Editorial: Special Issue on "Sustainable Green Environment (SGE)"

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The 23rd Edition of Strategic Workshop (SW'20) was held virtually on September 29–30, 2020. During the active 2-day discussion, the thematic focus was Sustainable Green Environment (SGE), presenting the concept, intelligent discoveries, digital technology-oriented business models, proposals for sustainability solutions & global partnership. The Workshop also discussed the current policies, network & security, safety standards, future global strategies, and the project proposal talks in the relevant area.

The theme of the Workshop was "Sustainable Green Environment (SGE)". Besides the scientific presentations on (SGE), the primary purpose of Workshop 2020 is to look for investment in green products and services through the technological platform and digital business models also how to deploy the strategies and look for Support by Governments and other stakeholders for the development of reliable and environmentally sustainable green energy future. We determined that the Sustainable Green Environment claims indispensable strategies to commit to the sustainable economy, especially for the countries where the viable Green idea is broadly deployed. Businesses are shifting internationally to execute their role to minimize environmental damage effects, which is sustainable and breathable. We discussed that the ICT plays an essential part at various gatherings to act upon climate change and balance the ecosystem through technologies that can fight higher temperatures, numerous frequencies of floods and storms, food and water chain, health care system, enterprise, green agriculture. The sustainability of the Green environment includes decisive objectives, such as less use of nonrenewable resources and guarding the delivery of reliable energy supplies, products and services through promotion of green energy, green products, and sustainable development. We also presented new humane questions and perplexities concerning privacy, safety and security issues regarding SGE.

We created a dedicated Panel and Sessions in Sustainable Green Environment (SGE) to serve the above purpose. During that Workshop, we strived to promote healthy competition

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Chosen Topics from the virtual Strategic Workshop, September 29–30, 2020.

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among green technologies use and challenges, big data analytics and the internet of things (IoT), data management plans and security standards, life cycle assessment and recycling with digital business models solutions and international partnerships for a common platform. Many challenges for green sustainability related to the environment, infrastructure, countries policies & practices, UNO goals with operational support and human resources were considered. The Workshop emphasized that the deciding point is to seek a joint agreement among stakeholders, the local population, and business communities to expand clearness in policies, communication, and shared partnerships Internationally.

The Special Issue presents fourteen selected papers that emphasize a wide range of scientific studies in Sustainable Green Environment (SGE) and address the use, interaction and robustness in growing renewable green technologies and their use. Digital innovative business models for Sustainable Green environments and correlated cooperation's and actions are discussed in the following papers.

The First Paper, ''Towards A Sustainable Green Design for Next-Generation Networks'', by Isiaka. A. Alimi, Romilkumar K. Patel, Akeem O. Mufutau, Nelson J. Muga, Armando N. Pinto, Paulo P. Monteiro.

The paper presents the evolution of Information and Communications Technologies that results in excessive energy consumption and carbon dioxide emission in wireless networks.

To offer insights into green communications, this paper reviews various energy efficiency improvement techniques. Authors consider a hybrid mode where main grid power and dynamically harvested green energy from renewable energy sources can be leveraged to support the energy demand of the radio access network. Numerical results show that with resource allocation algorithm exploitation, the energy efficiency can be enhanced. Besides, the amount of grid energy consumption can be considerably minimized, resulting in reducing greenhouse gas emissions in wireless networks.

The Second Paper, ''Leaf Image-based Plant Disease Identification using Color and Texture Features'', by Nisar Ahmad, Hafiz Muhammad Shahzad Asif, Gulshan Saleem, Muhammad Usman Younus, Sadia Anwar, Muhammad Rizwan Anjum.

The paper demonstrates that the Identification of plant disease is usually made through visual inspection or during laboratory examination, which causes delays resulting in yield loss by the time identification is complete. On the other hand, complex deep learning models perform the task with good performance, but due to their large size and high computational requirements, they are not suited to mobile and handheld devices. The paper proposed an approach that contributes to automated Identification of plant diseases which follows a sequence of steps involving pre-processing, segmentation of diseased leaf area, calculation of features based on the Gray-Level Co-occurrence Matrix (GLCM), feature selection and classification. The reported performance measures are better or comparable to the existing approaches and highest among the feature-based methods, presenting them as the most suitable method for automated leaf-based plant disease identification. This prototype system can be extended by adding more disease categories or targeting specific crops or disease categories.

The Third Paper, "Zero-Trust Principles for Legacy Components:12 Rules for Legacy Devices: An Antidote to Chaos", by Geir M. Køien.

In this paper, the author briefly outlines rules for integrating legacy devices into a modern industrial control system. These rules are relatively simple and are mainly derived from "Zero Trust" principles. These rules aim to be pragmatic, and cost-effectiveness trumps completeness.

The Fourth Paper, "Design of Two-Step Random Access Procedure for URLLC Applications", by Chih-Cheng Tseng, Hwang-Cheng Wang, Jieh-Ren Chang, Ling-Han Wang, Fang-Chang Kuo.

