



World Summit - from EARTH to URBAN - for Safe & Sustainable Cities
CIVIL ENGINEERING • ARCHITECTURE • URBAN PLANNING CONGRESS

www.causummit.org



CAUSummit 2025



World Summit
from EARTH to URBAN - for Safe & Sustainable Cities

CIVIL ENGINEERING • ARCHITECTURE • URBAN PLANNING
CONGRESS

Eco-friendly Congress - CAUSummit

ABSTRACT BOOK

1-5 September, 2025 - Antalya (Turkiye)



"The Meeting Point for Civil Engineers, Architects, City & Urban Planners"

SAVE THE DATE & NEXT YEAR JOIN US AGAIN for the CAUSummit 2026 - 31 August-4 September 2026

Preface

This is the Abstract Collection Book of CAUSummit 2025 and consists of the abstracts of oral and poster presentations in the 10th Anniversary “World Summit: Civil Engineering-Architecture-Urban Planning Congress” in Antalya (Turkiye) which is the pearl of the Mediterranean and the Turkish Riviera during 1-5 September 2025. The main mission of the "World Summit: Civil Engineering-Architecture-Urban Planning Congress - CAUSummit" was to lead to contribute in multidisciplinary studies related with Civil Engineering, Architecture, City & Urban Planning and to improve interactions between people within these fields.

What makes a city safe and sustainable? We discussed and took a look at the world's most safe and sustainable cities to find out how they were created... from EARTH through DESIGN, CONSTRUCTION, PLANNING, URBANIZATION, ENVIRONMENT, ... to CITIES ... As another mission, CAUSummit provided a forum for this diverse range of studies report very latest results and document emerging understanding of the related systems and our place in it. By this way, we tried to find solutions and methods to establish better, safe & sustainable cities where our children will grow up.

"World Summit: Civil Engineering-Architecture-Urban Planning Congress - CAUSummit" provided a forum for discussion of the latest findings and technologies in different fields of Civil Engineering, Architecture and Urban Planning. It gave opportunities to the participants for collaboration in a platform by sharing knowledge and experiences in their fields. CAUSummit also lead to provide a forum for early career researchers for presentation of their work and discussion of their ideas with experts in different fields of Civil Engineering, Architecture and Urban Planning.

I would like to express my sincere gratitude to all submissions to CAUSummit 2025 from many different countries all over the world for their interests and contributions in CAUSummit 2025. I wish you enjoyed the "World Summit: Civil Engineering-Architecture-Urban Planning Congress" and had a pleasant stay in the city Antalya (Turkiye) which is the pearl of the Mediterranean and the Turkish Riviera, and it is one of the most popular congress tourism and tourist destinations in Turkey, Europe, and the World.

I hope to see you again during next event "World Summit: Civil Engineering-Architecture-Urban Planning Congress - CAUSummit 2026" which will be held during 31 August - 1 September 2026.

Prof.Dr. Isik YILMAZ
President of CAUSummit



Scientific Committee

Prof.Dr. Dimitrios G. AGGELIS - Vrije Universiteit Brussel - BELGIUM

(Editor - Construction and Building Materials)

Prof.Dr. Hashem AKBARI - Concordia University - CANADA

(Editor - Energy and Buildings)

Prof.Dr. Imad L. AL-QADI - University of Illinois - USA

(Chief Editor - International Journal of Pavement Engineering)

Prof. Dr. Görün ARUN - Yildiz Technical University - TURKEY

(Editor - International Journal of Architectural Heritage)

Dr. Paola ARDIZZOLA - Antalya International University - TURKEY

Prof.Dr. Lucija AZMAN MOMIRSKI - University of Ljubljana - SLOVENIA

Assoc.Prof.Dr. Gergana ANTOVA - Univ. of Architecture, Civil Engng & Geodesy - BULGARIA

Prof. Dr. Francesco AUGELLI - Polytechnic University of Milano - ITALY

Prof.Dr. Temenoujka BANDROVA - Univ. of Architecture, Civil Engng & Geodesy - BULGARIA

(Editorial Member - International Journal of Digital Earth)

Prof.Dr. Fathi BASHIER - Wollega University - ETHIOPIA

Prof. Arq. Marco Avila CALLE - Catholic University of Cuenca - ECUADOR

Prof. Tiziana CAMPISI - The Kore University of Enna - ITALY

Prof.Dr. Amir CAUSEVIC - University of Sarajevo - BOSNIA and HERZEGOVINA

Prof.Dr. Eva COISSON - University of Parma - ITALY

Prof.Dr. Qingyan (Yan) CHEN - Purdue University - USA

(Chief Editor - Building and Environment)

Prof.Dr. Nikoloz CHIKHRADZE - Georgian Technical University - GEORGIA

Prof.Dr. Ana Maria DABIJA - Technical Sciences Academy of Romania - ROMANIA

Prof. Maria Paulina KAPLAN DEPOLO - Pontifical Catholic University of Valparaiso - CHILE

Prof.Dr. Pingsha DONG - University of Michigan - USA

(Editor - International Journal of Naval Architecture and Ocean Engineering)

Prof.Dr. Peter FAJTAR - University of Ljubljana - SLOVENIA

(Editor - Earthquake Engineering & Structural Dynamics)

Prof. Dora FRANCESE - University of Naples Federico II - ITALY

Prof.Dr. Mohamed FREDJ - University of Bejaia - ALGERIA

Prof. Marina FUMO - University of Naples Federico II - ITALY

Prof.Dr. Ulf Arne GIRHAMMAR - Lulea University of Technology - SWEDEN

Prof.Dr. Makarand (Mark) HASTAK - Purdue University - USA

(Chief Editor - ASCE Journal of Management in Engineering)

Assoc.Prof.Dr. Taehoon HONG - Yonsei University - KOREA

(Associate Editor - Journal of Management in Engineering, ASCE)

Assoc.Prof.Dr. Luis INOSTROZA - Ruhr University - GERMANY

(Associate Editor - Change and Adaptation in Socio-Ecological Systems)

Assoc.Prof.Dr. Krystyna JANUSZKIEWICZ - West Pomeranian Univ. Tech. Szczecin - POLAND

Prof.Dr. Gintaris KAKLAUSKAS - Vilnius Gediminas Technical University - LITHUANIA

(Editor - Journal of Civil Engineering and Management)



