced which calls for measures to increase the sponge activity of the city. Combing these issues, the present project is planned which attempts to quantify the evaporation based cooling effect of a blue space (water body) and thereby mitigate the UHI effect and also to estimate the optimal blue space required for mitigating the UHI by the rejuvenation of the dead blue spaces. With the focus, this study is planned which attempts to quantify the cooling impact due to a water body along with its area of influence. In this study, an institutional campus of Pandit Deendayal Petroleum University located at Gandhinagar, India is considered. The actual land use/land cover detail of the campus was modeled in ENVI-met along with the scenarios for different properties and locations of blue cover. The findings of the study would be of great significance for improving the urban fabric of the city and would pave the way for lowering the carbon footprint and making the city more resilient.

Keywords: Development, Water body, Urban heat island, Carbon Footprint

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Evaluation of direct or indirect presence of urban resilience in municipal sanitation plans: case study in four municipalities in São Paulo State, Brazil

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Brazilian legislation provides for municipalities to draw up Municipal Sanitation Plans (MSP), covering water supply, sewage, urban drainage and solid waste management systems. On the other hand, the issue of Urban Resilience (UR) has been the subject of attention of several municipalities, some of which have adhered to programs related to this theme, such as the "Making Cities Resilient: My City is Getting Ready " of the United Nations International Strategy for Disaster Reduction (UNISDR). In these cases, the UR issue should be addressed in the respective MSP. Thus, the objective of this study was to evaluate whether aspects of the UR are present, directly or indirectly, in MSP of four municipalities located in the State of São Paulo, Brazil, who joined the UNISDR program. To do so, criteria were adopted, based on the existing literature, to characterize a UR approach to sanitation from a water perspective. The four MSP were studied and systematized, considering the previously defined criteria. As a result, it was noted that none of them directly mentions the UR in its content. The indirect presence of the UR was observed in some aspects, both in qualitative and quantitative variables, as well as in those related to society's management and participation. In general, however, it was noted that the fact that these cities joined the UNISDR program was not reflected in the adoption of new procedures in the MSP and reformulations would be necessary so that the concerns associated with resilience could be effectively addressed.

Keywords: Urban Resilience, Climate Change, Sanitation, Municipal Sanitation Plans, Water Resources.

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Exploring the relationship between financial literacy and citizen participation in investment. Moderating role of Government website use

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Citizen participation in worthy investment is a very pivotal and challenging process which is influenced by many factors such as financial knowledge, trust, and source of information so on. Participation in investment is not only essential for the firm or self-interest but also for the country's development. This paper helps to determine those variables that guide the investor to participate in praiseworthy investments. The purpose of our study is to investigate the effect of financial literacy and financial trust on citizen participation in investment. In addition, this study analyzes the impacts of government website use on financial literacy and financial trust as the moderating variable. The finding that shows the novelty of this research is the use of government websites improving public knowledge and trust on government, due to citizen participate in investment. Moreover those peoples who more financially literate have higher income, male, higher education and regularly visit government website. The results suggest that use of government website may help to improve people's financial knowledge and trust.

Keywords: Financial Literacy, Trust, Investment Decision Making, Citizen Participation, Government Website Use.

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Fostering sustainable mobility in the upper rhine region (The SuMo-Rhine Project)

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Mobility is a central factor in society, both economically and socially. In its current form, however, in France it contributes about 31%, in Switzerland about 32% and in Germany about 20% to national harmful CO2 emissions – the lion's share of which is attributable to road traffic. Despite ambitious political goals, no reduction trend is discernible so far, which means that the other sectors are coming under even greater pressure to reduce. The share of road traffic is particularly high in border regions. However, sustainable mobility concepts must not stop at national borders; joint, multinational transport concepts in particular could create considerable synergies in reducing the environmental impact of cross-border transport.
In this presentation the objective and the current status of the SuMo-Rhine project is introduced. The main focus is on the development of an integrated instrument for the evaluation of the sustainability of mobility concepts through a decision support system. One main point of this newly developed instrument is its applicability by different actors. Furthermore, the steps to the development of such a decision support system will be introduced. This includes e.g. the information on the processed cross-border framework conditions for mobility (political objectives at EU level, of the three countries and regions, local influencing factors, etc.).
Our indicator system thus forms a cornerstone for the mobility transition in border regions. This will enable decision-makers from politics and industry to identify potentials for improving transport services with low environmental impact and for increasing the market share of alternative modes of transport much more precisely than before. Modern multi-modal transport concepts with large proportions of non-motorised routes or electric mobility are seen here as fundamental building blocks of a sustainable transport concept.

Keywords: Sustainable mobility, Decision support system, Cross, border mobility

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From global to local: The efficiency of the neighborhood planning unit

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This paper explores the efficiency of street networks within neighborhood planning units (NPUs). The article takes Abu Dhabi as a case study and studies ten (NPUs) with differ- ent street systems. In 1967, the planning of Abu Dhabi has been conceptualized as a grid of rectangular superblocks. Every superblock was designed as a neighborhood unit; the design conceptualized the city as a congregation of self-sustaining units adaptable to grow . Abu Dhabi's city planners has utilized the Clarence Perry NPU concept to guide the city's growth after this concept has gained prominence in America and Britain (Perry, 1939; Scoppa, M., Bawazir, K., & Alawadi, K., 2018). The design of Abu Dhabi NPUs took different forms at different times, each designed and filled differently. Each NPU is unique in its form representing a different phase of urban expansion. Elsheshtawy (2008), Alawadi and Benkraouda (2017) have classified Abu Dhabi's urban development into different urbanizing periods. This morphological evolution can be clasisfied into two major periods: Pre-1990's and Post-1990's.
This paper studies street connectivity at the NPU scale. It focuses on one parameter of street network analysis: efficiency. Efficiency is evaluated in terms of directness, noting that network designs that provide short and direct access between origins and destinations are more efficient. The research uses the Pedestrian Route Directness (PRD) method to quantify the performance of NPU's efficiency by measuring on the role of street networks in connecting buildings and places. The research addresses the following question: Are Abu Dhabi's NPU's designed to promote route directness toward the goal of overall efficiency?

Keywords: Urban form, urban network analysis, pedstrian route directness, connectivity, neighborhhod planning units

*Speaker

Geospatial analysis of urban land-use change using high resolution satellite images: implications for ecological sustainability

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Rapid urban expansion is a significant contributor to land use change and poses a great deal of challenge to ecological sustainability. Understanding the sustainability of the urban landscape requires baseline information and accounting of land use under different scenarios. However, potential implications of land conversion on the vulnerability of different ecological systems as well as their persistence for holistic understanding of urban landscape sustainability has not been adequately assessed. This study applies geographic information system, remote sensing and land use accounting techniques to analyse the spatial-temporal dynamics of urban land-use change and determine the implications of change for ecological sustainability in the Greater Accra Metropolitan Area, Ghana. A post-classification change detection of Quickbird and Worldview 2 imagery was conducted to analyse patterns of land-use change between 2008 and 2017. Subsequently, urban growth of the region was projected for the year 2030 using Markov Chain embedded in IDRISI's Land Change Modeler. The results reveal a substantial increase in the extent of urban built-up areas by 267% over the 22-year period. The increase which occurred mainly within the peri-urban areas resulted from the conversion of agricultural lands, grasslands, forests, waterbodies and semi-vegetated lands. Projected changes in land-use/cover show that urban built-up will increase significantly by 159% at the expense of semi-vegetated open lands, forests and waterbody/wetlands. These conversions and landscape transformation will bring destructive changes in ecological functions and services and so the authors argue that maintaining ecological sustainability through the trajectories of urbanisation and development will require new governance and institutional arrangements for integrative management of ecological functions and urban planning.

Keywords: Urbanization, Land, use Change, Ecological Sustainability, GIS and Remote Sensing, Accra, Ghana

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Greening strategies for heat mitigation in a subtropical high-density city, Hong Kong

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Hong Kong is a high-density sub-tropical city with a record of increasing trend of urban air temperature since the past few decades. Thus, high frequency and intensity of very hot days, heatwaves, urban heat island and thermal discomfort had been observed and expected to further aggravate for the rest of this century. In response, the Hong Kong's Government through the *Hong Kong 2030+* had proposed a smart, green and resilient city strategy frame- work for adapting and mitigating these impacts. One of the key strategic directions of this framework is "Promoting a sustainable built environment" which includes improvement of cur- rent urban greening plan and innovative blue-green infrastructure mix in urban development. In this study, we present the state-of the-art on climate change and greening strategies in Hong Kong. Furthermore, we show scientific evidence of positive impact of these strategies and optimization techniques for improved benefits. Basically, we have studied the thermal benefits of tree-planting and vertical landscape and effect of urban density on obtained thermal benefits through field measurement and numerical simulation. Results revealed that for a high-density Hong Kong, 30% tree coverage ratio is required for 1◦C and 4◦C urban temperature and Physiological Equivalent Temperature (PET) reduction. Moreover, we found that 30 - 50% of facades must be greened to potentially cause ˜1◦C reduction in both daytime and nighttime air temperature while the same could help improve daytime pedestrian thermal comfort by at least one thermal class. Lastly, practicable urban planning recommendations for development of climate-sensitive, resilient and sustainable city were presented for the attention of urban planners and landscape architects.

Keywords: Greening, thermal comfort, UHI, ENVI, met

*Speaker

Harnessing the potentials of evolutionary computation via the integration of rights-based distributive principles in water demand management

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The study establishes and classifies the diverse ways in which evolutionary computation (EC) techniques have been employed in water demand modelling and identifies important research challenges and future directions while recommending strategies for their use by policy-makers in meeting sustainable development goals (SDGs). The study posits that EC techniques could extend their capabilities in influencing water demand management policies beyond an advisory role and proposes an integrated water demand and management modelling framework (IWDMMF) that enables water policy-makers to assess the wider impact of water demand management decisions through the principles of egalitarianism, utilitarianism, libertarianism and sufficientarianism. This is necessary to ensure that water policy decisions incorporate equity and justice.

Keywords: Evolutionary computation, sustainable development, water demand, water equity, water justice, water policy

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Hazard mapping of chlorine gases incident and it's simulation: a case study of coastal area of Boao Henan China

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In the current industrial scenarios in China there is a serious need for formulating strategies to transport hazardous substances in the safest way. Accidental release of toxic chemicals can lead to severe emergencies. In coastal areas, it is unavoidable that large amounts of potentially hazardous chemicals like chlorine gas are transported through ships and used in facilities in near urban areas. In such cases a better emergency response plan (ERP) is always needed to minimize the risk of an accidental situation, to reach this goal, it is important to have accurate information concerning chlorine gas behaviors and how it is dispersed in coastal urban areas. In this article a simulation model for chlorine gas dispersion is discussed and variation in the different threat zones is observed due to change in temperature, wind velocity and surface roughness. This paper investigates and analyzes chlorine gas leakage scenarios, including its dispersion and different weather conditions such as wind direction etc effects on how it might be geographically spread in a city, using satellite Imagery and Spatial Analysis Techniques. Simulations of possible hazardous events and finding the dates of year when the urban area is at lowest and highest risk for preventing or reducing their probability are presented to gain a better insight into the incidents. Simulation results are used to investigate, analyze, building hazard maps based on chlorine gas behaviors, dispersion, distribution, accumulation, and other possible hazards by linking it with satellite imagery of the area. Possible hazards strength and their intensity zones are found, which provide solid ground for Emergency Response Plan (ERP).

Keywords: Coastal Areas, Spatial Analysis, Hazardous Substance, ERP (Emergency Response Plan), Safety, Hazard map, Threat zones, Risk, Simulation

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Housing solutions for Pakistan: Targeting and facilitating private sector investors

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A recent statement by Ar. Arif Hassan on Pakistan Governments' Low Cost Housing Initiative concluded that:

"(An) important reality is that for the foreseeable future, housing will increasingly be pro- vided by the formal and informal private sector. (Instead of the government which simply does not have enough funds to meet the housing demand in this way). Formal because increasingly funds are being made available for it, and informal because there is a demand for it and there are huge profits that can be made from it with very little investment." (Arif Hasan, 2018)

This could mean that instead of designing low cost housing schemes themselves, if the government were to invest its time and funds in training, facilitating and regulating formal and informal private developers there can be maximum betterment with the minimum investment. Informal settlements could be given technical support to make their urban/unit designs both climatically and socially responsive and guided to use environment friendly low-cost materials for construction. Such developers could also be provided with an urban plan/policy which makes sure they provide proper infrastructure and amenities, which are often missing in such developments due to their low cost nature.

In this paper we have tried to break down these solutions, to discuss how each can be provided by either the developers, the government bodies or the home owners themselves. The solutions have been divided into climate responsive design, ecofriendly construction, alternate/hybrid energy sources, urban water conservation, waste disposal and social issues of a Pakistani context such as lifecycle flexibility, economic diversity and an intimacy gradient from pedestrian to vehicular zones.