The paper highlights that the International Telecommunication Union (ITU) has required that the control plane (C- plane) latency in the fifth generation (5G) ultra-reliable low-latency communication (URLLC)application scenarios should not exceed 20 ms and encouraged technical innovation to reduce it to less than 10 ms further. However, the average C-plane latency in the fourth generation (4G) Long Term Evolution- Advanced (LTE-A) system is 80 ms. Such a high latency is because of the contention-based random-access procedure (RAP) execution. In this paper, the authors simplify the conventional contention-based RAP from 4 to 2 steps. Furthermore, utilization of demodulation reference signal (DMRS) for representing the UE ID and reservation of preambles for URLLC users significantly reduces the proposed 2- step RAP latency. From the perspectives of fixing the number of URLLC users and fixing the number of preambles reserved for URLLC users, simulation results show the percentage of successes for the 2-step RAP is 83.81% and 71.83% higher than that of the 4- step RAP, respectively. Consequently, the 10 ms latency requirement of the 5G URLLC is achieved.

The Fifth Paper, **"**Zehnder based Continuously Tunable Photonic Delay Line", by Zarlish Mushtaq, Muhammad Aslam Uqaili, Abi Waqas, Bhawani Shankar Chowdhry.

The article demonstrates the multi-stage Mach–Zehnder-based integrated continuously tunable optical delay line with an extensive tunability range increases transmission bandwidth and the vast delay-bandwidth product. The proposed non-resonant delay line is based on cascaded lattice Mach–Zehnder. With the proposed generalized, hitless, and simple control strategy, the delay tunability and delay bandwidth product of the delay line increases with the increasing order of the Mach–Zehnder-based stage. This paper has reported the results of delay line up to order 10 using the proposed control strategy. The authors have also shown the comparison between single and multiple stage delay lines over various characteristics.

The Sixth Paper, "Software-Defined Radio enabled Cloud Radio Access Network Implementation using OpenAirInterface", by Akeem O. Mufutau, Fernando P. Guiomar, Arnaldo Oliveira, Paulo P. Monteiro.

In this paper, the authors provide a review of OpenAirInterface (OAI) implementation and present an OAI based cloud RAN (C-RAN) testbed with which mobile fronthaul (MFH) solutions can be tested. Furthermore, the transmission of real-time radio signals over a passive optical network (RFoPON) is also demonstrated. While the successful transmission is achieved, the preliminary results show that the performance of C-RAN is limited by the delay overhead requirement of the passive optical network.

The Seventh Paper, "Bringing Time-Sensitive Networking to Wireless Professional Private Networks Filling gaps and bridging the innovation", by Jetmir Haxhibeqiri, Xianjun Jiao, Esteban Municio, Johann M. Marquez-Barja, Ingrid Moerman, Jeroen Hoebeke.

The paper demonstrates that Private, professional environments such as the manufacturing industry, warehouses, hospitals, airports, among others, increasingly rely on end-to-end connected solutions to support and improve their daily operational performance. To support end-to-end wireless-wired deterministic communication in these private, professional environments, it is necessary to introduce TSN features to the wireless network segments. In this paper, the authors list several considerations that must be addressed before such communication may become a reality, including accurate time synchronization and fine-grained scheduling. Based on these reflections, the authors

present a proof-of-concept realization of a TSN- capable Wi-Fi system, enabling end-to-end wireless-wired deterministic communication.

The Eighth Paper, "Coordinated Multicast/Unicast Transmission on 5G: A Novel Approach for Linear Broadcasting", by David Jim´enez-Soria, Francisco J. Mart´ın-Vega, Mari Carmen Aguayo-Torres.

The paper examines the integration of point-to-point (unicast) communication with cellular multicast/broadcast on 5G technology to extend the current support of linear broadcasting services. The integration relies on the use of mobile edge computing (MEC) at the 5G base station (gNB) to host dynamic adaptive streaming over HTTP (DASH) server that is coordinated with the multicast transmission to complement the broadcast service. The benefits of such an approach have been assessed with simulations in a realistic scenario that considers a vehicle moving across a sparsely populated region in southern Spain. Results reveal that throughput and bitrate playback (reproduction rate) is greatly improved when unicast/multicast integration is enabled since the number of stalling events is reduced significantly.

The Ninth Paper, "Digitalisation on the way to 6G", by Prof. Dr.-Ing. habil. Walter Konhäuser.

The paper presents that an additional concept of energy storage and supply based on energy management concepts must be claimed to integrate renewable energy economically. The political views have changed during the last years, and energy efficiency in buildings is seen as necessary because the final energy consumption produces 35% of greenhouse gas. The deployment of decentralized energy production, e.g., PV- Systems on the roof or CHP's in the cellar is essential to energy turnaround. Another important point highlighted by the paper is to deploy communication network coverage for long-range, low-rate, low-power, low-cost managed services and high-speed links for entertainment services. Enhanced digital networks to making progress by developing new applications like AI- and Blockchain-Technology is desirable.