- Assoc.Prof.Dr. Dr. Jan KAZAK - Wroclaw University of Environmental & Life Sciences - POLAND
Dr. Artemis KYRKOU - International Hellenic University - GREECE
Prof.Dr. Joao Carlos Goncalves LANZINHA - University of Beira Interior - PORTUGAL
Dr. Monika Gwozdz LASON - Cracow Univ. of Technology / University of Bielsko-Biala - POLAND
Prof.Dr. Herbert MANG - Technical University of Vienna - AUSTRIA
(*Editor - Engineering Structures*)
Prof.Dr. Osama Ahmed MOHAMED - Abu Dhabi University - UAE
Prof.Dr. Jianlei NIU - Hong Kong Polytechnic University - HONG KONG
(*Chief Editor - Energy and Buildings*)
Prof.Dr. Ainars PAEGLITIS - Riga Technical University - LATVIA
(*Editor - Baltic Journal of Road and Bridge Engineering*)
Prof.Dr. Luis Andrade PAIS - University of Beira Interior - PORTUGAL
Prof. De Joanna PAOLA - University of Naples Federico II - ITALY
Acad.Prof.Dr.Arch. Emil Barbu POPESCU - Honorary President of Ion Mincu Univ. - ROMANIA
(*Vice President of the 6th Section of Arch. & Urbanism - Romanian Acad. of Tech. Sci.*)
Prof.Dr. Natalia PUGACHEVA - Kazan State University of Architecture and Engng - RUSSIA
Prof.Dr. Abderrazak SAADOUN - University of Bejaia - ALGERIA
Assoc.Prof.Dr. Ahmad SAJJAD - University of Nevada - USA
(*Editor - Journal of Water Resources Planning and Management*)
Prof.Dr. Mattheos SANTAMOURIS - University of Athens - GREECE
(*Editor, Energy and Buildings*)
Prof.Dr. Raimar Joseph SCHERER - Technical University of Dresden - GERMANY
(*Editorial Board, Construction Innovation*)
Prof.Dr. Yehya M. SERAG - Ain Shams University - EGYPT
Assoc.Prof.Dr. Carles SERRAT - Polytechnic University of Catalonia (Barcelona Tech) - SPAIN
Prof.Dr. Natalia SHUSHUNOVA - Moscow State University of Civil Engineering - RUSSIA
Prof.Dr. Vijay P. SINGH - Texas A & M University - USA
(*Editor - Journal of Hydrologic Engineering, ASCE*)
Prof. Miroslaw J. SKIBNIEWSKI - University of Maryland - USA
(*Chief Editor - Automation in Construction*)
Prof.Dr. Ted STATHOPOULOS - Concordia University - CANADA
(*Chief Editor - Journal of Wind Engineering and Industrial Aerodynamics*)
Prof.Dr. Sherif EL-TAWIL - University of Michigan - USA
(*Chief Editor - Journal of Structural Engineering*)
Prof.Dr. Mehmet TUNCER - Cankaya University - TURKEY
Prof.Dr. Jerzy USCINOWICZ - Bialystok University of Technology - POLAND
Prof.Dr. Ana Lidia VIRTUDES - University of Beira Interior - PORTUGAL
Prof.Dr. Wei WU - University of Bodenkultur Wien - AUSTRIA
(*Chief Editor - Acta Geotechnica*)
Prof.Dr. Elzbieta Radziszewska ZIELINA - Cracow University of Technology - POLAND



Sea Level Changes Using Altimetric and Tide Gauge Observations and A Study of Seabed Formations Along the Mediterranean Coast of Africa

Kamil Kowalczyk ^{1*}, Katarzyna Pająk ¹ & Magdalena Idzikowska ¹

¹ Faculty of Geoengineering University of Warmia and Mazury in Olsztyn

ABSTRACT

The sea level trend over a 29-year period in the Mediterranean of the African coast is analyzed using a regional daily gridded data set based on dedicated satellite altimetry data processing. In addition, we assess the role of winds and depth in shaping differences in sea level trends and variability. We use multi-mission processing products: along-track observations (X-TRACK/ALES data) and gridded product (CMEMS time series provided by Copernicus Marine Service) to compile the satellite altimetry dataset. The altimetry observation dataset is also verified by comparison with tide gauge observations. The values of trends calculated from satellite altimetry and tide gauges are unfortunately not consistent. Sea level rise is statistically significant throughout the study region and a gradient in sea level rise is observed, with the eastern part of the basin rising more than the western. At each analyzed site, the deeper, i.e., greater distance from the coast, the trend is slightly less than near the coast. Annual sea level anomalies occur from approx. 6 cm to approx. 8 cm. The study also presents the quality of improved satellite altimetry products to support local sea level studies in areas with complex coastlines. The processing method used in this study can be applied in other regions, especially to investigate the applicability to regions more affected by both climatic or environmental factors, as sea level rise poses a very serious threat to sustainable development, especially in coastal zones.

Keywords: Sea level change, tide gauge, satellite altimetry, Mediterranean coast of Africa

Aspects of Modern Approaches for Selecting and Evaluating Organizational Solutions

Ivan Doroshin ^{1*}, Ruben Kazaryan ¹, Pavel Oleynik ¹ & Vadim Kisel ¹

¹ Technologies and Organization of Construction Production Moscow State University of Civil Engineering

ABSTRACT

The process of selection and evaluation of organizational solutions is considered. Five approaches to evaluation of organizational solutions used in domestic practice are disclosed, indicating the area of their application. Based on a comparative analysis, the paper provides evidence for the fundamental distinctions between the mathematical and applied methods of selecting optimal solutions. The mathematical process is presented as a search for the best solution to problems and as a process of finding an extremum. The applied process is presented in the form of various indicators and their combinations. The arguments presented suggest that relying on a singular approach and a single metric for evaluating organizational solutions is deemed unfeasible. The need for a comprehensive assessment of solutions through a set of indicators that ensure their comprehensive consideration is substantiated. The fundamental difference between the processes of optimization of organizational solutions in the mathematical and applied methods is shown with the conclusion about the inappropriateness of using the expression “optimization of organizational solutions” in applied works. Synonyms of this term are proposed and the concept of “selection of organizational solutions” is clarified.

Keywords: Organizational solutions. organization of construction, construction production

A Preliminary Study on BIM Integration in Modular Construction

Katie Marrette ¹, Junshan Liu ^{1*}, Scott Kramer ¹ & Mark Tatum ¹

¹ Mcwhorter School of Building Science Auburn University

ABSTRACT

The construction industry is undergoing a significant transformation driven by digital technologies, with Building Information Modeling (BIM) emerging as a critical enabler of modular construction. BIM optimizes the design, manufacturing, and assembly of modular components, leading to improvements in efficiency, sustainability, and project delivery. This study examines the integration of BIM in modular construction, analyzing its impact on cost savings, resource optimization, and environmental performance. Case studies, including modular developments in China and the UK, reveal that BIM enhances design coordination, lifecycle cost control, and material efficiency, with observed benefits such as a 45% reduction in material waste, a 36% decrease in water consumption, and a 30% improvement in energy efficiency. Despite these advantages, challenges such as high initial costs, interoperability limitations, and workforce skill gaps continue to hinder widespread adoption. The findings underscore BIM's role in addressing labor shortages, reducing carbon footprints, and improving overall construction efficiency. As modular construction gains global traction, BIM integration is positioned to redefine industry standards, promoting sustainable, cost-effective, and high-precision building solutions.