Keywords: Resilient Cities, Housing Solutions, Sustainable Urbanism

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How can noise barriers reduce pollutant exposition : an exemple of built area near a highway

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When localized near high atmospheric pollutant emission sources, living areas can be impacted by high pollutant concentrations. This is particularly the case when a highway crosses a densely built area such as a city. In order to limit pollutant concentrations in these sensitive areas, local structures can be built. Noise-barriers, frequently found along roadside near cities, is an exemple of these structures. Built with the aim of reducing noises generated by the road trafic, they also act by reducing pollutant concentrations by modifying the local dispersion of pollutants. Effects of noise-barriers were studied in situ with 3D computational fluid dynamics simulations. Results show that noise-barriers can induce flow patterns such as street-canyon patterns which can radicaly modify the dispersion of trafic related pollutants. In the streamwise direction, pollutant concentrations observed after the barriers can decrease to reach less than 30% of the maximal concentration observed at roadside. These results are obtanied for a given road width and noise-barriers height, and could probably change for other lengths.

Keywords: Street canyons, Noise barriers, Computational fluid dynamics, In situ modelisation

*Speaker

How ensure a good indoor air quality in buildings?

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People spend 90% of their time in indoor environment and are exposed to harmful air pollution. In the framework of the MERMAID project (ADEME Primequal program, Rizk et al., 2018; Blocquet et al., 2018), a measurement campaign was performed in the North of France in a school building, in April-May 2014. In order to analyse the measurements and detail the indoor air quality, the INCA-Indoor model (Mendez et al, 2015) was developed and used to produce several scenarios.
The INCA-Indoor model takes into account the main physico-chemical processes: emissions, chemical and photochemical reactions, deposition, adsorption/desorption, exchange through the ventilation or infiltration, etc. The analysis of the measurements and the model simulations allows identifying the main sources of the pollutants indoors and develop new knowledge on the indoor air quality. The presentation will present the main results of the MERMAID project and its following analyses.

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Keywords: Indoor Air Quality, INCA, Indoor, MERMAID campaign, Sustainable Buildin

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How pollutant concentrations evolve in step-down street canyons as a function of buildings geometric properties

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When planning new buildings, it is necessary to choose their geometric properties such as heights, lengths and distances between them. These choices, usually made by architects and planners, are often made on the basis of available space and the future use of the buildings. In densely populated cities, the possibilities are limited, and it generally results in high buildings with small distances between them also called street canyons. However, this type of build- ings implantations often results in poor ventilation conducting to a stagnation of atmospheric pollutants and high concentrations. To better understand how evolve atmospheric pollutant concentrations in street canyons as a function of buildings geometric properties, RANS-CFD (Reynolds-Averaged Navier-Stokes Computational Fluid Dynamics) simulations were conducted. The study is limited to step-down street canyons where the ratio of upwind building height ($H1$) over downwind building height ($H2$) is between 1.0 and 2.0. The ratios of the distance between buildings (W) over downwind building height used in this work are between 0.6 and 1.4. For these ratios, three different flow regimes could appear. The pollutant concentrations in the canyons are highly relying on the regime established and, for a particular regime and a given distance between buildings, the mean concentrations do not change at all. With the new information provided, it is possible to better understand how the geometric properties of buildings affect atmospheric pollutant concentrations in street. Moreover, architects and planners have now keys in order to achieve better sustainable constructions in terms of atmospheric pollution by choosing the best compromises between $H1/H2$ and $W/H2$ to avoid too high concentrations in streets.

Keywords: Street canyons, Computational fluid dynamics, Building characteristics, Planning

*Speaker

How to include Urban Climate issues in Urban planning? From urban and social data production to legal documents.

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Cities are particularly vulnerable to climate change, due to the concentration of people,

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infrastructures, goods and activities.In addition, they increase the climatic and meteorological hazards, the urban heat island increasing the impacts of heat waves and imperviousness increasing flash floods. This shows cities need adaptation to climate change. Furthermore, they are also complex systems, withseveral layers of governance.Their study requires an interdisciplinary approach.The goal of the MApUCE project is to propose a methodology to integrate quantitative energy and climate data in French urban policies. In order to achieve this, aconsortium was built, formed by urban meteorologists, architects, geographers, urban planner researchers, sociologists, geomaticians and researchers in environmental law. The consortium was completed by 5 urban planning agencies, representingthe National Federation of Urban Planning Agencies. The project hastwo objectives, requiring intense transdisciplinary work.The first objective is to obtain data from numerical simulations, focusing on urban microclimate and building energy consumption. Both aspects are physically coupled as domestic heating and air-conditioning are highly meteorologically dependent and waste heat impacts the Urban Heat Island. For this reason, we develop a generic and automated method for all cities in France,including the urban architectural, geographical and sociological parameters necessary for the energy and microclimate simulations. A model of energy consumer behavior is also developed inside our coupled micro-climate building energy model since human behavior is a very important influential factor for building energy consumption.The second objective is to define vectors, understandable by urban planners, to include quantified energy-climate data to legal urban planning documents. A focus is also done on 3 case studies: La Rochelle, Toulouse and Aix-Marseille agglomerations. This is done by analysis of legal and planning documents, of a few ”best cases” and based on urban planning agencies requirements. A cartographicmethod, based on the Local Climate Zones,is proposedto facilitate the integration of urban climate information in urban planning process. The environmental law researchers extract examples of legal writing in urban planning statutory documents where urban microclimate issues are quantitatively taken into account. A guide to urban planners and stakeholders summarizes all the results and proposes ways to include directives for adaptation to climate change in the planning documents.

Keywords: interdisciplinarity, urban heat island, database, urban planning, legal documents

How urban design facilitates everyday urbanism? Evidence from an Abu Dhabi neighborhood

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This article revisits the concept of everyday urbanism. It focuses on the role of urban design in cultivating a supportive setting for the growth of everyday, "do-it-yourself", urbanism in neighborhoods. Many cities around the word witnessed a significant growth in everyday practices. International literature has well documented the different forms of everyday urbanism and the socio-economic factors that enhance it. However, physical design and its contribution to the formation of everyday urbanism is not well represented in the literature. For that reason, this article pays a particular attention to the different elements of the built environment that support such daily ternaries. It studies an old aging Abu Dhabi neighborhood to explore the urban design factors that facilitate everyday urbanism. The paper also asks to what extent such practices promote community life and to what degree they should be supported by formal planning. Results reveal that everyday urbanism is nourished by: Compactness, population density, connectivity, accessibility, and adaptability of public lands. The article argues that everyday urbanism provides benefits to community life, and thus it cannot be ignored in planning practice. It should be, instead, respected and promoted by government planning with a careful understanding of culture and place.

Keywords: Everyday urbanism, do, it, yourself urbanism, urban form, neighborhood, Abu Dhabi's urbanism

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Hydraulic Engineering and Landscping of a 16th century Mughal Gardens at Wah

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This presentation relates to the 'Hydraulic Engineering' employed at a 16thcentury Mughal Garden better known as 'Wah Gardens' in the area known as Hassan Abdal. The main purpose of this presentation is to share discovery of the Hydraulic system and understand the Hydraulic Engineering techniques employed in running the fountains, the *Hammam*(Turkish Bath), supply of water to the main tank and three canals running parallel with the length of the Gardens for supplying water and enhancing the beauty of the Gardens. It is important to note that this is the only Mughal Garden in the subcontinent where a complete hydraulic system has been discovered, which provides us a complete model of the Mughal Hydraulic Engineering system for study and to benefit from this simple yet efficient techniques which can be utilized in our urban town planning and landscaping with the conservation of energy and related resources. The author was Principal investigator of the project titled "Archaeological and Hydraulic Studies of Wah Gardens" undertaken by the Dept. of Archaeology, Govt. of Pakistan. Complete excavation report was published by the author sometimes ealier. Now another Project on the Landscaping of this garden has been approved. Therefore it was felt necessary to write once again for the guidance of the team to undertake the project. In the conclusion some practical suggestions are made for the restoration of this simple but complete hydraulic system as well as on the landscaping on the original pattern. The presentation will include visuals of the garden and drawings of the hydraulic engineering for better understanding of the hydraulic system and the landscape.

Keywords: Bagh, i, Hassan Abdal, Wah gardens, Mughal hydraulic engineering, Akbar, Jahangir, Shahjahan, Aurangzeb, Raja Man Singh, Hayat, Hammam, Baradari, Ahmad Mimar, Saleh Kanboh, Mullah Abdul Hamid Lahori.

*Speaker

Impact of built-up areas on development of urban heat island in mega cities of Pakistan

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The objective of this study is to evaluate the impact of built-up areas on the development of urban heat island (UHI). The study mainly focused on two mega cities of Pakistan including Karachi and Lahore which have a population of 14.91 million and 11.12 million respectively. Geographical Information System (GIS) and remote sensing techniques were applied to find out the land use land cover change upon the availability of 2000 and 2015 Landsat images over a period of 16 years for Lahore. In addition to this, to study the UHI of Lahore, the meteorological data of each 30 minutes was also collected through direct on site observation by using digital weather station. While for the city of Karachi, Finit Volume Mesoscale Model was used to extract the UHI through simulation. The results showed that there is significance urban heat island presence in two major cities of the Country where built-up area is more than the vegetation cover. The areas with densely built-up areas show higher temperatures while the areas with higher vegetation covers show fewer temperatures. It is further observed that as the distance between the city and the rural areas increases, the temperatures declined toward the rural sites at the same time. The UHI in Karachi is measured as 5.6◦C to 13.5◦C and in Lahore it is measured 5.5◦C to 8.3◦C. It is important to note that as Karachi is largest city of Pakistan with dense population and more built-up area, it's observed UHI is higher when compared to Lahore which is comparatively smaller city than Karachi both in population size and areal extent.

Keywords: Built, up areas, Urbanization, Urban heat island, Finit Volume Mesoscale Model, Landsat images

*Speaker

Impact of ecological degradation on urban areas' temperature: The case of Lahore in Pakistan

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Abstract: The tremendous increase in the population has geared the process of urbanization which, in return, has been modifying the land surface particularly that of the cities. As the population of urban areas increases, it costs the removal of natural land surfaces, degrading the urban ecology and lowering the urban sustainability. It results the increasing paved surfaces and extensive use of energy consumption for human comfort which leads to modify the local thermal budget by increasing the local areas' temperature in form of urban heat island. The modification in urban ecology causes to effect the local weather and is one of the major tool and indicator toward sustainable cities. This study focused on Lahore city in Pakistan which has 10.1 million inhabitants. Due to rapid urbanization in last decade, the eco- fields have shrunk and built-up area has tremendously expanded causing to increase the local area temperature over short period and long period. Increasing anthropogenic activities, expansion of city, removal of natural land and destruction of eco-fields of the city has made Lahore a vulnerable and less sustainable. The objective of this study is to evaluate the impact of urban development, ecological degradation on local climate changes. The aim is to design the strategy to develop the sustainable cities located in hot climate zones such as Lahore where energy use is maximum for cooling purposes. Statistical techniques to assess the local change in temperature, GIS technique to assess the conversion of natural surface into built-up surfaces and a survey technique to assess the urban sustainability will be used to fulfil the objectives.

Keywords: Urbanization, Land cover, Sustainability, Heat island, Ecology.

*Speaker

Impacts of renewable energy sources on sustainability issues, climate change mitigation and energy security in developing countries

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In today scenario, the warning of global climate change, huge dependency on fuel import, and quickly rising energy demand level have intensified the need for more sustainable energy systems. Some of the obstacles that the present world economy faces are energy security, sustainability, and climate change impacts. Climate change threatens more land, populace, and economy in developing countries than any other part of the world. In this aspect renewables may help to mitigate climate change, moreover it has the capability to provide sustainable energy in order to meet the energy demand of future generations. Therefore the advancement of 100% renewable-based economy may give a permanent solution to the obstacles produced by climate change, energy security and pollution. The present study shows a transition to a 100% renewable- based economy may be crucial to attain everlasting solution to these challenges. The study concludes that a 100% renewable transition is feasible, but not essentially compatible with an imprecise increase in energy consumption. The study also suggests some actions and policy recommendations if they considered may help to achieve the goal of renewable energy resources to reduce emissions, mitigate climate change and enhance a clean environment with clean energy for all future generations.

Keywords: Environment, climate change, energy security, renewable energy, Sustainability, Developing countries

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Industrial waste and urban bio-diversity in developing country: Mapping aquatic biodiversity in Nepal

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This study investigates empirically the relationship between industrial waste and urban biodiversity in Nepal by using mapping method based on secondary data sources. In addition, it estimates social cost of urban biodiversity loss. Its result is positive correlation between industrial waste and urban biodiversity loss. Its social cost is interestingly significant.

Keywords: Industrial Waste, Urban Biodiversity, Aquatic Biodiversity, Nepal

*Speaker

Infrastructure development influence in land use dynamics pattern in small towns: Lessons from Handeni town

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The rate of urban growth land uses and change in small towns of developing countries of Sub-Saharan Africa have been constrained by various factors. Low level of investments in basic infrastructures provision, land use management and land use guidance have been among the main drivers. To understand the nature of land use dynamics pattern and factors influencing the change, this study on land use dynamics in one of the small towns in Tanzania was conducted. Methodologically data were collected through transect walk in the field with satellite images of 2008, 2013 and 2018 to realize the existing change in addition to discussion with local people and leaders, observations, representatives and officials who were working in the area. The study was done between February 2018 and March 2019. Data analyzed indicated that the pattern of development in land uses has followed a series of infrastructure development such as roads, social services and market places. The change has been both in the form of land use types, proportion in land use categories and pattern of settlement development, with structures, density and forms of development in the town. The research concluded that, there should be an integration in policy formulation on infrastructure investments and land use development which focus on keeping consideration of form and pattern of settlement growth.