The Tenth Paper, "Green Multi Business Models" How to measure Green Business Models and Green Business Model Innovation?", by Peter Lindgren, Niclaes Stoyan Hornbæk Knoth, Sukanthan Sureshkumar, Mathilde Fogh Friedrich, Rita Adomaityte.

The paper primarily focuses on the definition of a green business model, tool innovation, and development on measuring green on business models. The article also reports on the innovation of a green business model dashboard enabling measurements of how green a business and its business models are at any time. The research presented relates to a careful review of business model and green business model literature and practice. The article aims to achieve a greater understanding of how green business model innovation and development occur and to take Green Business Model Innovation and research into the next step of business model and advanced wireless technologies innovating, offering future research directions.

The Eleventh Paper, "Improving VLC Data rate and Link Range using Commercial Electronic Components", by Talha Kaim Khani, Zarlish Mushtaq1, Abi Waqas, Bhawani Shankar Chowdhry, Muhammad Aslam Uqaili.

The main idea of this research article is to set up a VLC link using standard commercially available LEDs to integrate lightning and communication to reduce cost and achieve high data rate and long-range communication. The work uses Red, White and Yellow

LEDs at the transmitter as sources with two different LED drivers to drive LED to transmit binary data 1's and 0's. At receiver BPW34,S1227-66BQ and NRC-815 photodiodes are used to receive data based on cost and minimum response time. In this work, the authors tested different combinations of an electronic component, and results are compared in terms of frequencies versus intensity and rise time to achieve a high data rate and long-range communication.

The Twelfth Paper, "6G and the UN SDGs – Where is the connection?", by Marja Matinmikko-Blue.

The paper continues from traditionally green communications and energy efficiency considerations in wireless communications to establishing a close connection between 6G and the triple bottom line of economic sustainability, societal sustainability, and environmental sustainability. The paper outlines open research challenges for sustainable 6G development and provide a set of research questions to encourage guide, especially the researchers and engineers in the wireless and mobile communications community, to address to realize a sustainable future.

The Thirteenth Paper, "6G Networks for Next Generation of Digital TV byeond 2030", by Paulo Sergio Rufino Henrique, Ramjee Prasad.

The author proposes a novel 6G QoS over the future 6G wireless architecture to offer excellent Quality of Service (QoS) for the next generation of digital TV beyond 2030. The creation of the Over The Top (OTT) content platforms based on Cloud Services followed by its commercial video consumption model, offering flexibility for subscribers such as n Video on Demand (VoD). Besides the new business model created, the network infrastructure and wireless technologies also permitted the streaming of high-quality TV and film formats such as High Definition (HDTV), followed by the latest widespread TV standardization Ultra-High- Definition(UHD) TV. Mobile Broadband services onset the possibility for consumers to watch TV or Video content anywhere at any time. This new concept was coined as TV Everywhere. However, the network infrastructure needs continuous improvement, primarily when crises, like the coronavirus disease (COVID-19) and the worldwide pandemic, creates immense network traffic congestions. The outcome of that congestion this time was the crush of multimedia services user's experience (UX) and QoS. More power-hungry video applications are commencing to test the networks' resilience and future roadmap of 5G and Beyond 5G (B5G).

The Fourteenth Paper, "Sustainable Green Fog Computing for Smart Agriculture", Rehan Qureshi1, Haris Mehboob, Muhammad Aamir.

The paper presents a green fog-based architecture comprising Single Board Computers acting as low power consuming fog nodes, for processing data from IoT sensors, specifically for the agriculture sector. The low energy requirements of the proposed system can be easily met with the inclusion of renewable energy resources, thus creating a more sustainable approach. The authors suggested that green fog-based architecture will positively develop a green environment for the intelligent agriculture sector and other application areas.

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Marina Ruggieri is Full Professor of Telecommunications Engineering at the University of Roma "Tor Vergata" and therein co-founder and CSIO of CTIF – an Interdisciplinary Research Center on Information and Communications Technology and its verticals. She has been Vice President of the Italian Space Agency (ASI) Technical Scientific Council; member of the Ministry of Research Policy Experts Advisory (MIUR CEPR); arbitrator of the Italian Industries Federation for Aerospace, Defense and Security (AIAD). She is Principal Investigator of the 40/50 GHz Communications Experiment of the TPD#5 payload, currently flying on-board the ESA satellite ALPHASAT (launched on July 2013). She is IEEE Aerospace and Electronic Systems Society (AESS) 2021 Vice President, Technical Operations and member of the Board of Governors (2019-2021). She is an IEEE Technical Expert recognized as "Impact Creator" in the area of Information and Communications Technology. She has been IEEE 2017 Vice President, Technical Activities; 2014-2015 Director of IEEE Division IX; 2010-2011 AESS President. She received: 1990 Piero Fanti International Prize; 2009 Pisa Donna Award for women in engineering; 2013 Excellent Women in Roma Award; 2011 AESS Service Award. She has been inducted in 2015 as a Professional into the IEEE Honor Society Eta Kappa Nu (HKN). She is IEEE Fellow for Contributions to Millimeter-wave Satellite Communications. She is author/co-author of more than 350 papers, 1 patent and 12 books.