Keywords: Building Information Modeling (BIM), modular construction, prefabrication, sustainability, project delivery



Multi Criteria Analysis of the Selection of Secondary Anchors for the Modernization of Multi-layer External Walls in Existing Large-Panels Buildings

Jasiczak Józef ^{1*}, Girus Krzysztof ² & Kanoniczak Marcin ³

¹ Faculty of Civil and Transport Engineering Poznan University of Technology

² Poznan Budopol

³ Faculty of Civil and Transport Engineering Put

ABSTRACT

Prefabricated, large-story, large-panel buildings constitute the basic housing stock in the countries of Central and Eastern Europe (Germany, Poland, Czech Republic, Bulgaria, Romania, Ukraine), which are still used by 10 to 30% of their inhabitants. The program established in the EU to achieve energy based on renewable energy sources by 2050 requires a complex of activities covering both the buildings themselves and their sources of electricity and heat supply. Multi-family, multi-story buildings, commonly constructed after 1960 using the prefabricated concrete construction technology, constitute a special subject of analysis in the context of the expected changes. One of the necessary ways to implement such a program is the thermal modernization of external walls, including their structural reinforcement. The expert assessments of existing buildings revealed numerous irregularities that occurred at the stage of production of elements and their operation over a period of several decades. First of all, numerous deviations from the system assumptions were found. They concern both the type of steel from which the anchors were made (often instead of the declared stainless steel, ordinary steel was used; the number of anchors - hangers made of stainless steel was also limited) and the thickness of the individual layers. Often, the facade layer made of gravel concrete, instead of the designed thickness of 6 - 8 cm, showed a thickness in the range of 10-12 cm, while the load-bearing capacity calculations of the hangers were performed for thinner layers. The deviations in thickness were caused by the technology of production of the elements. The slabs were made in horizontal stand molds starting from the structural layer. The structural layers always have the designed thickness, while the thermal insulation and texture layer - do not. The reason follows from the natural compression of the mineral wool under the influence of the load of the texture layer. Leveling the surface with textured concrete to the upper edge of the mold caused numerous deformations of the mineral wool and thus different thicknesses of the external layer. Taking into account the above aspects as well as additional insulating and architectural layers related to thermal modernization processes, it is necessary to additionally - secondary anchor the old texture layer to the load-bearing structural layer. The problem is of a mass nature (in Poland there are 60,000 large-panel buildings covered by modernization programs), so an optimization approach is required, the outline of which is presented in this publication.

Keywords: Multi-family large panels buildings, secondary anchors, durability

Experimental Campaign of Simply Supported Beams Reinforced with GFRP Reinforcement

Robert Sonnenschein^{1*} & Michaela Stefanovicova¹

¹ Department of Concrete Structures and Bridges Faculty of Civil Engineering, Slovak University of Technology in Bratislava

ABSTRACT

The use of GFRP reinforcement as a substitute for steel reinforcement has an impact on reducing CO₂ production during construction. The potential for replacing steel reinforcement with GFRP is significant, however, due to the four times lower modulus of elasticity of GFRP compared to steel, it is necessary to consider the impact on flexural strength, deflection, and crack width when replacing it. In addition to the lower modulus of elasticity, the surface treatment of the reinforcement, which ensures cohesion between the reinforcement and concrete, has a significant impact on these parameters. The presented contribution deals with the comparison of experimental measurements with design procedures for GFRP reinforced elements from the point of view of flexural strength, deflection, and crack width. Simply supported beams with a span of 2.7 m and a cross-section of 200x500 mm were selected and reinforced with straight bars with a diameter of 16 mm at the lower surface and two bars with a diameter of 16 mm at the upper surface. Three types of longitudinal reinforcement of beams were used: steel, helical-wrapped GFRP (HW GFRP) and sand-coated GFRP (SC GFRP) reinforcement. Stirrup reinforcement was used in all beams - steel double-shear stirrups with a diameter of 8 mm and spacing of 50 mm through the entire length of the beams. The results of experimental measurements are compared with standard procedures according to ACI 440.1R-15, CSA S806-12, EN 1992-1-1, MC2020 and 2nd generation EN 1992-1-1.

Keywords: GFRP reinforcement, bending resistance, crack width

Physical-Mechanical Characterization of a Lightweight Concrete based on Wood Chips

Derabla Riad

Department of Civil Engineering University of Skikda

ABSTRACT

Wood concrete is a relatively new material that is part of the current trend toward using bio-based materials for construction. This composite appears to have interesting properties; however, they do not yet allow it to compete with traditional masonry systems. This study contributes to improving the properties of this type of concrete while ensuring the development of porosity that benefits thermal and acoustic characteristics. The subject is experimental and consists of the study of a lightweight concrete made from wood chips. The work is based on the study of the physicommechanical behavior of the concrete prepared at 3, 7, and 28 days of age. To this end, a volume substitution of normal aggregates (3/8 and 8/15) was undertaken with lightweight aggregates made from wood chips in proportions of 25, 50, 75, and 100%. A comparison is made between the control concrete (OC) and those prepared using wood chips (WCC). The results obtained show that the incorporation of 25% wood chips resulted in very encouraging and advantageous properties in terms of both strength and lightness.

Keywords: Lightweight concrete, wood chips, acoustics, absorption, porosity

Chemical Resistance of Sustainable Concretes Modified with Waste Powder Containing Epoxy Resin, Calcite and Barite

Bernardeta Dębska ^{1*}, Janusz Konkol ², Wioleta Iskra-Kozak ², Andriy Huts ², Guilherme Brigolini ³, Cristopher Antonio Martins De Moura ⁴ & Barbara Pilch-Pitera ⁵

¹ Department of Building Engineering Rzeszow University of Technology

² Department of Materials Engineering and Building Technology Rzeszow University of Technology

³ Department of Civil Engineering Federal University of Ouro Preto

⁴ Institute of Exact and Earth Sciences Federal University of Mato Grosso

⁵ Department of Polymers and Biopolymers Rzeszow University of Technology

ABSTRACT

The currently designed building materials should be in line with the principles of sustainable development, low-emission economy and circular economy. Guided by these criteria, waste powder containing epoxy resin, calcite and barite was included in the concrete mix. The waste material was used as an additional component of the concrete mix in the amount of 7.5% of the cement mass, without reducing the amount of binder. At the same time, the water/cement ratio was used at a level of 0.44 to 0.56. The obtained concretes were characterized by good workability and fluidity, despite the modifier used. Tests were carried out to assess the resistance of the obtained concretes to the effects of sulphates and chlorides. After 28 days of curing, the concrete samples were immersed in a 5% sodium sulphate solution and a 5% sodium chloride solution. After 48 days of exposure, a decrease in the compressive strength of the concrete samples modified with waste powder was noted in relation to the control concretes. In the case of samples exposed to sulphate salts, the introduction of 7.5% by weight of waste into the concrete composition was associated with a reduction in compressive strength by 8% or 9.9%, respectively, for a higher or lower water/cement ratio. The compressive strength of concrete immersed in sodium chloride solution was reduced by 9.9% for samples containing 7.5% waste at a water/cement ratio of 0.56 and by 5.4% when the water/cement ratio was 0.44. The mass of the samples was also monitored during the test. An increase in the mass of all samples, modified with waste powder and those without the modifier, was noted. The average mass changes for concretes immersed in sodium sulphate solution ranged from 0.16% to 0.31%, and for sodium chloride solution from 0.15% to 0.24% and were dependent on the water-cement ratio and the presence of waste in the concrete mix. The analysis of the durability of concretes showed no harmful effect of the modifier on the microstructure of the cement paste resulting from the action of corrosive reagents. The conducted FTIR, XRD, SEM tests did not confirm the formation of, among others, secondary ettringite, which could cause microstructural damage to the cement paste by generating expansive forces, especially in small pores due to the high crystallization pressure. The proposed method of modifying the composition of concrete is promising and can help reduce the problem related to waste management, but also help reduce greenhouse gas emissions.

Keywords: Sustainable concretes, chemical resistance, waste materials



A Study on the Effect of Adding Titanium Dioxide to Asphalt Glue Oil on Anti-Ultraviolet Aging

Kuo-Chi Chen ¹, Tsung-Hao Chen ¹, Liang-Hsiung Chou ¹, Ho-Wen Chen ² & Chien-Yuan Chen ^{1*}

¹ Civil and Water Resources Engineering National Chiayi U.