Keywords: Land use, Dynamics, Settlement Pattern, Small town and Infrastructure

*Speaker

Investigating the dynamics of urban heat islands of Ahmedabad city of India using Satellite data, statistical analysis and GIS

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With the rapid rate of urbanization and industrialization which the entire globe is undergoing, Urban Heat Island (UHI) emerges as one of the most challenging environmental problems of the 21st century. Ahmedabad, which is one of the fastest growing cities of India, has witnessed a significant urbanization in the past two decades. With this background, the present study of comprehensively investigating the dynamics of UHI of Ahmedabad city during 2001-18 has been undertaken. Annually averaged Land Surface Temperature (LST) of both nighttime and daytime for the study area was retrieved from the Monsoon Asia Integrated Regional Study program which utilizes Terra and Aqua Moderate-Resolution Imaging Spectroradiometer (MODIS) with 1 km spatial resolution. Each dataset contained 557 data points representing 501 km2. The LST data was then utilized for computing the UHI intensities at all points. The trend analysis of the UHI intensities (for both daytime and nighttime) of all the locations was done for the 19 years study period using the Mann-Kendall trend test. Based on the significance of the increasing or decreasing trend at different confidence level (like 90%, 95% and 99%), the locations were accordingly classified and were then mapped using Geographic Information System. The UHI maps along with UHI trend maps were then juxtaposed which lead to the identification of the emerging, stabilized and diminishing heat islands of Ahmedabad city for the daytime and nighttimes. The driving forces for each UHI category were then investigated and this study thus puts forward the dynamics of UHI which would offer deeper clues for evolving UHI mitigation plan.

Keywords: Urban Heat Island, Mann, Kendall Trend Test, GIS, MODIS, Ahmedabad

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Investigating the impact of urban landuse on air pollution and surface temperature in Tehran

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Urban land use changes during the past years and increasing the number of vehicles has led to an increase in pollution and air temperatures in the world's major cities. Main objective of this study was to investigate the effect of urban land use on air pollution and increase of surface temperature of Tehran metropolitan area. In this study satellite imagery and Tehran air quality control center data were used. In the first step, land use maps of 1992 and 2018 were prepared using the most similarity classification method and land use changes were analyzed based on CrossTab model. In the second step, the concentrations of PM10 contaminants were assessed using the Tehran air quality control center data and its relationship with urban land use status was evaluated. In the third step, the Land Surface Temperature (LST) was calculated using separate window algorithm and its relationship with land use and air pollution was investigated. The results of this study showed that urban expansion in the last 26 years has led to a decrease in the area of plant cover and bare lands in Tehran. Due to the inverse relationship between plant cover and surface temperature, this has caused an increase in air temperature and the formation of heat islands in Tehran. On the other hand, in the metropolitan city of Tehran, areas with larger spaces of industrial land uses and highways have higher rate of pollution and temperatures than other areas.

Keywords: Air Pollution, Surface Temperature, Tehran

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Is Lahore's urban system ready to sustain climate change?

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Lahore, home to 12 million people with annual population growth rate of 2.4%, has experienced deadly smog duration since last three years. Climate Change is a global challenge and administrations in major cities around the globe have started addressing the issue on top level. Lahore has also seen establishment and operation of various public sector institutions/offices which explicitly or implicitly claim to help Lahore sustain changing needs of urban system due to climate change. However, little is documented yet whether how effective have these interventions proved so far. This paper investigates policies, plans, procedures and regulations (whichever available) for relevant government offices on the basis of set indicators in order to explore whether Lahore's urban system is ready to sustain the challenge of Climate Change; the investigation covers the debate on policy to the plan level and includes the apprehension of the human resource dedicated to work on the issue. Institutional frameworks of considered government offices have been analyzed to ascertain their efficacy. In essence of this study; the capacity of current system has been documented, the gaps in the system have been outlined and the prospective solutions for the way forward has been suggested in this study.

Keywords: Lahore, Climate Change, Pakistan, Lahore Development Authority (LDA), Environment Protection Department (EPD), Urban System

*Speaker

Is there any room for a long term socio-ecological research on green roofs ?

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Throughout the world, roof vegetalization is recognized as a sustainable building practice as green roofs can provide a variety of valuable ecosystemic services such as runoff delay, thermal building insulation, urban heat island mitigation, improved air quality, biodiversity, aesthetic and human well-being. Water, food or energy productions may be foreseen too, through rain water re-use, urban agriculture or photovoltaic panels. Some recent works compile and discuss technical and research knowledges about green roofs, and more recently about green roof ecology. Long term socio-ecological researches (LTSER) focus on the interactions between an ecosystem and the society. They are carried out in an interdisicplinary framework to address scientific questions related to the atmosphere, the biosphere, the hydrosphere, the geosphere, and the sociosphere. The definition of LTSER network applies to plenty of socio-ecosystems, ranging from "natural" ones (forestrial, rural....), to anthropized/engineered urban ones. Green roofs are engineered ecosystems of very limited size. As such, they can be set as a benchmark to implement and study ecological concepts, notably ecosystemic services they provide.
This talk raises current issues from and for the Strasbourg's eurometropolitan council – Which are the most valuable eco-services (flood mitigation, heat island mitidation, agriculture) ? What are the most promising combinations? What are social actors' perception of such services? How to identify "green roof" candidates? How to promote roof vegetalization in an efficient manner? – and addresses them from a LTSER point of view.

Keywords: Green roofs, ecosystemic services, perception, LTSER

*Speaker

Large scale constructed wetland planted with Echinochloa pyramidalis (Lam.) Hitchc. as sustainable solution for domestic wastewater from social residential house in Yaounde, Cameroon

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Wastewater treatment is of recent history in Cameroon. The aim of this study is to evaluate the efficiency of a full scale wastewater treatment plant for domestic wastewater treatment in Yaounde, Cameroon. Wastewater flow at the inlet and outlet of the system was assessed for 13 months. The physicochemical (EC, pH, TDS, TSS, PO43-, TKN, NH4+, NO3-, COD and BOD5) and bacteriological (faecal coliforms and faecal streptococci) characterisation of wastewater were done bimonthly at five points in the wastewater treatment plant following standard methods. The results showed that the treatment plant receives averagely 151 ± 3 m3 of wastewater per day. The removal efficiencies reached 93.6 % for TSS, 93 % for COD and 91.5 % for BOD5. Phosphorus removal was relatively low and variable with an average yield of 41.7 % for total phosphorus and 39.8 for orthophosphate. The reduction of nitrogen pollution by the system averaged 80 % for TKN and 40 % for nitrogen ammonia. The reduction of the bacterial load was very high, with performances up to 98.44 % for faecal coliforms and 98.62 % for faecal streptococci. Nonetheless, the average residual levels (5633 + 2068 UFC.100 ml-1 for SF and 9165 + 4111 UFC.100 ml-1 for CF) are still above the WHO guideline for unrestricted reuse in irrigation (≤ 1000 ufc.100 ml-1 and ≤ 2000, respectively for SF and CF).

Keywords: Domestic wastewater, constructed wetlands, tropical urban area, sustainable solution, social residential household.

*Speaker

Life cycle cost analysis of residential building for saving water using building information modelling (BIM)

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The construction industry is labour-intensive in developing countries, due to knowledge gap and lack of technologies. According to the World Bank, there are 135 middle and lower income countries existing in the world. Building Information Modelling (BIM) is breaking the stereotype of working for innovation and productivity in the Architectural, Engineering and Construction (AEC) industry. BIM can also be used to overcome the problem of wastage of water using different water purifying equipment. Water is essential for every human being for their daily routine, so it is preferred that every human being should get pure and drinkable water. Nowadays we are using different water purification systems and this system is purifying only one third part of the water provided to the purifying system and remaining two third of water is wasted. So it is necessary for us to manage and use wasted water for different purposes. In this paper we discuss a case study of a residential project in which we calculated the benefit cost analysis for providing centralised purification system and use of wasted water for various aspects. We design an alternated pipeline network using Revit software and we also compare Life Cycle Cost Analysis (LCCA) for existing pipeline network with new proposed pipeline network.

Keywords: Building information modelling (BIM), Construction Industry, Purification system, Life Cycle Cost Analysis.

*Speaker

Local solution for smart and intelligent mobility developed in Nancy

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Urbanloop is the new urban transport system being developed at the University of Lorraine to provide a smooth and sustainable mobility service. Individual pods drive users without connections nor stops on a rail network. The system consists of boarding stations, interconnected traffic lanes, a fleet of pods and a centralized control system. Each pod is equipped with its own propulsion and embedded guidance system. This new means of transport results from the expression of territorial, societal and technological stakes. As it is designed for medium- sized cities with a large urban spread, reduced travelling times and a compact, lightweight system are necessary. Most of the technological solutions that are used have long been proven in existing industrial applications. The truly innovative feature is the centralized supervision and control system, which is an application of AI progress. Project is mainly carried out by students and professors from Lorraine INP to obtain a portfolio of technical solutions in electrical, mechanical, computer, or geotechnical engineering sciences. Research laboratories and other academic partners also participate to tackle the challenge of urban planning, regulations, human-machine interaction, etc. The necessary work for the practical development of Urbanloop is carried out by a multidisciplinary team from the university and a project management unit coordinates actions and their financing. Knowledge is shared in an ”open source” mode by a result exchange hub and website. The fast advance of the project requires several experiments in progress in Nancy: a numerical simulator for flow optimization, a control and command platform for a model network, and a full-scale demonstrator equipped with several pods and a 200-meter-long loop.

Keywords: smart mobility, intelligent, green, urban transport

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Micropollutants in the sewage system : making one's own cleaning products to limit pollution?

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Public authorities are highly concerned about the presence of micropollutants in the sewage system. Wastewater treatment plants have nowadays more difficulty to treat wastewater properly. Damages on ecosystem and human health are one of the major consequences of this deficiency. As an important part of polluting spillage results from domestic sphere, it is necessary to lower and/or to enhance all domestic discharges. The first step is to understand/analyze the individuals' representation of micropollutants in order to propose concrete measures to change their behaviors. 605 questionnaires were completed by the inhabitants of Strasbourg Eurometropole (East of France). The results show that individuals are aware that the presence of micropollutants in water can be linked to individual practices. It also seems to be difficult for the respondents to think that everyday products, in particular those related to body treatment, may have an impact on water quality. Nevertheless, the majority of the respondents remain convinced that the industrials are the first responsible. In a second step of the research, we focused on the measurement of the intention to substitute usual household products by a "home-made" product more eco-friendly. 304 questionnaires were completed by the inhabitants of the Strasbourg Eurometropole and were analysed by using the Theory of Planned Behavior (TPB). The results show that TPB explains 35% of intention to use the "home-made" product. Respondents have a positive attitude toward this "home-made" product. It also appears that there is a strong capacity constraint of this product in terms of disinfection although this parameter is essential when choosing a household product.

Keywords: water quality, micropollutants, cognitive representations, household spillage

*Speaker

Modelling a smart urban food system through metabolic optimization integrated into urban planning in Algiers (Algeria)

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Food system is witnessing new spatial and organisational configurations as a response to urban food insecurity caused by climate change. Considering the unsustainability of globalized agro-industrial system, the trend is towards local food systems close to cities such as "Territorialized Food Systems" that claim to be more respectful of sustainability targets. In this contribution, we bring a critical look at Territorialized Food System model within the scope of urban resilience. We propose a Smart Urban Food System (SUFS) theoretical model that would be more integrated locally. Unlike the first food model that aims mainly to preserve specific natural heritage and local know-how of a particular region, the second, i.e SUFS, seeks to optimize distances and resources consumption through circular metabolism within a city. This new model will be tested on Algiers. A preliminary spatial analysis on the city's agro-food geographic information system shows the possibility of creating a SUFS, however its implementation requires system-building scenarios. In this contribution, discussions are about the integration of SUFS components into urban planning and development in Algiers.

Keywords: Smart Urban Food System, urban food security, resilience, metabolic optimization, urban planning

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Multichannel analysis of indoor-outdoor particle number concentration in a university building

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This work, carried out in the framework of the VIEPI project (Integrated Evaluation of Indoor Particulate Exposure), aims to describe the variability of air concentrations of the total particles number concentration (PNC, considered a proxy of the UFPs) and size distribution in the university district of San Lorenzo in Rome, in order to evaluate the exposure of people that live, study or work in the area.
PNC measurements were made using four portable Condensation Particle Counters (TSI 3007). Size distribution was assessed using two Optical Particle Sizers (TSI 3330), and a Nano Particle Sizer Spectrometer (TSI 3910). During 2017 and 2018, seasonal campaigns were carried out to measure the internal and external PNC of the Fermi Physics building. In each campaign, for a week, indoor measurements were made in classrooms on the second floor, outdoor measurements were made, at the level, on two different sides of the building. In the second week, indoor measurements were made in the Conference hall on the ground floor and in a classroom on the 4th floor. Outdoor measurements were made, on the two levels.

Firstly the horizontal concentration gradient was considerd to evaluate the differences between classrooms located on the same floor. Then the vertical concentration gradient was measured to evaluate the differences between classrooms located at different heights.
In addition, in two classes (Informatics room and conference hall), measurements of indoor-outdoor temporal variability of size distribution in 16 channels from 10 nm to 10 μm, were carried out. These measures allowed to highlight night/day variations in concentration and the effects of human activities.

Keywords: Ultra, fine particles, PNC, spatial variation, atmospheric pollution, urban areas

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Multiple sources of air pollutant PM2.5 in an industrial and portal city Kaohsiung, Taiwan

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Particulate matter with an aerodynamic diameter less than or equal to 2.5 μm (PM2.5)belongs to the most important and hazardous air pollutants. The potential sources of PM2.5 are multiple and complicated. A portal city Kaohsiung, southern Taiwan, has been highly industrialized, with petrochemical, steel, shipbuilding, etc. industries, as well as with heavy traffic. To develop reduction strategies, determination of the PM2.5 sources and their contributions are important. Daily air particle samples were collected with PM2.5 samplers (Thermo Partisol R&P 2000) regularly for every six days in 2017-2018 in Kaohsiung city. Chemical constituents of PM2.5 were analysed, including trace metals, water-soluble ions, and organic/elemental carbons (OC/EC). Positive matrix fraction (PMF) model with those chemical profiles was applied to quantify the potential sources of PM2.5 according to the constituents. Annual average of PM2.5 concentration was measured to be 29.4 mg/m3, with higher levels in winter time. Potential sources of PM2.5 varied significantly by season, and were estimated to include traffic emissions (approximately 42%), heavy oil combustion (approximately 33%), non-ferrous metal smelting (approximately 9%), iron ore steel industry (approximately 6%), re-suspended dust (approximately 6%) and coal combustion (approximately 4%). In conclusion, for urban air pollutants like PM2.5, a clearer understanding of the potential sources will enhance the development of strategies for pollution control in this industrial portal city.

Keywords: Air pollutants, PM2.5, source apportionment, industrial pollution

*Speaker

Nature-based strategies for resilient cities: the case of green envelopes

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Cities are particularly exposed to climate change and environmental problems due to the impact of anthropic activities. Flooding, heat and drought, in particular, are hazards which are increasingly characterising the urban areas. Climate change and anthropogenic pressures have altered the functions of ecological systems and have consequently modified the flow of ecosystem services in terms of their scale, timing and location. In urban environments, additionally, the negative effects of climate change are amplified by settlement features (impervious surface, buildings, transport infrastructure, socio-economic activities).
Greening systems can improve environmental conditions in cities, and thus quality of life of citizens by providing multiple ecosystem services. Nature based strategies, such as urban forestry and greening systems for the building envelope, can be implemented to curb a wider urban heat island phenomenon having regional scale impact on energy demand, air quality and public health.
The paper presents case studies, including monitored pilot projects, of greening systems for the building envelopes. Research results show their multifunctionality and performances, in terms of microclimate regulation (outdoor comfort) and energy savings for air conditioning, air quality improvement, aesthetic and social aspects, resulting in economically and environment sustainable design strategies (as verified by means of life cycle assessment and cost benefit analysis).

Keywords: Urban areas, nature based, adaptation, green envelopes, vertical greening systems

*Speaker

Near Road Air Pollution Modelling using vehicular emission and dispersion model and validation with in situ measurement

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Traffic related air pollution is one of the most challenging situations faced by upcoming smart cities as well as greenfield smart city, Due to rapid urbanization and unplanned development it is very necessary to implement geospatial technology along with well-planned corridor, the major problem associated with the city is traffic congestion, Due to increase in number of vehicles, air pollution is gradually increasing which in terms increases the risk to people residing in vicinity as well as to riders and travelers.
This paper presents a pilot study of Ahmedabad City corridor from Shivranjani Crossroad to Akbar Nagar in which concentration of traffic-related air pollution PM, CO and CO2 was estimated with real-time traffic and basic meteorological information. The model used is CALINE-4 a Gaussian line source dispersion model which predict the pollutant based on vehicle emission factors, average traffic speed, traffic volume, and vehicular fleet composition, metrological parameters, road geometry terrain, and background pollution.

We will be evaluating and calculating the distribution of pollution concentration in the corridor and in vicinity and pollution exposure is evaluated and the impact of traffic stagnation, traffic pollution on the public and will be validated using the in situ measurements of pollutants. The results will show a correlation between traffic (speed, traffic intensity, and signal timings) and traffic-related air pollution concentration.

Keywords: Smart City, Corridor, CALINE 4, Gaussian Model, Emission factor, Air pollution

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Pattern of national urban network in globalizing process (Case study of Iran metropolises and capitals)

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The purpose of this study is to explain the national power network based on power and prestige This model, based on Network Theory, runs for the first time on a geography of country. Data used in the model includes all links and data with the origin and destination of metropolises, provincial cities. From aviation data including passengers, cargo and number of flights and ground transportation ngers, and student data, 2015 Depending on the source and destination of the acceptance, it is used to analyze the power network.
The process is carried out in such a way that after data is prepared by the usual software, the data is entered into the UCINET software, then two stages of the basic analysis are performed: The first step is determining the cities' strength using four analytical indicators of Outdegree, Indegree (Prestige), Clossness and Betweenness cities of the country and forming primary clusters, then performing REGE and determining the position of cities in the city's urban network and ranking of cities. In this analysis, two Outdegree and Indegree indicators are very important, such as the analyzes conducted by Hammer in his five-level model (including the main blocks, high level, low level, snub and isolate).
The output of urban network analysis of the country based on power indicates that Tehran has full control over the urban network of the country and the withdrawal of the shape of the network from star mode to the formation of new power centers and new regional prestige based on the cities of Isfahan, Bandar Abbas, Ahvaz.

Keywords: Iran's Urban Network, Power, Prestige, Outdegree, Indegree, Clossness, Betweenness

*Speaker

Population growth and changes in residential land use of Bahawalpur City

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Use of land by man for various purposes is a highly significant and dynamic phenomenon on the face of the earth. With the rapid increase in urban population due to natural increase and migration from the surrounding areas of the city for various purposes has increased the demand of land. Bahawalpur was a walled city in ancient times, but in last 50 years establishment of educational institutes, availability of better medical facilities, job and business opportunities the city started to grow its urban boundaries. The current study is focusing upon the Spatio Temporal changes in the Residential land use of Bahawalpur City associated with the changes in population growth. For the current study secondary data sources has been utilized like demographic profile of the city is obtained from Pakistan Bureau of Statistics, Punjab Welfare Department and District Census Reports, and Outline Development Plan of Bahawalpur. This data is numerically and graphically depicted to identify the change in urban population in Bahawalpur City. Specifically remotely sensed data played a pivotal role in determining the residential land use of the city since 1987. Change detection has been made in the land use of the city using satellite imagery by applying a supervised classification in ERDAS Imagine 10. Accuracy of classified images is calculated by using Kappa Index of Coefficient. The result obtained after supervised classification reflects the clear change and increase in proportion of residential land use of the city. The current study not only opens the doors for further research to determine the magnitude and direction of residential growth.

Keywords: Residential Land Use, Population Growth, Remotely Sense Data, Supervised Classification, Change Detection

*Speaker

Predicting urban park users' postures on exotic turtles management

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Strasbourg shelters exotic turtles in its urban parks. Most of them are alien invasive species. Usually, the implementing prevailing approach management consists in eradicating them. However, an ethnological survey in 2017 revealed that many park users are opposed to lethal measures. Here, we investigate whether one can predict users' postures and their opinions on management options based on socio-demographic variables. Multivariate analyses allow to explore the profiles of 74 users interviewed. First, we explore if one can predict whether users are satisfied with the presence of turtles before been informed about their origin and invasiveness. This analysis does not show any robust categorization but satisfied people seem rather young, unemployed or students. Most of them ignore buying and releasing turtles practices and their exoticism. Then, we explore people's reactions when told that turtles have been abandoned. This analysis shows (without robust evidence) that people offended by abandonment or concerned by turtles' wellbeing tend to be similar to those satisfied with their presence. By contrast, those feel mainly concerned with the quality of ecosystems tend to belong to higher professional categories and are older. We then analysed whether interviewees' postures towards interventionist management options are predictable, once people are informed that turtles are exotic and carnivorous. This analysis does not unveilany meaningful structure in our data. Finally, the last analysis explores whether people's satisfaction is sensitive to the information given. It appears to be often the case. All in all, this study suggests that people's stances do not reflect socio-demographic categories but are rather anchored in idiosyncratic life histories, ideas and beliefs.

Keywords: exotical turtles, urban nature, invasive species, ethnobiology, multivariate analysis

*Speaker

Preparation of sulfur composite material for manufacturing of corrosive resistance building structures using petrochemical solid waste

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Petrochemical industry produces variety of end products like sulfur, spent catalysts, etc. Owing to sulfur and spent catalyst chemical compositions properties, like high resistivity to corrosive environment, waterproofing nature, antifungal property of sulfur, it can be used in construction industries as a substitute of cement concrete, Thus, the structure built out of these material can be widely used for corrosive environmental conditions such as structure of sea water and acidic environment etc.In this study, sulfur composite was prepared from sulfur and spent catalyst. Organic modifier was used to enhance the building property of sulfur cement. Sulfur composite and cement concrete specimens were submerged in seawater for 7, 21, 45, 60, 90, and 120 days. After 120 days of immersion, durability and resistivity of specimens were examined by change in weight, compressive strength, microstructure crack, etc. Interesting results will be presented at the symposium.

Keywords: spent catalyst, organic modifier, sulfur composite, cement concrete, sea water

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Quantitative environmental assessment of development operations from the early stages of the project in Strasbourg Eurometropolis (France)

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The NESTERR2 research program is a continuation of the NEST tool (Neighborhood Evaluation for Sustainable Territories). NEST is a quantitative environmental assessment of development operations from the early stages of the project. It is a plugin, powered by the 3D modeling software Sketchup. The project leader is NOBATEK Technology center. The AMUP laboratory
mission is to make this information accessible for all. The objective is to explore the possibility of mapping the territory of the Eurometropolis using the indicators provided above through the combination of several data or several means of graphic representation (3D, 2D) to evaluate development plans up to 2030.
NEST was particularly responsive to the expectations of project managers to produce indicators for the development of projects with HEQ (High Environmental Quality) criteria. However, this tool had important limitations. The environmental indicators were not adapted to the scale of development operations, or larger scales. It was impossible to use the tool on a large scale because the file formats used required excessive processing capabilities. The software did not present enough commercial opportunities. Finally, the results, concentrated on the appraisal of environmental contexts, were not adapted to the decision-making process.
In order for the NESTERR2 urban sustainability assessment tool to fully play its role at different scales, work to create coherence between the scales and the political strategies for sustainable development is required. The privileged scale would be the IRIS because it is a scale that corresponds to land use planning and it offers rich databases.

Keywords: environmental indicators, quality of life, simulation platform, representation

*Speaker

Rainwater harvesting from urban rooftop buildings for recharging groundwater

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Rainwater harvesting provides an opportunity to collect and store rainwater, which can be used for recharging groundwater. This study was conducted to design and develop adaptable rainwater harvesting model along with analyzing long-term rainfall data for Faisalabad city. Thirty years (1983-2013) rainfall data of one day maximum rainfall events were analyzed using normal, log-normal, log-pearson type III and gumbel distributions. Keeping in view the rainfall data analysis, RWH system was designed and installed to collect rooftop rainwater. The rooftop area of the selected building was 626.75 m2 in size. The collected rainfall water was used to recharge groundwater using three pits of 1.22 x 0.91 x 1.52 m of length, width and depth, respectively, along with having variable borehole depths of 7.62, 10.67, and 13.72 m at center of bottom of the pits. The first pit of 7.62 m borehole depth with diameter of 101.6 mm had blind PVC pipe of 4.57 m followed by 3 m gravels filled showed average recharge rate of 6.5 lpm. The second pit of 10.67 m borehole depth had same size of blind PVC pipe followed by 6.1 m screened PVC pipe, showed average recharge rate of 47.2 lpm whereas the third pit had blind PVC pipe of 6.1 m with screened PVC pipe of 7.62 m showed average recharge rate of 52.2 lpm. These results indicate that RWH has potential to recharge groundwater under conditions similar to those of the study area, which can be replicated to enhance groundwater recharge in the urban and peri-urban areas.