² Department of Environmental Science and Engineering/ Center for Smart Sustainable Circular Economy
Tunghai University

ABSTRACT

Asphalt concrete is currently mainly used for road pavement paving. The material components of asphalt concrete are asphalt, glue oil, and aggregate materials. With the increasing traffic flow and abnormal climate changes (high temperature or torrential rainfall), the pavement surface is easily damaged, and the service life is shortened. In the study, asphalt glue oil (AC-20) is used to add different proportions of titanium dioxide (TiO₂) divided into industrial and nanometer grades. The adding amounts are 0, 2, 4, 6, and 8 %, respectively. Three samples were used as control groups and then irradiated for 0, 24, 48, 72, 96, 120, and 144 hrs according to the ultraviolet irradiation machine settings. After completion, the penetration and viscosity tests were used to obtain data to determine the aging differences of different addition amounts. Electron microscopes and optical microscopes were used to observe the surface aging changes at different times after the test and further analyze which amount of additions are most suitable to slow down the asphalt glue aging time. The analysis results show that adding TiO₂ to asphalt glue oil significantly slows the aging effect of ultraviolet rays compared to the effect without TiO₂. TiO₂ can be used in asphalt concrete to enhance the service life.

Keywords: Asphalt glue oil; UV rays; viscosity; penetration test; titanium dioxide

Development of Road Transport Infrastructure on the Eastern Flank of NATO and of Romania

Nica Ioan Flaviu ^{1*}, Lobaza Mihai Gabriel ² & Andries Gabriela ³

¹ Department of Roads, Railways and Construction Materials Technical University of Civil Engineering
Bucharest

² Roads, Railways and Construction Materials Technical University of Civil Engineering Bucharest

³ Doctoral School of Utcb Technical University of Civil Engineering Bucharest

ABSTRACT

The paper aims to present and research the European context of the road transport infrastructure from the Eastern Flank of North – Atlantic Treaty Organization – NATO, correlated with the Trans – European Transport Network – TEN-T for the newly created Baltic Sea – Black Sea corridor, after years of armed conflict in Europe and at the Romanian borders. The eastern geographical Romanian side develops along two development regions: First Region - North – East region and Second Region - South - East region where is mostly aggregated the new road transport infrastructure with the final purpose of connecting the Ukrainian border line to Port Constanta, passing through Romania. The research is a key point for the country with the most border line of the Eastern Flank of NATO regarding the transport infrastructure. Finally, the general impact of the developing transport infrastructure is considered.

Keywords: Transport infrastructure, regional development, highway



Effect of Synthetic Wax and Surface-Active Agent and Aging Process on the Rheological Properties of Polymer Modified Asphalt Binder

Marek Iwański^{1*} & Małgorzata Cholewińska¹

¹ Department of Transportation Engineering Kielce University of Technology

ABSTRACT

In order to ensure the required service life of road pavements, polymer modified asphalt binder are increasingly being used to produce asphalt mixtures. However, as a result of technological aging during the production of the asphalt mixture and operational aging, the parameters of the binder are reduced. In order to slow down this process, various types of low-viscosity additives are used, which include Fisher-Tropsch synthetic wax and surface-active agents. Such additives also have the effect of lowering the technological temperatures for the manufacture and incorporation of the asphalt mixture. As a result of their use, there is also a reduction in greenhouse gas emissions and energy intensity in the production of the asphalt mixture. In the study, synthetic wax F-T was used, which was dosed at 0.0%, 1.5%, 2.5% and 3.5%, as well as a surfactant at 0.0%, 0.2%, 0.4% and 0.6% into PMB 45/80-65 polymer modified asphalt binder. The binder was then subjected to technological aging (short-term aging) and operational aging (long-term aging). An important part of the study was the determination of rheological characteristics in terms of linear and non-linear visco-elasticity, composite viscosity η^* and zero shear η_0 , dynamic modulus $|G^*|$, phase shift angle δ and MSCR parameters. Based on the analysis of the test results, the effect of the additives used on the rheological properties of the polymer asphalt was found to be significant. The addition of synthetic wax F-T contributes to a significant increase in the level of stiffness (hardness) of polymer modified asphalt binder after the aging process. In terms of asphalt pavement operation at low temperatures, however, it was noted that long-term aging has a much smaller effect on the stiffness (brittleness) of PMB 45/80-65 with 0.6% surfactant addition than with 3.5% synthetic wax content. It was also found that after the aging process, polymer asphalt with 3.5% F-T synthetic wax addition contributes to an increase in Jnr3.2 susceptibility and has a comparable value of elastic return R3.2 compared to the reference asphalt before aging. On the other hand, the addition of surfactant in the amount of 0.6% causes both a decrease in the value of susceptibility Jnr3.2 and elastic recurrence R3.2. At the same time, it was found that synthetic wax decreased the susceptibility of PMB 45/80-65 at medium and high operating temperatures, and influences a decrease in its aging rate with an increase in the elastic part of the dynamic modulus. Synthetic wax increased the level of zero shear viscosity of the binder which will have a beneficial effect on reducing the deformation rate of the mineral-asphalt mixture and ensure the required service life of the pavement

Keywords: Polymer modified asphalt binder, synthetic wax F-T, surface active agent, aging process, rheological properties

Permeability Prediction for Sandstone Reservoir Rock Utilizing Laboratory NMR Measurements

Abdel Moktader El-Sayed ^{1*} & Nahla A. El Sayed ²

¹ Geophysics Ain Shams University, Faculty of Sciences

² Core Lab. Egyptian Petroleum Research Institute

ABSTRACT

Permeability is one of the most significant and challenging parameters to estimate when characterizing a hydrocarbon-producing reservoir. Several empirical methods with geophysical borehole logs have been employed to estimate it indirectly. They include the Timur model, which uses conventional logs, and the Timur-Coates model, which uses the nuclear magnetic resonance log. The present study's first aim was to correlate core porosity with NMR-porosity because it directly impacts permeability estimates. The regression line equations are calculated with a consistent very high coefficient of correlations for 25 sandstone core samples ($R^2 = 0.93$ and 0.71) obtained from the Szolnok (Hungary) and the Baharyia (Egypt) formations respectively. The Coates model was used to predict permeability for studied sandstone core samples obtained from hydrocarbon reservoir intervals. Out of these samples, only 11 core samples belonged to the Szolnok Formation (Hungary), while the rest belonged to the Baharyia Formation (Egypt). An innovative model was suggested and approved to be more effective than the Coates model in permeability prediction for sandstone reservoir rocks. It could produce a reliable solution with consistent parameters and an accurate permeability estimation.

Keywords: Sandstone reservoirs, porosity, permeability, Szolnok formation, Bahariya formation

Effect of the Distribution of Joints in Tunnel Excavation Phase Simulation: A Case Study

Riadh Boukarm ^{1*}, Mohamed Fredj ², Abderrazak Saadoun ³ & Kamel Menacer ⁴

¹ Mining and Geology University of Bejaia

² Department of Mining and Geology University of Bejaia

³ Mining and Geology Department University of Bejaia

⁴ Mining University of Badji Mokhtar Annaba

ABSTRACT

This work aims to show the effect of joint distribution taking into account during the excavation phase simulation of the tunnel, in our case, Tunnel 4 of Kherrata (Algeria). At this effect, a comparison is made between the simulation of a sequential excavation phase by the Finite Element Method (FEM) with an equivalent model and a simulation whose the presence of the sets of joints in the model. The first simulation represents an equivalent model representing the whole rock mass with the Hoek and Brown Generalized criterion. Conversely, a Discrete Fracture Network (DFN) combined with the finite element method represents the distribution of the sets of joints used in the second model. In our case study, geomechanical classification of the rock mass carried out by the Rock Mass Rating (RMR) and the rock mass quality (Qsystem) methods, with values of 33 and 1.06, respectively, show that a poor quality characterizes the south portal zone of the Tunnel 4. To assess the stability of the tunnel during the excavation phase, we made a numerical simulation with the two models, the equivalent model and the model, taking into account discontinuities distribution. Finally, results show that the presence of joints considerably influences the simulation results.