Keywords: rainwater harvesting coefficient, groundwater recharge rate, return periods, recharge pits, rainfall analysis

*Speaker

Rainwater management in dry gardens of Zen-Buddhist monasteries in Japan: Survey for designing attractive raingardens adaptive to climate change

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Rainfall has been intensifying due to global warming and heat-island effect in urban areas. Urban flooding caused by heavy rainfall has been deteriorating with the spread of impervious surfaces in the city. In order to mitigate today's urban flooding, just installing large-scale, centralized storm-water drainage system may be insufficient; it is necessary to actively promote small-scale, spatially-distributed water management/urban green infrastructure such as bio-retention swales, raingardens, green roofs, etc. in the city. This study investigates rainwater management in attractive, traditional dry-gardens in Zen-Buddhist monasteries in Japan and provides information on how contemporary raingardens should be designed. Two gardens in Kyoto and one in Fukuoka, Japan are precisely surveyed using drone-mounted cameras/gimbal systems. The water balance of one of the gardens designated as a cultural asset of the city is examined by observing rainfall and rainwater retention in the garden during the rainy season in 2017. The capacity of rainwater management of the garden is estimated to be between 430mm (storage) and 850mm (storage and infiltration) during a rainfall event, which are around 1/4 and 1/2 of the average annual rainfall of Japan. Moreover, one of the gardens investigated has hardly-permeable soil layers under the temple area. Thus the designer of the garden seems to have introduced a rainwater-management function of what we call "cushion", i.e., distributed drainage with intricate channel networks and dry gardens as a retarding basin/buffering area between temple buildings and a hill behind them.

Keywords: rainwater harvesting, green infrastructure, adaptation to climate change, urban flood disaster, Japanese garden

*Speaker

Resilience and collapse in urban systems

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The latest IPCC report urges humanity reducing emission by 70% until 2030 if increases in temperature are meant to be avoided. Even though awareness about sustainability has been widened at governmental, institutional, professional and academic levels in the last years, carbon emissions keep on increasing, making the 2030 IPCC's target highly unlikely to happen. What is the plan B in case things go awfully wrong? Urban resilience has gained international recognition as a possible answer to this question by highlighting the need to make cities more adaptable, even though what this really means is still unclear. The concept of resilience has been criticised for being an excuse to accept without confronting the roots of unsustainable practices. Moreover, in the context of a global environmental crisis, these consequences are largely underestimated. Collapse, which is one phase in the resilience adaptive cycle, is hardly ever discussed. Using a logical argumentation method, this paper exposes a deeper understanding of the concept of collapse and why it should be a key topic of analysis for professionals of the built environment interested in the resilience and sustainability of cities. This paper is the product of an interdisciplinary research that uses studies from anthropology, sustainability, ecology, economy and social sciences to discuss the possibility of coexisting within a collapsed environment. The conclusion suggests that discussions about the resilience of cities are incomplete without a proper understanding of the concept of collapse, its meaning and implications.

Keywords: collapse, resilience, sustainability

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Role of Chrypsopogon zizanioides in Immobilizing Contaminants during Phytoremediation of Crude Oil Contaminated Soil.

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Soil pollution is generally caused by industrialization and population growth linked to urban lifestyle that affects the environment through oil spills with negative effects on human health and the surrounding ecosystem. The traditional methods used for soil treatment including engineering and chemical methods often add more harm to the environment. As a result scientists are exploring the use of plants known as phytoremediation, as a sustainable and environmentally friendly approach for soil treatment. This paper explains the results obtained from a study on the phytoremediation of crude oil contaminated soil using *Chrysopogon zizanioides*. In this research about 70kg of soil was artificially spiked with 1kg of crude oil and allowed to weather for 100 days. Then about 1kg of the weathered soil was placed in different terracotta pots and the seedlings of *C. zizanioides* were placed in each pot. Some samples were treated with doses of Nitrogen, Phosphorous and potassium (N.P.K.) fertilizer and biosurfactants (95% Di Mono-Rhamnolipid and 95% Mono-Rhamnolipid) in order to promote the growth of plants and solubilize the organic contaminants for easy absorption by the plants. An improvement in plant biomass and reduction in levels of Polycyclic Aromatic Hydrocarbons was observed after a period of 72 days and 8 months respectively, with highest number of plant culms and height in samples treated with N.P.K. only, followed by samples treated with both N.P.K and biosurfactants. However, the highest growth in root structure occurred in *C. zizanioides* grown in crude oil contaminated soil only which compacted the soil together thereby preventing further spread of contaminants. In conclusion the root system of *C. zizanioides* can potentially be used for immobilizing contaminants in the soil during the process of phytoremdiation of crude oil contaminated soil.

Keywords: Pollution, Phytoremediation, cost effective, sustainable, health

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Shaping India's future by building smart future sustainable cities

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India is confronting a surge in Urban population in a most recent couple of decades. This paper is an endeavor to talk about the key issues to build future urban cities and to redeveloping existing infrastructure in existing urban areas. Further, the paper discusses the difficulties in financing Smart city projects in India. The government of India under the leadership of PM Mr. Narendra Modi has propelled a strong eagerness towards Smart City Mission in 2015 with the sole objective of giving a better quality of life to the citizens of the country. Government is initiating steps for the transformation of over 100 Cities into Smart Future Cities. The present nature of government silos will represent a noteworthy test in the execution of urban development projects. To motivate and attract the increased private sector participation and investment in infrastructure projects it would be beneficial if the Government funding were linked to the effort of developing projects as PPP. It is still beginning of brilliant Urban Cities advancement in India. India's Smart Future city improvement should be reliably monitored as it unfurls. What Indian urban communities require in the present setting is not smartness but usefulness, but rather development on technology segment. There is a growing understanding among mainstream researchers that Urban local bodies assume an essential part in encouraging development in urban areas, which focuses on enhancing personal satisfaction by incorporating innovation and providing ease of living.

Keywords: Smart City, PPP, Infrastructure, Urban, Local Bodies

*Speaker

Social impacts on the adoption of organic food products: A meta-analysis of consumer behavior

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Consumption of organic foods is nowadays increasingly widespread phenomenon. This study aims to provide a systematic view on the research of social impact on the consumer's adoption of organic food products. By using a meta-analysis, three main research issues are addressed. Firstly, the publication bias problem distorts the "true" effect of social factors on the consumer's choice. Second, under the problem of publication selection, we test the existence of "true" social impact on the adoption of organic foods. The third issue is to explain the study heterogeneity which defined as the deviation of effect sizes among the primary studies. Through the selection criteria in meta-analysis design, the research compiles data from 30 primary studies in academic journals which cover the 106 effect sizes, statistical estimates, study and publication characteristics for quantitative analysing. The findings confirm the existence effect of social factors on the organic food choice although the publication bias problem comes from the choice of explanatory variables in estimation and sample size in primary studies. The study heterogeneity explains by the including of indicator for value variables and trust variables, the choice of social factor's indicator, and the use of indirect impact of social factors.

Keywords: Social factors, Meta, analysis, Organic food products

*Speaker

Soil phytoremediation as sustainable and low-cost technology to mitigate PAHs pollution in urban area

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As long as fossil energy remains the main source of energy, oil pollution issues will increase in urban area. Soil pollution by PAHs causes tremendous environmental and health dam- ages. Nowadays, it appears to be a necessity to preserve environment for the future generations through sustainable management techniques such as phytoremediation. This green biotechnology is particularly beneficial at the city level since the conversion of a polluted site into a green space reduces the greenhouse effect and creates recreational spaces. This work therefore aims to assess the mitigation of PAHs in soils through phytoremediation with 6 plant species from March to August 2016. Plant growth characteristics and their phytoremediation potential were evaluated. Only 3 species (*E. indica*, *C. dactylon* and *A. sessilis*) survived and developed throughout the experiments. The bioconcentration and translocation factors values of PAHs indicate that *E. indica* and *A. sessilis* promoted rhizodegradation and phytoextraction of PAHs, whereas *C. dactylon* was mainly involved into rhizodegradation. The removal efficiency of hydrocarbons in soils planted with *E. indica* (82.56%), *C. dactylon* (80.69%) and *A. sessilis* (77%) was significantly higher than that of the non-planted soils (57.27%). To confirm the experiments, a mechanistic model of PAHs soil-plant transfer has been developed. Three plant compartments (roots, stems and leaves) of *E. indica*, *C. dactylon* and *A. sessilis* were concerned to predict their PAHs concentrations as a function of time and the initial PAHs content in air and soil. Overall, the simulated PAHs concentrations were significantly similar to the experimental ones. *E. indica, C. dactylon* and *A. sessilis* therefore good candidates for mitigating PAHs pollution in urban soils.

Keywords: Mechanistic model, PAHs polluted soils, Phytoremediation, Soil plant transfer

*Speaker

Source apportionment of the particle number concentration near the Amsterdam Airport Schiphol using positive matrix factorization (PMF)

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We identified the major sources of particle number (PN) concentrations near the Amsterdam Airport Schiphol, using the positive matrix factorization (PMF) model. Time-resolved PN size distributions in the range of 10-225 nm combined with concentrations of auxiliary variables including gaseous pollutants (NOx, CO, and O3), black carbon (BC), and particle mass were measured through May-October 2018, and the collected dataset was used as the input to the PMF model. An optimum solution with four factors was identified: airport with a number mode diameter of 10-15 nm, traffic 1 with a number mode diameter of 25-35 nm, traffic 2 with a number mode diameter of 60-70 nm, and urban background with a number mode diameter of 225 nm. The corresponding mass mode diameters for each of the resolved factors were the same as the number mode diameters. Results indicated that airport has the highest contribution to total PN concentrations (56.9%) even though the sampling site was surrounded by freeways and parking lots, which indicates the huge importance of airport as a tremendous source of ultrafine particles. Traffic 1 and traffic 2 factors with contributions of 30.4% and 10.7%, respectively, were the next major contributors to PN concentrations, followed by urban background factor with a minimal contribution of 2.0% to total PN concentrations. In contrast, PM mass concentrations were dominated by urban background with larger mode diameters (54.6%). The findings of this study will be used in assessing the source-specific toxicity of PN concentrations, and can be used as a tool for decision makers to set emission/ambient standards on PN to better protect human health.

Keywords: Particle number, Amsterdam Airport Schiphol, source apportionment, PMF model, ultrafine particulate matter (UFP)

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Space syntax as support for mitigation of urban mobility colplexity: case study in latin american

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The study of urban mobility is a theme that has evolved with the development of the inventory and its cartography (mapping) to the application of geographic information systems in Latin America during the last decades.
In terms of its components it is essential to understand the spatiality of urban mobility with the evolution of the territorial system, and thus the aim of this research is to analyze the organization of the territory with the spatiality of urban development in a chronological time. This theme is part of a current perspective of territorial resilience and development at international level to understand the evolution of spatial planning and its urban landscape. In this context, how space syntax can contribute to improve the planning of urban mobility?

Then, given the relevance of the problem, was defined the study urban area of Bogotá city in Colombia. As methodology is proposed the theory of space syntax in scope to scale municipality and region as a test and innovation in transversal of that technique which is supported with a geographic information system.
The data showed the link between the spatiality of urban mobility in the space of time with the network of the complexity system. As conclusions, the possibility of measuring the efficiency of the urban organization and its major spatial changes in order to allow development of land management policies that will drive better sustainability and mitigation of the urban mobility complexity.

Keywords: Space Syntax, Urban mobility, Urban complexity

*Speaker

Spatial and temporal variations in the performance of indirect drain water heat recovery systems in wastewater treatment plants

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After the use of hot water in several commercial, industrial and domestic applications and appliances, drain and waste water often contains a significant amount of embedded energy. Different strategies for the recovery of this waste heat can be applied, recovering the heat in upstream locations, where waste water temperatures are high, resulting in a higher energy density, and thus a high efficiency of the recovery system. However due to smaller flows, the total recoverable energy is smaller. For financial feasibility the investment cost must remain low in these cases. A second possibility is to move downstream, where temperatures are lower but flow, and thus recoverable energy, are larger. In these cases, larger investments can be justified.
This study investigates waste water heat recovery at wastewater treatment plants (WWTPs), investigating their feasibility considering the proximity of WWTPs to heat consumption demands, and the evolution of the available heat over the different seasons in one year. The available heat is determined by the wastewater temperature and flow.
Introducing both a spatial and temporal dimension, this analysis aims to not only identify WWTPs with large heat recovery potential, but also to allow for the identification of periods when the security of heat supply from the WWTPs could be under stress, and to identify consumers of the recovered heat. It also shows locations where the recovered heat can be consumed by a single supplier, simplifying the design of the system. It also shows where potential for district heating networks exists, using WWTPs as (one of the) heat sources for the network.

Keywords: Drain Water Heat Recovery, Waste water treatment plants, Wastewater and heat interaction, temporal and spatial feasibility, Heat pump systems

*Speaker

Spatial variability and frequency of surface heat island in a small Brazilian city with continental tropical climate

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Surface temperature is a decisive phenomenon to the formation of urban climate. Temperatures are naturally high in tropical environments under continental influence. In Brazil, the problem of high temperature is intensified by the urbanization process, which is characterized by vegetation removal, concentration of buildings, and the use of building materials unfavorable to the climate in the tropics. Therefore, in this article, we analyze the spatial variability and the frequency of the surface temperature during the dry and rainy seasons in Penápolis, a small population city in the countryside of São Paulo State. The analysis was performed by establishing the relationship between the normalized vegetation index (NDVI) and the surface temperature in order to contribute to urban planning. The adopted procedure used 10 images from satellite Landsat 8, Operational Land Imager (OLI) and Thermal Infrared Sensor (TIRS) for the year 2018. The results showed that the surface urban heat island has significant seasonal variations that are directly associated with the rainfall regime of the region. The intensity was not elevated during the year, and the highest magnitudes occurred in the summer, which is a hot and rainy season. In the winter, being the dry season, the magnitudes were lower. The frequency of heat island intensity taken from 10 points of the images is related to construction density, building materials, and the vegetation cover index. These results are important to understanding the generation of heat in the city and proposing planning measures for the use and coverage of urban land.

Keywords: Urban climate, Surface heat island, Vegetation, Land use, Landsat 8

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Strategies to improve urban and landscape condition on communities affected by and periodical floods linked to climate change

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Based on the contingency of unprecedented episodes of risk affecting Latin in a short period of time, Observatorio Panamericano de Paisaje, Territorio y Arquitectura (OPPTA) developed a concurrent methodology of research, proposals and action to approach infrastructural, architectural, landscape and social actions regarding urban sustainability and resilience. The logic behind is to identify patterns, concurrencies and differences at the technical, infrastructural and political (governance) level, to effectively face the Climate Change's effects on five case studies along Latin America. Amongst them, are going to be presented the researches and proposals developed for two cities affected by constant and periodical floods: San Cristobal (Canal del Dique Region, Colombia) and Puerto Saavedra (Araucania Region, Chile).
Canal del Dique Region is affected by La Nina phenomena that periodically and recurrently overflow Magdalena River and Canal del Dique channels, creating a massive flood altering the habitability of the entire territory. In recent years the problem has increased due to the intensity of the phenomena. The community, strongly linked to site, is open to improve old building techniques used by their ancestor together with urban and landscape intervention, in the development of a resilient community.
Puerto Saavedra experiences constant risks linked to periodical floods and potential Tsunamis, which have already destroyed the locality twice. The actions are focus on the improvement of infrastructures and the development of a resilient urban space to mitigate risks and guarantee the connectivity of disconnected urban fabrics. All in order to re-establishing social and economic activities to prevent the deterioration and abandonment of the city due to risk.

Keywords: Resilience, urban sustainability, climate change, risk, flood

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Strategies to mitigate the urban heat islands in the context of climate change

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Urban areas are currently facing multiple challenges. Future climate change is expected to translate into more and longer heat waves in the future. Additionally, new urban planning laws in Switzerland calls for a densification of urban areas, to limit their growth and to preserve the natural and agricultural spaces outside of urban areas. Efficient planning strategies are thus required to reduce both the building energy consumption while at the same time improving the outdoor comfort of the inhabitants. To evaluate the performance of these strategies, coupled models are needed to evaluate the impact from the building to the regional scale. In this study, we will thus make use of a methodology to couple mesoscale models to the building scale. The simulations are set to be centred over Lausanne and the models is run in a two-way coupling. A first simulation is run over the summer of 2003 to evaluate the computations. The temperature and wind speed are compared with meteorological stations located in the domain. The results obtained from the simulation are in good agreement with the monitored data. Finally, multiple urban planning scenarios are run to evaluate the impact of future land change (densified scenario, vegetated scenario and albedo change). The impact on the urban temperatures are assessed and an estimation of the impact of the temperature changed on the energy consumption of the building in a district in Lausanne is conducted. It is shown that the increase in temperature will significantly affect the cooling demand in particular the peak demand is expected to increase by over 15% in the future.

Keywords: Adaptation, Building energy demand, Climate Change, Mitigation, Urban heat island

*Speaker

Study of Sulfate removal using nanofiltration compared to biological method to access sustainable water resources in urban areas, A case study of Najaf Abad in Iran

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Abstract

The rapid *increase* of human *population* accompanied by industrial growth and rising standards of living have resulted in heavy demand for water across all sectors. So, treated wastewater could be an unlimited and stable alternative for water supply to use in irrigation and industry and plays an important role to achieve sustainable urban development. *Nowadays, finding an appropriate wastewater treatment & reuse method is one of the important issues which many research has been* conducted in this field. *The aim of this study was to compare the treated wastewater (industerial) by biological method compared to the nanofiltration method and determine* more suitable method for industrial *wastewater treatment. Thus, BOD5 of industrial wastewater was used for this purpose and* the appropriate method was chosen by calculating the percentage and percentage of this parameter as well as analyzing the significance of the difference between the results of the two methods used by SPSS software. The nanofilter used in the study was made from carbon-neon and the pressure of its desired performance has been 10 times and the diameter of the stomata is 50-80 nm. Also, all experiments were performed weekly for a period of 11 weeks in Najaf Abad wastewater treatment plant. The results showed that the mean BOD5 = 6.87 mg / L measured by nanofiltration method while the mean BOD5 is 9.91 mg / L by biological method. According to the results, the nanofiltration method is more effective than the biological method. Nanofiltration method is suggested to prove the superiority and other water quality parameters are also tested.

Keywords: Nanofiltration, Biological, Treatment, Industrial Wastewater, Sustainable Development

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Study of sulfate removal using Nanofiltration compared to biological method to access sustainable water resources in urban areas, A case study of Najaf Abad in Iran

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Abstract

Population growth and the need for sustainable urban development as well as lack of water resources due to the position of Iran in the arid and semi-arid zone and the occurrence of recent drought has seriously raised the importance of water scarcity. Nowadays, unconventional water resources are considered as one of the possible solutions to provide water supplies. Among different resources of unconventional waters, the use of wastewater as a sustainable resource for water scarcity management is considered as a strategic strategy. The aim of this study was to compare biological treatment method and nanofiltration method to remove sulfate from industrial wastewater.Thus, industrial wastewater of Najaf Abad treatment plant was used for this purpose and the experiments were carried out for 11 weeks and 11 replications. The appropriate method was chosen by calculating the removal percentage of various parameters and SPSS software was used to analyze the significance of the difference between the results of the two methods. According to the results, the percentage of sulfate removal in all experiments in the nanofiltration system was higher than the biological system and nanofiltration method is more reliable to remove sulfate. So, nanofilter system would be a good alternative for the biological system to reduce and remove sulfate in industrial wastewater.

Keywords: Keywords: Nano filtration, Sulfate Removal, biological treatment method, Sustainable Development

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Study of the Ribeirão João Leite bowl (Go, Brazil): a morphometric analysis and human actions

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This research consists of the application of geoprocessing and remote sensing techniques to the analysis of the Ribeirão João Leite watershed, located in the Brasília-Goiânia axis. In this study, environmental impacts in the BHRJL were recognized and susceptibility to potential laminar erosion were identified through the application of geotechnology, morphometric techniques, and field work. The methodology consisted of generating a Digital Terrain Model, using Alos-fbs Palsar radar images with a spatial resolution of 12.5 meters, which allowed the modeling of the relief of the watershed. The images generated information plans with terrain slopes plus a land cover and land use map using OLI sensor images. The images were generated aboard the Landsat 8 platform, which, by means of spectral fusion, allowed a panchromatic band with a resolution of 15 meters. We used the work carried out by Oliveira (1996), who elaborated the soil mapping of Ribeirão João Leite watershed in the 1:50.000 scale. Soil classes, as well as their characteristics, were used in the present study as references for the refinement of the final version of the soil map. Among the models used to simulate laminar erosion, the methodology proposed by Salomão (1992) was used. It was also determined that conservation practices, integral of this model, the erodibility of the soils and the set of ramp length and degree of slope. With maps of the natural and anthropomorphic elements, it was possible to provide elements for future works seeking guidelines on land use and occupation practices, making it possible to identify the impacts of anthropomorphic interference on BHRJL.

Keywords: Susceptibility and Potentiality to laminar erosion, Soil Use and Land Use, Geographic Information System, Watershed and Anthropogenic actions

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Study on method for synthetic precipitation data for ungauged sites in city using quantitative precipitation model

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A method was developed to estimate a synthetic precipitation record for ungauged sites using irregular coarse observations. The proposed synthetic precipitation data were produced with ultra-high hourly resolution on a regular 1×1 km grid. The proposed method was used to analyze selected real-time observational data collected in South Korea from 2010 to the end of 2014. The observed precipitation data were measured using the Automatic Weather System and Automated Synoptic Observing System. The principal objective of the proposed method was to estimate the additional effects of orography on precipitation introduced by ultra-high-resolution (1×1 km) topography provided by a digital elevation model. The Global Forecast System analysis of the National Centers for Environmental Prediction was used for the upper atmospheric conditions, necessary for estimating the orographic effects. Precipitation data from 48 of the more than 600 observation sites used in the study, which matched the grid points of the synthetic data, were not included in the synthetic data estimation. Instead, these data were used to evaluate the proposed method by direct comparison with the real observations at these sites. Overall, the correlation coefficient of the synthetic precipitation data was > 0.7 for 43 of the 48 test stations and the RMSE was

Keywords: synthetic precipitation ultra, high resolution ungauged QPM

*Speaker

Studying the relationships and spatio-temporal distribution of urban heat and green spaces using remote sensing data

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In this study, the land surface temperature (LST) and normalized difference vegetation index (NDVI) were derived from Landsat images of the city of Yerevan (Armenia) for the period of 1984-2017 and analyzed for the spatio-temporal distribution of changes in LST and NDVI and their relationships. The results show that there is significant increase in LST, particularly during last 10 years. Simultaneously, significant decrease in vegetated areas was observed (approximately 20%). In order to study the relationships between LST and NDVI the testing site was selected, were the impact of anthropogenic transformations are strongly expressed (urban park was transformed into built-up area). The significant negative correlation (r) was observed between quantitative (vegetated area) and qualitative (mean NDVI) changes of vegetation cover and LST (-0.84, p=0.001 and -0.78, p = 0.005, respectively).

Keywords: land surface temperature, NDVI, urban heat, relationship, remote sensing

*Speaker

Subjective well-being in a European city: The case of Strasbourg metropolis

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Based on a recent survey on well-being in the Strasbourg metropolitan area (Eurométropole de Strasbourg) in 2017, we investigate the determinants of individual subjective well-being. The latter is defined in several ways, opportunity to laugh, satisfaction of social life and individual sentiment of well-being. Beyond socioeconomic determinants, a special attention is paid on the specicities of the Eurometropole such as security condition and public services. It is observed that income exerts a signifcant effect on subjective well-being only for individuals having a low income while public services in culture and sport impact significantly and positively individual well-being.

Keywords: Subjective well, being, satisfaction, Strasbourg metropolis, public services

*Speaker

Sustainable public lighting for informal settlements

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Lighting research in several informal settlements in Colombia will be presented. It will be shown that the public lighting in those settlements tends to be characterised by fragmentation, which means an inconsistent distribution of light due to missing luminaires or due to luminaires provided by the authorities that fail to adapt to the informal context: In-between a formal lighting network, lighting gaps emerge. It will be shown, that such gaps are often filled with 'informal' self-built luminaires by the residents that do not comply with product safety and sustainability standards. Several of such self-built luminaires will be presented and their product quality as well as the builder's intentions discussed. Furthermore, it will be shown that lighting provided by the authorities tends to conflict over time with the vertical densification processes in informal settlements, often resulting in luminaires that become enclosed by the informal architecture. It will be shown that there are two aspects of sustainability that require improvement: On the one hand, both the formal and informal lighting systems tend to result in high degrees of light pollution. On the other hand, lighting systems are required to address settlement development phases of several decades in order to be considered as sustainable. It will be concluded by arguing that state-of-the-art lighting technology, such as 'smart lighting', constitutes the key to policies that are able to tackle the current sustainability issues of public lighting in informal settlements effectively.

Keywords: informal settlement, lighting, sustainability, technology, policy

*Speaker

Sustainable waterscape driven by Living Lab and polycentric governance

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River are worldwide experiencing a socio-ecological crisis. Urban rivers are particularly impacted by human activities and intensive exploitation of the related ecosystem-services. According to the concept of socio-ecological system, self-organizing stakeholder will drive the system evolution to achieve long-term resilience. This communication will explore in the case of the Isar River how polycentric governance and living lab activities driven nature-based solutions as urban river restoration. The Isar modifications performed since the 19th century resulted in the ecological degradation of aquatic and terrestrial habitats, the decrease of the recreational potential and an insufficient flood protection. In response to this, the Isar-Plan (2000-2011) enable the restoration of 8kilometer urban river stretch. It is one of the world's most famous urban river restoration projects and is recognized as a good practice to follow because it applied innovative socio-ecological approach and forerunner participation process. This contribution give an overview of the preliminary results of an ex-post-analysis of the Isar-Plan planning process. The study is based on stakeholder interviews and a non-systematic literature reviews. The contribution will present the driving forces of the governance and stakeholder arrangement set-up Isar-Plan and compare the practice with existing conceptual frameworks. The results highlight how polycentricity facilitated trust, learning, and the co-design of a resilient urban landscape.

Keywords: Resilient society, participative process, socio, ecological restoration, urban study

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The coupling between in-situ measurement and simulation of indoor air quality using machine learning

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We spend 90% of our time in enclosed spaces. These environments often have poor air quality. This quality is monitored mainly by chemical measurements which do not give an overall view of air pollution. It is in this context that the INCA-Indoor model has been developed to interpret the concentration measurements of gazeous and particulate polluants and to predict the behaviour of pollutants in different scenarios. It is a model of indoor air quality which integrates the different physicochemical processes occurring in the building (chemical mechanisms, deposition, sorption, ventilation ...). It allow today to conduct the analysis of indoor air quality, even supports projects of building designs The emergence of reliable sensors with affordable prices allows to acquire in-situ data in the building. The differences observed between the simulations and the measurements would be a way to detect a malfunction in the simulation or to identify a change in the use of the building and the need to update the input data. IAQ sensors can correct some input parameters of the model. This combination of the models and the sensor must be intelligible and efficient. Thus, the machine learning is an algorithmic method that allows the use by the model of data acquired by the sensors.