Keywords: Stability, tunnel, finite element method, discrete fracture network, rock mass, joints

The Role of Mythology in Architectural Identity: The Case of the Temple of Heaven

Xinyan Chen ^{1*}, Domenico Giuseppe Chizzoniti ¹ & Tommaso Lolli ¹²

¹ Department of Architecture, Built Environment and Construction Engineering Politecnico Di Milano

ABSTRACT

Architecture is more than the geometric composition of space; it is also the expression of its local culture, which involves mythology, philosophy, architectural prototypes, etc. The research explores the impact of mythology on architectural identity with the Temple of Heaven in Beijing as the main case because, as an extraordinary presence of ancient Chinese imperial sacrificial architecture, the Temple of Heaven preserves the exquisite architectural complex and embodies rich mythological symbolism and cultural significance. This research initially reviews the theoretical outcomes of mythology and architectural identity, investigating their specific contents, characteristics, and interactions. In this phase, the three main categories of criteria regarding the architectural identity manifestation are defined, which are spatial organization (mainly reflected in shape and form), semantic organization (tightly related to design concept and principle), and relationship with context (includes materials as one of the main parts). Next, according to the organized criteria, the research analyzes the Temple of Heaven's design concept, space organization, structural design, and special decoration, which reveals how Chinese mythology appears in its design, proving that the Temple of Heaven is not merely a physical structure but also an incarnation of sacred order. In the design process, mythology is translated and generated into the architectural language and subsequently applied to create the form with symbolic meaning. The research also compares the commonalities and differences between the Temple of Heaven and other mythologically influenced architecture worldwide. Afterwards, it discusses the Temple of Heaven's profound influence and mythology's broader effect on contemporary architectural design. Ultimately, the paper highlights and concludes the detailed approaches and roles in which mythology shapes and promotes architectural identity in the contemporary context.

Keywords: Mythology, architectural identity, architecture design, contemporary architecture, the Temple of Heaven

Project Based Learning – Analyzing Student’s Choice of Correlation between Different Class Assignments

Otilia-Alexandra Tudoran ^{1*} & Camil Milincu ¹

¹ Department of Architecture Polytechnic University of Timișoara

ABSTRACT

The article presents an analysis of how third-year students specializing in Furniture and Interior Design have chosen to integrate components from various subjects into their main interior design studio project. To facilitate this integration, the design project topic was aligned with other subjects involving practical activities. In this case, the correlation with Industrial Design was examined, where students were required to design a reconfigurable modular system. The purpose of the modular system is to serve as an exhibit framework for the activity within the main project. The study focused on the evolution of project quality and complexity as the seminar topic was related to the design project, as well as on the working methods used. Students' perspectives were assessed through a questionnaire. The majority stated that correlating the disciplines helped create more complex projects and gave them motivation and inspiration to create better projects. Many used the exact modular system solution they created in Industrial Design within the Interior Design project. Another notable aspect observed was the risk of design solutions being simplified based on the requirements related to modelling and drafting methods. The purpose of the research was to analyse the feasibility of correlating discipline requests and to look into how much such initiatives help the work process of students and how these helps develop professional skills. The purpose is to improve the design process for the upcoming year in order to improve the didactic process. The outcome of this article can also help improve next year’s design theme and the choice of design methods for students.

Keywords: Modular system, design methods, teaching, interior design



Architectural Perspectives on the Planning Process in Building Projects: The Case of the Maritime Faculty of the Mersin Chamber of Maritime Commerce

İrem Köse

Department of Architecture Hasan Kalyoncu University

ABSTRACT

Abstract. This study explores the architectural planning and implementation processes of the maritime faculty building of the Mersin chamber of shipping from the perspective of the project's architect. It begins by addressing the unique spatial and functional requirements of maritime education, emphasizing the critical role of such institutions in shaping architectural design strategies. The research traces the project's development from the conceptual design phase through to its realization, evaluating key factors such as sustainability, aesthetics, technological integration, ergonomics, and functional performance. The scope includes an in-depth analysis of specialized training spaces within maritime faculties—such as simulation rooms, laboratories, and training pools—within the framework of architectural design criteria. In this context, the study evaluates the design process and outcomes of the Mersin chamber of shipping maritime faculty building, focusing on the architect's experiences and the building's functional effectiveness. The methodology consists of a comprehensive literature review, on-site investigations, development of the building's colophon, spatial analysis, and a semi-structured interview with the building's architect, Kaya Arikoğlu. The interview was conducted using a swot (strengths, weaknesses, opportunities, threats) analysis framework, enabling a systematic evaluation of the project's internal and external dynamics. Through this multi-faceted approach, the study identifies the strengths and limitations of each stage in the architectural planning process and reveals the final architectural configuration of the project. Moreover, it proposes a set of strategic recommendations and a conceptual roadmap to guide future projects through both design and execution phases. This research highlights the importance of designing sustainable, functional, and pedagogically-aligned environments in the context of maritime education. Findings suggest a direct relationship between the architect's decision-making process during the planning phase and the subsequent performance of the completed building. The study aims to contribute to the enhancement of educational architecture by offering insights and practical guidance for future architectural endeavors.

Keywords: Architectural planning process, maritime faculty design, SWOT analysis, architect's perspective



Towards a Healthier Interior Comfort of Informal Housing Constructions in Tropical Countries: Energy Performance Simulations and Improvement Proposals for a Case Study in Dhaka, Bangladesh

Alexander Kader ^{1*}, Ahammad Al Muhaymin ² & Mohammad Shaidujjaman ²

¹ Urban Planning and Architectural Design (Upad) German University of Technology in Oman (Gutech)

² Department of Architecture Bangladesh University of Engineering and Technology (Buet)

ABSTRACT

This paper explores the thermal performance and air pollution of informal housing constructions in Dhaka, Bangladesh, focusing on a typical informal building in the Hazi Road slum at Mirpur 1. The study demonstrates how the indoor comfort of such inadequate housing can be enhanced with minimal effort and cost through targeted interventions. Urban slums constitute a substantial portion of many cities in developing and emerging countries. These informal settlements are particularly prevalent in cities where rapid population growth, migration, and poverty converge with weak or missing infrastructure and urban planning. As a result, urban regulations often fail to apply, leading to inhumane and unacceptable living conditions. It is indisputable that life quality and living conditions must be substantially improved for this significant portion of the world's population. In Bangladesh, as in many tropical regions, informal housing suffers severely from poor indoor environmental conditions. Common issues include excessive heat, high humidity, insufficient natural ventilation, and indoor air pollution. The latter is primarily caused by the use of inefficient, unventilated cookstoves. This study highlights the inadequacy of current living conditions by simulating poor indoor comfort levels, specifically focusing on excess heat, humidity, and air pollution. It presents proposals for improving interior comfort, especially temperature and air quality, showing that significant improvements can be made with relatively low effort and cost. How can existing informal dwellings be transformed with minimal architectural intervention to optimally reduce indoor air temperatures and air pollution levels? The study employs a mixed-methods approach, combining a detailed case study analysis of informal dwellings in Dhaka with computational building performance simulations (using Climate Studio) to assess indoor thermal conditions (temperature, humidity, airflow) and pollutant dispersion. The simulations compare baseline scenarios with proposed low-cost interventions, focusing on passive cooling strategies and cookstove ventilation improvements. Results are analyzed to demonstrate gains in thermal comfort and reductions in air pollution, ultimately informing evidence-based retrofit recommendations. Simulations of the case study building showed that indoor conditions exceeded the thermal comfort threshold (28°C, 70% humidity, < 0.3 m/s air flow) by 1–5°C on about 128 days annually and by 5–10°C on about 55 days annually. However, simulations of the same case study building, but with a design optimized for solar shading and natural ventilation, showed significant improvements, reducing temperature exceedances to 1–5°C on about 71 days and 5–10°C on only about 29 days per year. Additionally, the proposed ventilation strategy could reduce indoor air pollution from

cooking stoves by approximately 72 %. This study demonstrates that a much better interior comfort in informal housing in tropical climates can be achieved almost immediately with minimal modifications. These low-effort solutions represent an essential first step toward significant improvements. Further research, including detailed analysis, simulation, on-site measurement and testing, will be crucial for scaling and refining these interventions. Such efforts could strongly enhance living conditions not only for the estimated 3.5 to 4 million slum dwellers in Dhaka, but also for the tens of millions of people living in similarly challenging environments across tropical and hot humid regions worldwide.

Keywords: Informal housing; low-cost intervention; environmental health; building performance simulation; thermal comfort; indoor air quality; natural ventilation; tropical climate

Experimental Method in the Revitalization Process of Degraded Inner-City Areas in the Utilitarian and Social Context on the Example of the Wesola District in Cracow (PL)

Zbigniew Władysław Paszkowski

Department of Architecture and Fine Arts Andrzej Frycz Modrzewski Krakowuniversity

ABSTRACT

This research aims to contribute to the development of contemporary principles for transforming valuable urbanized areas, with a focus on addressing the social priorities of local residents. The study was conducted in the Wesola district of Krakow in Poland. It identifies the area's inherent values, social expectations, opportunities for transforming degraded spaces, and potential adaptive reuse of selected structures, alongside preferences for their future use. The research employs a combination of analytical, cognitive, and experimental methods, integrating multi-criteria design approaches, which led to conceptual plans for the area's development. These plans were evaluated by experts for their alignment with the city's investment capabilities, as well as assessed socially to better understand the true needs of local inhabitants. The goal was to identify the most beneficial direction and principles for the planned transformations. The project holds theoretical significance by systematizing and conceptualizing transformation strategies based on practical case studies of urban regeneration. It serves a scientific purpose by uncovering hidden socio-spatial relationships and providing tools to strengthen these connections through the careful development of degraded urban areas, ensuring they acquire both aesthetic and functional value. Additionally, the research has practical implications, particularly in advancing the principles of "adaptive reuse" for buildings and areas with low historical value but substantial spatial and volumetric potential. The analytical-synthetic approach applied to the Wesola district serves as a model that can be adapted to other challenging, degraded urban areas, requiring innovative and experimental design solutions. The author emphasizes the importance of addressing this issue, as the social engagement of local communities in revitalizing deteriorating urban spaces remains weak in Poland. Furthermore, there is a notable gap in the integration of social activities with planning processes (despite the statutory requirement for public participation) and a disconnect between theoretical and scientific planning concepts and actual investment practices.

Keywords: Revitalisation, experimental methods, participatory planning, adaptive reuse

Educational Outcomes of Cross-Course Learning in Interior Architecture

Ioana Antonia Tănase ^{1*}, Anamaria Andreea Anghel ¹, Cristina Maria Povian ¹, Beatrice Daniela Lucaci ¹, Andrei Gheroghe Racołța ¹ & Ștefania Dănilă ¹

¹ Department of Architecture Polytechnic University of Timisoara

ABSTRACT

In order to implement the concept of Project-Based Learning within the bachelor's program in Interior Architecture and Furniture Design (M.A.I.) at the Faculty of Architecture and Urbanism, Politehnica University of Timișoara, the curricular structure was designed to support the design process in a logical and progressive manner over the three years of study. The disciplines associated with design are organized into three categories, corresponding to the fundamental components of design: artistic, functional, and technical. Starting from the premise that design belongs to the field of arts, the first year is predominantly conceptual and artistic, while gradually introducing elements related to graphic representation, materials, construction techniques, and ergonomic principles. The second year maintains the artistic component—supported by the Form Study Studio and the Stylistics course—but places greater emphasis on the functional aspects of space and furniture. At the same time, technical knowledge diversifies to include digital representation, constructability, and finishes. The third year shifts its focus toward the technical detailing of the spatial and formal concept, in close correlation with complementary disciplines from both the humanities and engineering domains. This progression aims to prepare students for the diploma project, for continuing their studies through a master's program in interior architecture, and for professional practice. This paper details the way in which the disciplines are correlated during the first year of study and highlights how they contribute to the acquisition and experimentation of knowledge within the design studio, considered the core subject of this educational model. Furthermore, the study presents strong arguments for the effectiveness of this type of curricular organization, through the increased applicability of theoretical knowledge and the development of transversal skills. Additionally, the coherent integration of disciplines around the design project enhances student engagement and interest, increasing the attractiveness of the program and reinforcing long-term motivation.

Keywords: Project based learning, interior architecture and furniture design, curricular organization, visual language, synthesis, compositional concept

A Vital Response to the Ecological Crisis: Intrinsic Biophilic Approaches in Interior Design Education

Deniz Hasırcı^{1*}, Idil Bakır Küçükkaya¹ & Gözde Damla Turhan-Haskara¹

¹ Department of Interior Architecture and Environmental Design Izmir University of Economics

ABSTRACT

Intrinsic biophilic design approaches in the interior design studio are discussed in this paper to prevent harm to the sensitive ecological state of the world today. Through rich projects, the variability of biophilic design is shown, with possible lessons for both educators and practitioners. The field of interior design has a significant impact on the environment, through construction techniques, material resources, waste generation, indoor air quality issues, as well as its role as a mediator of health, function, and communicator of sustainable living. The field of Biophilic Design has created knowledge and methods for making decisions that create a better understanding of the role of nature in the lives of human beings and thus attempting to bring aspects of nature into the interior space, both directly and indirectly. Biophilic Design is also more accessible for both scholars and practitioners due to its varied and wide-ranging scope of interpretations, involving technical as well as what may be defined as more poetic or philosophical definitions. It is clear that, in each design decision, one can opt in or out to side with ecological steps, and both awareness and know-how are effective in these choices. The power that interior designers have is considerable, and any decision taken during the intricate design process may potentially have a large-scale impact on the environment. Subsequently, if interior designers adopt a biophilic outlook on healthy living for themselves, it is believed that this will lessen the negative impact of the field on ecosystems. In this context, “Intrinsic Biophilia” and/or “Intrinsic Biophilic Design” has been coined to define the active involvement of designers in biophilic approaches [1]. The second-year interior design studio at Izmir University of Economics is the first in Turkey to be consistently utilizing biophilic design as a framework for several years, and the ecological awareness of students and graduates has been observed to increase significantly. The most recent project of the studio was to design a work environment through the purposing of biophilic design models that bridge theory and application. Intrinsic approaches include requirements to prevent the use of plastics in the studio, use ecological and recycled material in models, and an incentive to eat non-packaged goods, not buy new clothes, and waste less as an overall philosophy. Moreover, the biocomposite workshop completed in the studio enabled students to achieve hands-on experience with nature-based materials, enabling them to observe the behavior of natural constituents. The project brief was to redesign an interior design office with a new identity and use adaptive reuse methods, defined by a biophilic design concept statement. The project began with a site analysis to utilize the existing resources at the 1/200 scale and brought to 1/1 scaled detail drawings under the same concept. The resulting projects reflect sensitized intrinsic design decisions like to be carried into practice in the endeavors of future interior designers.