Keywords: Indoor Air Quality, Simulation, Building, Sensors, Machine Learning

*Speaker

The influence of pavement colour on urban canyons temperature: A study through a reduced scale model in small-sized cities

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The urban climate is direct influenced due to the growth of the cities. Through the infrastructure expansion, the road network becomes a constituent part of this scenario and proportionally responsible for the interferences in the local microclimate. In this way, urban layout and morphology should promote ventilation, shading and temperature control of the built environment in order to reduce climatic effects, such as the urban heat islands (UHI). Thus, this research seeks to analyze the effect of pavement colour on the temperature reduction of urban canyons, through a reduced scale model. The methodology was based on a study in an experimental field, which on a model built in 1:15 scale, with two urban configurations and four pavement colours, in order to compare the temperature difference in each scenario. The material taken as reference was the flexible asphalt pavement, in relation to the interlocking semi-permeable concrete floor, in the natural, red and graphite colour. The choice of asphalt material as the reference is justified by its wide use in built urban space. Thermocouples were installed and they made temperature data acquisition of paved surfaces and the variation of air temperature, in different urban canyon configuration. The results of surface temperature show that the variation in two urban morphologies (H/W = 0.66 and 0.33) is in average 1.62 ◦C on asphalt pavement, and the scenario with the lowest H/W ratio was recorded as higher surface temperatures. Finally, the expectation when proposing a colour change and physical properties of the pavement is to reduce the temperature of the urban environment, and that this intervention contributes in UHI mitigation.

Keywords: Surface temperature, Urban climate, Urban pavement, Microclimate, Urban Heat Island.

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The perceived restorative qualities of botanical gardens in the urban context

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Introduction: Botanical gardens carry out multiple functions in urban spaces, such as contributing to biodiversity and promoting positive changes in human health. In particular, exposure to botanical gardens can encourage perceived restorativeness in humans, defined as the perception of regeneration and recovery of mental energy lost in daily activities. **Objectives**: The aims of the present study were twofold: to assess the perceived restorative quality of botanical gardens by exploring the links among perceived restorativeness, perceived psychological and physical benefits, and self-reported wellbeing; and to understand whether the relationship between perceived restorativeness and self-reported wellbeing varies across participants as a function of different socio-demographic characteristics, such as gender, age, or household composition. **Methods**: 127 visitors of four different botanical gardens, located in cities in the south (Bari), the center (Rome and Florence) and the north (Padua) of Italy, completed a questionnaire on perceived restorative experience and the perceived physical and psychological benefits derived from the visits. **Results**: As expected, a bootstrapping mediation model supported the idea that perceived restorativeness of botanical gardens significantly predicts visitors' subjective wellbeing, both directly and indirectly through perceived physical and psychological benefits of the visit. A moderation model also revealed that the relationship between restorativeness and wellbeing varies across respondents with different socio-demographic characteristics, being stronger for singles as compared to couples, with and without children. **Conclusions**: Study results confirm the physical and psychological benefits derived from exposition to botanical gardens. In the urban environment botanical gardens are an excellent source of physical and psychological wellbeing for residents, both in terms of health and the promotion of a positive human-nature relationship.

Keywords: botanical garden, perceived restorativeness, physical benefits, psychological benefits, subjective wellbeing

*Speaker

The refurbishment of abandoned industrial areas with adaptive re-use strategies: analysis of decision making models and design criteria.

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The preservation and reuse of abandoned industrial buildings play an important role in the process of urban regeneration. Adaptive re-use is a sustainable strategy that promotes the enhancement of urban planning and activates projects for the refurbishment of unused areas. The existing multicriteria analysis models allow the development of adaptive re-use strategies, identifying the variables influencing the steps of the building reconversion. The article deepens the topic of adaptive re-use, through the study of decision support systems for the recovery of industrial areas. The objective of the research is to identify decision making choices that take into account the social, functional and architectural risks conditioning the solidity of the city-environment-society system. The proposed model considers the factors involved in the building transformation process, highlighting the complexity of the management, control and implementation phases of the same. The definition of adaptive re-use interventions is done by multicriteria analyses based on the weight of each component during the building transformation. The proposed research shows that the identified microscopes allow to synthesize the procedural apparatus, guaranteeing the optimal management of case-by-case decisions.

Keywords: Adaptive reuse, Decision making, Sustainable architecture, Design criteria

*Speaker

The risk of water, energy, and food nexus under regional metabolism for multi-sector city

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The Urban Nexus system creates another risk characteristic of resource metabolism. Urban metabolism has complex effects from multi-levels and multi-sectors resulted from the changes socio-economic. It is crucial to implement effective urban governance; in particularly, resource metabolism creates a new nexus risk by dramatic growth in urban areas. The resource metabolism associated with the water, energy, and food consumption in urban scale that drives the intensity in resource metabolism. Therefore, this study estimates the FEW intensity of nexus and demand side in material flow analysis to identify the nexus risk by organizing into four categories of resource metabolism, including supply side, process side, demand side, and final sink. In study, these results also indicate that a higher demand risk would lead to a higher nexus risk. This research compared different characteristics for a small island dominated by tourism (Kinmen Island) and a multi-sector city dominated by increasing economic activity (Taichung City). The resource intensity (food, energy, and water) on the demand side and resource service systems were evaluated to identify the nexus intensity and risk for FEW nexus at the urban scale. According to the nexus risk at an urban scale, this study determined that constraints for resource service systems are complex, and higher risk suggests that resource consumption intensity is higher in that particular nexus process and demand sector. Water consumption cause loads on resource metabolism in a multi-sector city due to the main driving factor the consumption for food and energy. To avoid excessive loads on resource metabolism, sustainable resource management should implement trade-off strategies after analyzing the resource metabolism for urban nexus.

Keywords: Nexus risk, FEW, Resource metabolism, Multi, sector city

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The role of energy in the formation of spatial structure based on urban morphology (Case Study: Berlin and Tehran cities)

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Recently, energy issues in urban studies have become more important. The main aim of the present study is to investigate and extract the optimal energy model in urban morphology, which is an applied, structural and analytical-descriptive research. In this research, five types of construction configuration of the two cities of Berlin and Tehran, according to type Climate and energy considerations were compared and simulated in a comparative comparison. As the main result of the study, the main relations are studied and ultimately raised in the morphology context. Specifically, it can be argued that the specimen of the typo-morphology of each city has a different behavior in this amount of heat energy and higher density compositions have better energy efficiency. The building's average height, building density, and surface-to-volume ratio is a good criterion for heat energy efficiency, which correlate well with the thermal energy demand, which can eventually be the data relationships and the correlations between the variables of the typo-morphology of demand and energy consumption as the main results of the presentation. Due to the type of urban fabric in Tehran and Berlin, policy making in the type of spatial configuration and urban texture resulting from the work of urban planners prioritizes the importance of focusing on the element of energy, which highlights its major importance in metropolitan macroeconomics.

Keywords: Energy, Urban Morphology, typo, morphology, Building Type, Heat Energy

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The role of green infrastructure in microclimate enhancement: Evidence of Abu Dhabi neighborhoods

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The main focus of this research is to find ways in which to enhance the microclimate and improve the outdoor air temperature of Abu Dhabi's neighbourhoods by reducing it through a change in landscape. Providing shaded areas in the urban environment and efficient design of landscape elements could potentially reduce air temperature in hot-humid climates (S. K. Syed Othman Thani, 2013). The overall research question will focus on the relationship between the design and utlization of green infrastructure (native landscapes) in neighbourhoods and the local microclimate conditions.

By setting a quantitative baseline, the study assesses and compares landscape characteristics and microclimate performance of existing typologies in Abu Dhabi. This eventually helps model the use of different landscape design strategies, to reduce ambient temperature. By using different native plantation types, the opportunity for enhancing air temperature can increase through utilizing passive cooling effects, appropriate landscaping strategies, and shading efficiency. The study areas mainly focus on neighbourhood side-walks and street canyons to develop design strategies that provide shades for pedestrians and promote walkability.

The study in particular, attempts to answer the following questions:

What are the physical characteristics of Abu Dhabi's single family neighbourhoods?

What are the form and type of existing landscaping strategies in Abu Dhabi's neighbourhoods?

What is the impact of using different native plants in enhancing the microclimate of Abu Dhabi's neighbourhoods?

Whatare some policies and design interventions that promote functional and efficient landscape design?

Keywords: Urban form, microclimate, Abu Dhabi, Envi, Met, native landscape, urban climate

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†Speaker

The urban metabolism model as governing framework for understanding the urban heat island phenomenon

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The joint action of climate change, heatwaves and the urban heat island phenomenon (UHI) is responsible for the modification of urban climates. As we approach even the lowest of predicted climate change warming scenarios, 1.50C global warming, the effects of UHIs and heatwaves in cities is predicted to significantly worsen. As heatwaves become more common and intense, our need to understand UHIs as localised urban phenomena and how they affect the full array of social, economic and environmental systems in cities becomes ever more important.
However, most UHI studies focus on only a limited set of parameters, typically from a single or limited set of disciplines. This lack of focus on complex systems leaves our ability to understand and adapt to and/or mitigate UHIs severely limited. To address this problem, this study will focus on the use of the urban metabolism model (UM) to represent how the urban heat island phenomenon interplays with urban systems. This representation simplifies the interplay processes between the UHI and the urban environment and helps to define the key parameters linking the UHI phenomenon and the socio-economic system to facilitate its integration into the decision-making process.
The representation of UHI through the UM framework also helps to redefine the urban phenomenon under the lens of system thinking. It shows that the feedback loops generated bythe urban systems' externalities and outputs are the causes of UHI. Meanwhile the increase in air temperature from UHIs impacts the urban system triggering social and environmental impacts. Only by understanding these complex multifaceted cross-system feedbacks can UHIs truly be understood and (see submitted file).

Keywords: Urban metabolism, urban heat island phenomenon, governance, urban systems, systems thinking

*Speaker

Thermal efficiency neighbourhoods design applying performance-based planning approach: the case of Mendoza-Argentina.

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In the last decades, a set of urban planning guidelines have been develop in order to foster sustainable cities. Performance-Based Planning (PBP) is an efficient and effective decision making tool to attain this goal. The implementation of the PBP approach could be suitable to reduce the energetic and environmental impacts of the built areas. In relation to this, it is known that a climate-sensitive built form is a feasible strategy to reduce and mitigate the urban heat island (UHI). The aim of this paper is to analyse and identify the potentialities of PBP approach in order to improve thermal behaviour at neighbourhood scale in arid cities. For this reason a series of urban indicators were defined to determine a range of values to gets optimal thermal conditions. Methodologically, this study was made by twenty-four CFD's simulations, previously adjusted with microclimatic data measured in Mendoza-Argentina. Results show that an adequate combination of layout, street dimensions, block proportions and their orientations, added to an appropriate urban trees configuration and the implementation of cool materials, can improve the neighbourhood microclimate by reducing the air temperature up to 1.6°C. This findings highlight that a neighbourhood design where the planning goals are align with the particularly features of the city, can reaches sustainable built environments and improve dwellers life quality.

Keywords: Performance, based planning, Urban heat island, Climate, sensitive built form

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Trees and efficient green façades for adaptation to climate change in tropical cities of Brazil

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Presence of green infrastructure as trees and green walls in open areas bring well-being and thermal comfort in outdoor environments, especially in cities with high density construction. This work aims to present a methodology to make-decision in urban planning based on greening tropical cities. The methodology consists in: a) quantify the influence of trees and green façades on microclimate by field measurements in open areas, b) select urban canyon with different aspect ratio (H/W), c) simulate future scenarios: with trees, with green façades, with trees and green façades by using softwares such as RayMan and EnviMet. Thermal comfort was evaluated through PET (Physiologically Equivalent Temperature).
Field experiments to evaluate the influence of isolated and clusters of trees were done from 2007 to 2010 and the efficiency of green walls in prototypes was studied from 2010 to 2015. It was selected the species *C. pluviosa F.* that presents the best possibility in terms of PET since its value is reduced between 12 and 16C for individual trees. In green façades, it was used *T. granfiflora R.* that shows 2.90C difference in the indoor temperature for a prototype arrangement with vine as compared to one without creeper.
Simulation results show that East-West orientation and H/W ratio between 2.0 and 3.0 can improve thermal comfort. H/W ratio above 3.0 requires additional measures such as planting vertical gardens to control the heat fluxes in the street canyon. **These tools can be used to planning urban areas so to improve outdoor thermal comfort. The method can be applied by architects and urban planners interested in reducing UHI impacts.**

Keywords: Green Infrastructure, Human Thermal Comfort in Urban areas, EnviMet, PET, Green façades

*Speaker

Urban innovation challenges: smart urban agriculture towards the sustainable transformation of industrial parks in China

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Industrial parks in China are experiencing a dramatic process of urban transformation. The changing global economic-political conditions have forced Chinese industrial parks to rethink their spatial planning under the vision of sustainable development. The primary aim of this research is to explore a sustainable urbanisation model for industrial parks by introducing the concept of smart urban agriculture, which involves technological innovations to reuse urban resources for various types of agriculture productions. The research employs a case study of Suzhou Industrial Park that is widely acknowledged as one of the successful industrial park developments in China. The essence of the case study is an attempt to conceptualise a series of smart urban agriculture models at different geospatial scales, and examine the challenges in the process of urban innovation development. The study has reviewed global case studies, and conducted policy analysis from national to local levels. It also investigates the market positioning drawn from a total of 350 comprehensive questionnaires. A number of interviews with diverse stakeholders has been conducted to provide deeper insights into the implementation feasibility for a particular industrial park. The research outcomes show a positive influence of smart urban agriculture projects towards the sustainable regeneration of the industrial park. However, the findings of this study also emphasise the importance of sound stakeholder analysis at the earlier stage of innovation development. This is because many urban innovations often intend to bridge the gap between different interests and responsibilities of multiple stakeholders, but a lack of understanding on issues and conflicts between diverse interests might be significant limitation on its achievement.

Keywords: Urban agriculture, Smart cities, Regeneration, Urban innovation, Industrial park

*Speaker

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Urban spectacles: Urban festivals, urban social Space and the transformations of the urban form

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In this era of mass urbanisation, cities in India are transforming wherein temporality and informality have become significant urban characteristics. As such, Indian cities can no longer be perceived as a static entity; rather, they are morphing into urban spaces which are more fluid and malleable. Although informality and temporality are some of the pervasive urban phenomenon in the developing cities such as India, current planners hardly incorporate them while planning. As opposed to the western planning practices adopted by planners, cities in India need to break these hegemonies and integrate their unique socio-cultural contexts for more inclusive cities. In India, this particular 'Kinetic' aspect of cities is often visible through the festivals celebrated in their urban Fabric. These festivals which appear only for some fleeting time in the urban landscape, however, holds the power to transform the everyday spaces into spaces of social interaction, lending a unique identity to the city and their presence in the everyday landscape weaves itself through the urban fabric of cities. The central concern of this paper is to reiterate the need of understanding built environments in terms of their spatial configuration to gain an insight on culture specific human preferences about space proxemics. This paper will address how urban festivals can facilitate the urban social space through social interactions and stimulate local identity by participant observation of visitor behavior and festival spaces of various festivals in Guwahati, India. The analysis of the morphology of the city was undertaken through Space Syntax to gain an insight into how socio-cultural phenomenon influence the formation of the urban fabric.

Keywords: Urban Spectacle, Urban Festivals, Urban Social Space, Urban Form, Space Syntax

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Urban transformation and heat island: Potential of urban design alternatives to mitigate the effects of urban overheating in Austrian cities

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Ongoing urbanization worldwide has critically affected the quality of urban life. This development poses great challenges for cities due to the growing demand for more living space and supporting infrastructure, resulting in environmental pollution, higher anthropogenic waste heat and poor outdoor thermal comfort. To accommodate this rapid expansion of urban areas, the city authorities need to adopt a more climate-sensitive approach to urban transformation. In this regard, the present contribution investigates the potential of specific planning and adaptation strategies to attenuate the urban overheating for distinct urban locations in Vienna and Linz, Austria, over two distinct summer periods (a typical and a hot summer day). For this purpose, we applied the parametric modelling environment Rhinoceros 3D and a number of built-in algorithms in the Rhino's plug-in Grasshopper for dynamic simulation of urban microclimate. The results were compared based on the mean radiant temperature (MRT) averaged over a 24-hour cycle and differentiated into day- and night-time shares. The results reveal a notable potential of selected greening measures to positively influence outdoor thermal conditions. The effectiveness of these measures, however, seem to be time-dependent, whereby a more pronounced cooling effect was noted during the daytime, namely attributed to the solar shielding effect.

Keywords: Urban Climate, Urban Heat Island, Climate Modelling, Adaptation Strategies, Urban Greening

*Speaker

Urban transport policy for Electrification in France

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In order to elucidate trend and social background of Electrification of Urban transport in Europe, this research analyse urban mobility plan and do a field survey about electrification policy of public transport and urban logistics system in five French cities.
The purpose of this research is to show the trends, institutional and social background of Electrification of Urban transport. European countries have recently revised the legislation of transport for environmental sustainability after the EU creation of new regulation (Dir. 94/2014). For this presentation, we will focus on France that has developed an advanced legal system on Sustainable Transport and urban mobility planning system.

We will present our empirical research on France: intuitional research; Empirical research and case study of 5 city cases; Lyon, La Rochelle, Tours, Valenciennes, Aix en Provence. This research analyse each electrification projects and social background and planning system. We will elucidate the concerns with institutional and planning aspect and implementation of urban transport Electrification project. This research focuses on two type of electrification projects, electrification of bus and urban logistic system.
Electrification on Public Transport, four cities have projects and plans. But in the case of Normal size electric bus, it appeared to be at the stage of demonstration experiment. Only Lyon has developed Trolleybus system. Majority of these PDU have ambitions about urban freight, but the application is very weak. We conclude that why the logistics seem to be the hardest public policy is to need a long-term policy to change comportments and habits, and why public transport electrification advanced slowly is difficulty to match between planning and technology.

Keywords: PDU (Urban Mobility Plan), Electric Bus, Urban logistics system, Electrification of transport, Sustainable urban transport

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Urbanization-driven vegetation cover change and influence on climate: The case of Addis Ababa, Ethiopia

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Detection of vegetation cover change is crucial in identifying its impact on urban scale climate and suggesting plausible interventions for sustainable land use management. This study utilized Land-sat images to generate land use/land cover change map for Addis Ababa. The normalized differencing vegetation index (NDVI) was used to detect major changes in vegetation cover that occurred between 1986 and 2011 due to changes inland use and land cover. Moreover, a statistical downscaling model (SDSM) was employed to investigate the occurrence of urban heat island (UHI) in the city. The study found out that the built-up areas of the city have increased by 121.88 km2 during the last 25 years. The NDVI images show considerable decline in vegetation cover that have occurred during the same period. Temperatures in the central parts o the city (both commercial and residential sectors) are found to be warmer than adjoining areas. This shows the impact of urbanization on urban climate clearly. The population density considerably influences the minimum temperature change. Future urban climate change projection of urban heat island under emission pathway of A2 and B2 scenario shows that, the nocturnal UHI will be intense in winter or dry season episodes in the city. Under A2 scenario the highest urban warming will occur during October to December (2.5^{o}C to 3.2 ^{o}C). Also under RCP 8.5 scenario the highest urban warming will occur during October to December (0.5 ^{o}C to 1.0 $\circ$C) in the 2050s and 2080s.

Keywords: : Vegetation cover change, urban scale climate, urban heat island (UHI), normalized differencing vegetation index (NDVI), climate change

*Speaker

Using high resolution air quality models to analyse urban air pollution abatement measures

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Air pollution is a very important problem in urban areas where most of the world population lives and hence, is exposed to it. However, the air flows and dispersion of pollutants are strongly influenced by the size and shape of buildings, streets, squares, urban vegetation, etc yielding to very complex patterns of spatial distribution of atmospheric pollutants with strong concentration gradients even inside a street. The main sources of urban air pollution are mainly vehicle traffic emissions and to less extent, those of house heating in winter. High-resolution air quality models are needed to correctly simulate atmospheric processes in urban areas. The more suitable tool is Computational Fluid Dynamics (CFD) modeling. This contribution shows some examples of studies carried out in Spain illustrating how the high-resolution air quality CFD models can be used to assess urban air pollution abatement measures. The studies are performed for some districts of a large city as Madrid and also for a medium-size town as Pamplona. The effect of measures such as traffic restrictions or banning, use of photocatalytic pavements, urban-street trees, vegetation barriers or the use of different fuels for house heating is described and discussed in this work.

Keywords: Urban air pollution, CFD models, air pollution abatement, vegetation barriers

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Walking the Neighborhood: When alleyways matter in network efficiency

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A major morphological component in neighborhood design is the road network. The efficiency of network systems using streets has been studied widely in the field. However, no particular attention has been given to alleyway systems in assessing network efficiency at neighborhood scale. This study highlights the necessity of studying both streets and alleyways when assessing network connectivity efficiency. Taken Dubai as a case study, the research evaluates eleven neighborhoods with different streets/alleyways systems designed during different growth periods. The research investigates the efficiency of different street layouts and exolores the contribution of alleyways into that efficiency. A Pedestrian Route Directness (PRD) test is used to assess each neighborhood along two scenarios: The first using the street networks only, and the second one using both streets and alleyways.
This study argues that studying the efficiency of network systems for non-motorized travel has to consider not only streets but also alleyway. Alleyways or sikkak infrastructure (sing. sikka), as named in Arabic literature are narrow alleyways between land parcels and are typically present in neighborhood designs. Sikkak has played a major role in shaping road networks around the world. Considered as a pedestrian network system, it has the ability of increasing connectivity and circulation efficiencies. However, studies in the field have neglected the contribution of sikkak infrastructure in improving the connectivity of neighborhoods. Typical urban design literature has focused on streets and urban blocks in understanding connectivity.

This paper studies: (1) What is the efficiency of different streets systems of Dubai's neighborhoods? And (2) what is the contribution of sikkak to the network efficiency of neighborhoods.

Keywords: urban form, urban network analysis, Pedestrian Route Directness, alleyways, street patterns

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†Speaker

Wastewater as a renewable source for urban heat supply - Current situation in Austria

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During the last years heating and cooling has been the biggest energy sector of the European Union (EU). Consequently, to achieve the energy transition climate friendly heating is essential. Most recently, wastewater as a potential source of heat has come more into view, as the current recast of EU's directive on energy from renewables now also acknowledges wastewater as a renewable source of energy due to its thermal energy content.
In Austria heat recovery from wastewater has gained pace in recent years. An analysis of more than 600 wastewater treatment plants revealed a thermal energy potential in the effluents of about 3.000 GWh/a. Case studies proved environmental benefits related to this kind of heat supply and showed its economic feasibility at many different locations. Potential application sites can be found in the urban environment (heating of buildings) as well as in agriculture (heating of greenhouses, stables and aquacultures, drying of herbs and woodchips). Currently, still only four practical implementations are available across the country. However, several cities have already started to assess the available heat potentials in their wastewater systems. In addition, the Austrian Water and Waste Management Association just has installed a working committee to address and coordinate the issue on national level in an interdisciplinary context. It can be expected, that the acknowledgement of wastewater as a renewable source of energy on European level will further foster the activation of this so far still widely unused resource. Wastewater can be part of a diversified heat supply and thus make a valuable contribution to a successful transformation of (urban) energy systems.

Keywords: Heat exchanger, heat pump, energy transition

*Speaker

What nature in the city oftomorrow? Toward a new paradigm about exoticism.

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Two public parks in Strasbourg city have been studied through an interdisciplinary approach aiming at quantifying populations of aquatic turtles and at assessing the knowledge, representations and opinions about them. The naturalist inventory reveals the occurrence of 9 species and subspecies, all exotic (some invasive in the wild), totalling some 100 individuals. Ethnographic interviews with agents and park users reveal a general lack of knowledge of this biodiversity. Although the sensitivity to the turtle is slightly exacerbated, its presence in the parks causes various reactions between curiosity and indignation, 40% of users however telling themselves satisfied. Opinions on the relevance of this exotic presence diverge among agents and users and all discuss the risks of biological invasion in the city. Agents and users propose mainly interventionist or preventive solutions, with a preference for the extraction of individuals to dedicated spaces. The destruction of the species is globally rejected. These operational solutions require a fine and local understanding of the relationships between the citizens and the living, a new paradigm about exotic species that may contribute to a reconnection of citizens with nature, with the potential raise of a new nature in the city to be understood and accepted thanks to the co-construction of positions energized by citizen and scientific knowledge.

Keywords: Urban ecology, multispecific ethnography, exotic species, management, new paradigm

*Speaker

Why have redevelopment attempts not enlivened Riyadh's city centre?

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Urban centres in some of the world's largest cities are facing the challenge of urban decline, a phenomenon which is facilitating significant economic and social changes and also could be caused by these changes, which is part of the dilemma making the issue difficult to resolve. Urban decline can be associated with slowdowns or reductions in population growth as well as increasing shortages of economic opportunities and investment. The central area of Riyadh, the capital of Saudi Arabia, has been suffering from persistent urban decline since the early 1980s, despite several redevelopment projects, some of which were granted international architectural awards. This paper draws on archival material and semi-structured interviews with representatives of key stakeholders to explore why such redevelopment attempts have failed to enliven this area. Analysis reveals eight key factors contributing to the failure to minimise or reverse the process of urban decline, which include a lack of robust evaluation to determine the needs of the deteriorating areas, a lack of meaningful partnerships and coordination among relevant actors, and failure to acquire sustained funding. There is, therefore, a definite need for a regeneration strategy that relies not only on what has been learnt from successful international practices but also on an accurate understanding of what has frustrated previous attempts to address the decline.

Keywords: Redevelopment, Urban decline, City centre, Regeneration

*Speaker

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