Keywords: Intrinsic biophilia, biophilic design, interior design, design education



Abstraction and Figuration of the Suspended City: An Experimental Settlement Models as an Alternative to the Vertical City

Domenico Giuseppe Chizzoniti ^{1*} & Elisa Maruelli ¹

¹ Department of Architecture, Built Environment, and Construction Engineering Politecnico Di Milano

ABSTRACT

Since the end of the 20th century, globalization and the spread of technologies have radically transformed the geography of living spaces. The increasing population density in urban centers has led to unprecedented levels of settlement concentration, which in turn has induced the progressive consumption of natural resources. An initial response to this phenomenon focused on limiting land use, improving energy efficiency, and fostering technological innovation. The combination of these factors has progressively driven the adoption of a vertical urban model, with high-rise buildings emerging as the seemingly most advantageous settlement solution. While urban transformation processes are a physiological and permanent aspect of the city, the problematic element lies in the fact that, in the vast majority of cases, these transformations are not the result of conscious, shared decisions. Instead, they are operations of remodeling, conversion, and alteration, independent of any architectural premise. The conventional model of urban transformation typically involves the dismantling, demolition, and disposal of the pre-existing settlement in favor of establishing a new part of the city, often with a vertical layout. This paper aims to analyze the issue of urban densification in transformation areas within the consolidated urban fabric and explore alternative solutions to the relationship between resource conservation and high-density artificial settlements. The perspective proposed in this study defines resource conservation not only as a consideration of the natural system but also as the preservation of the artificial system, including the artefacts, infrastructures, and design elements deeply embedded in the specific context of the transformation areas. The research presented here aims to address two main phases of work. The first phase involves defining an operational approach capable of assessing specific parts of the city undergoing transformation, such as marginal areas, peripheral zones, and mixed-use productive and residential fabrics. The second phase focuses on applying a methodological-critical approach to identify relevant case studies and select experimentally innovative solutions. These solutions have addressed the challenge of urban densification in areas marked by social, economic, and cultural criticality, testing alternative strategies for developing new parts of the urban fabric. The aim is to demonstrate how total physical replacement can be avoided through an approach based on restoration and transformation, both at the urban scale (beginning with the valorization of the settlement palimpsest, land-ordering layouts, and the preservation of infrastructural resources) and at the architectural scale (by protecting the most significant architectural elements), as well as in the broader context of the natural and artificial landscape. The specific point of view proposed in this research aims to shift the focus of critical observation on the theme of urban transformation and densification, attempting to see the infrastructural resources of the transformation areas as an opportunity to be incorporated into the project, to be valorized and made operative, rather than assuming their land connotation and expendability for speculative purposes.

Keywords: Alternative settlement models, urban densification, superimposition, superimposed pattern

How to Build a Creative City through Design and its Heritage: Covilhã

Luís Moreira Pinto ^{1*} & Cláudia Sofia São Marcos Beato ²

¹ Department of Civil Engineering and Architecture Beira Interior University - Claud

² Department of Civil Engineering and Architecture Beira Interior University and Geobiotec

ABSTRACT

This article presents the results of a course which, using drawing as its main tool and the different cultural backgrounds of the participants, explored possibilities for revitalizing Covilhã's industrial heritage in Portugal. Through the study of the city, its history, cultural context, and urban structure, the essential elements for a morphological reading of Covilhã and its potential for evolution were identified. Using new technologies and various tools of artistic expression, and with the active participation of the population and local agents, solutions were developed to enhance and publicize Covilhã's rich industrial heritage, which, despite its relevance, remains little visible to both visitors and the inhabitants themselves. These proposals are particularly useful for the local community and municipal authorities, especially in the field of tourism, as they make visible what was hidden and present the city and its culture in an innovative and collaborative way. Furthermore, the course fostered a dynamic exchange of ideas among participants, resulting in the creation of sustainable interventions that respect the historical and cultural significance of Covilhã's industrial landscape while promoting its integration into contemporary urban life. These interventions not only highlight the aesthetic and historical value of the sites but also encourage community engagement and economic revitalization through culturally sensitive and environmentally conscious approaches.

Keywords: Design, industrial heritage, technological innovation, communication tools, active participation, Covilhã

Exploring Covilhã's Industrial Heritage: Outcomes of Sustainable Interventions Methodology

Luís Moreira Pinto ^{1*} & Cláudia Sofia São Marcos Beato ²

¹ Department of Civil Engineering and Architecture Beira Interior University - Claud

² Department of Civil Engineering and Architecture Beira Interior University and Gebiotec

ABSTRACT

This article presents the first results of an innovative course in which, in a city as rich in industrial heritage as Covilhã, in Portugal, sustainable specificity is sought through the execution of artistic and functional interventions, based on an in-depth dialogue with the community, and which meets the Sustainable Development Goals (SDGs), the UN's global agenda for 2030, which aims to create a fairer and more balanced future for all. From the exchange of ideas, knowledge and aspirations, the study of the city's history and its design, solutions are sought that materialize in urban design thanks to functional and aesthetically appealing artistic interventions, where their spatial location is studied as much as their execution using new technologies and the idea of co-participatory community creation. In terms of methodology, the use of surveys and interviews among the population and local agents, their analysis as well as the participatory design of university students, resulted in a set of initial ideas, some of which are presented in this article. These ideas, which synthesize the city's historical/cultural matrix and the SDGs in everyday objects, are intended to serve local authorities and entities in the pursuit of these objectives in a unique way, capable of generating multiplier effects in the local economy.

Keywords: Design, living heritage, SDGs, artistic/functional interventions, urban design, Covilhã



The Industrial Cultural Heritage of Elefsina Area As a Tourist Destination in Western Attica (Greece)

Georgia Cheirchanteri

Industrial Design and Production Engineering University of West Attica

ABSTRACT

Elefsina, a historic city in Western Attica, holds a unique position as a hub of industrial cultural heritage and a growing tourist destination. The city, internationally known for its ancient Eleusinian Mysteries, has also played a pivotal role in Greece's industrial development, hosting major factories such as Titan Cement, Iris Paints, Votrys Distilleries, and Kronos Shipyards. Over time, industrialization shaped Elefsina's urban and social landscape, leaving behind a rich yet underutilized industrial heritage, which now presents significant opportunities for cultural tourism and urban regeneration. A key milestone in Elefsina's transformation was its selection as the European Capital of Culture 2023, an event that aimed to reposition the city as a center for cultural and sustainable tourism. The initiative emphasized the revitalization of industrial sites, the promotion of artistic performances, and the integration of cultural activities with the city's industrial legacy. Through this process, Elefsina has sought to redefine its identity, blending its ancient past, industrial history, and contemporary artistic expression into a unique, multifaceted cultural experience. This study explores the potential of Elefsina's industrial cultural heritage as a key driver for tourism development. Through adaptive reuse, abandoned factories and warehouses have been repurposed into museums, cultural centers, and event venues, attracting visitors while preserving the city's architectural and industrial character. Successful case studies from other European cities demonstrate that integrating industrial heritage tourism with community involvement can lead to economic growth, job creation, and local engagement, while maintaining the authenticity of cultural sites. Despite the opportunities, Elefsina faces multiple challenges in its effort to develop sustainable industrial tourism. Environmental degradation, infrastructure deficiencies, and limited awareness of industrial heritage tourism remain significant barriers. Additionally, balancing urban growth with the preservation of historical sites requires a carefully crafted development strategy. A comprehensive tourism master plan is essential, focusing on environmental restoration, improved accessibility, digital heritage initiatives, and educational programs that highlight Elefsina's unique industrial and cultural identity. Collaboration between local authorities, cultural organizations, tourism stakeholders, and private investors will be critical in promoting Elefsina as a leading destination for industrial heritage tourism in Greece and beyond. In conclusion, Elefsina represents a remarkable intersection of ancient mythology, industrial history, and modern cultural innovation. With the right policies, investments, and sustainable tourism practices, it has the potential to become a model city for industrial heritage tourism in Europe, fostering both economic revitalization and cultural preservation. The transformation of Elefsina can serve as a blueprint for other post-industrial cities seeking to leverage their heritage as a catalyst for sustainable development and cultural enrichment.

Keywords: Industrial heritage, cultural tourism, Elefsina, sustainable development, urban regeneration

Gardens of Resistance in the Third Landscape and the Emerging Ecopoetic Urbanism

George Katodrytis

Department of Architecture American University of Sharjah

ABSTRACT

This research investigates topographies of wildness that have been established in urban interstitial spaces and transitional zones with a focus in the Gulf. These temporalities of vacant plots sustain an invasion of seeds, indigenous weeds, and ruderal species but also industrial components that colonize such bare sites. These spaces do not recognise boundaries and provide opportunities to host diverse social-ecological conditions for minorities that are excluded by regulated urban spaces and resist participation in dense public spaces. The ecological qualities of interstitial spaces are regarded by French garden designer Gilles Clément, in his *Manifeste du tiers paysage* (Manifesto of the Third Landscape) as spontaneous ecologies and cherished reservoirs that diversify and sustain the urban ecology. These are spaces of indecision where humanity steps back from the evolutionary process. The Third Landscape subtracts from development with a precarious hold on terrain where biodiversity can arise. The resulting ‘eco-barrier’ than ‘sustainable development’ (slogan of neoliberal growth model) may offer the missing interstitial component of the Gulf city planning. This resistance entails an atomized ‘system’ of increasingly self-sufficient, local economy whose strength lies in their subtraction from the network. Liberating the ground from a monetary model of land value allows for irregular and autonomous apparatuses and unique interventions to exist. The architect as squatter, mediator and community participant sets out a journey traversing the city to become the Open City, an assemblage of environmental design, vegetation, and infrastructure. Rather than clearing a site for a new sustainable development, the emerging architecture sets a discourse of responding and returning to a natural, raw, and imperfect condition, utopian, a hybrid; a new ornamental dimension of architecture for sustaining indigenous cultures. The future is its neglected natural and cultural history.

Keywords: Landscape, urbanism, gardens

Territorial Ambiguities and Hesitant Identity: A Critical Reading of the Fishing Neighbourhood of Paramos Through Photography

Jorge H. C. Marum ^{1*} & Maria De Fátima Neto ¹

¹ Department of Civil Engineering and Architecture Beira Interior University

ABSTRACT

This article offers a critical reading of the fishing neighbourhood of Paramos, located on the northern coast of Portugal, through a methodological approach that combines documentary photography and cognitive cartography. The study investigates the relationships between identity, landscape, and power within a territory marked by spatial fragmentation, symbolic exclusion, and functional indeterminacy. By means of a structured visual essay supported by field observation and interpretive maps, Paramos is examined as a liminal urban enclave whose ambiguities reveal tensions between memory, informal appropriation, and control devices. Drawing on authors such as Lefebvre, Augé, Hayden, Domingues, Foucault and Latour, the article argues that the photographic image, used as a critical tool, can unveil hidden territorial logics and contribute to a more inclusive and situated spatial discourse.

Keywords: Liminal territories; cognitive mapping; photography; territorial identity; spatial production



Living Concrete: Expressiveness, Technique and Meaning in Contemporary Architecture

Jorge H. C. Marum ^{1*} & Miguel Santiago Fernandes ¹

¹ Department of Civil Engineering and Architecture Beira Interior University

ABSTRACT

This paper investigates concrete as an active architectural matter, exploring its simultaneously technical, aesthetic and symbolic dimensions. It departs from the hypothesis that concrete, often seen as brutal, cold or austere, can be understood as “living matter” – mutable, expressive and imperfect. Rather than a neutral substance, concrete reveals itself through its texture, flaws and uncertainty, embodying time and process. The paper draws upon the theoretical contributions of Kenneth Frampton, Peter Zumthor, Juhani Pallasmaa and Tadao Ando, and engages critically with the Goetheanum by Rudolf Steiner as a paradigmatic case. It examines the dual nature of concrete — as structure and form, as support and surface — proposing that its plasticity and ambiguity allow it to function not only as a means of construction but also as a medium of poetic expression. By articulating technique and atmosphere, material and meaning, this reflection asserts that concrete plays a central role in the contemporary architectural imagination, positioned between rational precision and artistic freedom.

Keywords: Concrete; architecture; materiality; poetics; Rudolf Steiner

Understanding Place - Boosting the Circular Economy Through Urban Art: The Case of Trancoso, Portugal

Cláudia Beato ^{1*}, Daniel Pacheco ² & Paulo Carvalho ³

¹ Deca -Architecture and Civil Eng. Department Ubi -Beira Interior University and Geobiotech

² Department of Civil Engineering and Architecture Beira Interior University

³ Department of Civil Engineering and Architecture and Gebiotec Beira Interior University

ABSTRACT

This article shows how some cities have been developing ways of attracting people back to their historic centers and cultural or tourist areas, focuses its study on Trancoso, a small town in the interior of Portugal, where the loss of population and attractiveness for business has been decreasing over the last few decades. Based on a participatory methodology, the aim was to create an event based on the town's history/culture/people and climate, which would promote and be able to make the town more attractive. Indeed, in recent years, some cities in Portugal have opted for artistic manifestations that seek to enhance their streets, either through urban art, the most widely used, or through creative initiatives such as "Águeda", with Umbrella Sky, a festival that fills the city's streets with colorful umbrellas, or the Wood Festival in Covilhã, The use of marketing and communication techniques, combined with new digital technologies, has been an essential tool in disseminating local memory and cultural identity, and the main aim of these initiatives is to attract visitors and beautify the city. The use of new materials, new digital tools can be an instrument that, while always bearing in mind that the city is ultimately a human creation, of the zeitgeist and of human knowledge, can and should contribute to greater sustainability in time and space of agglomerations, taking up good practices and based on reflective practice and the uniqueness of people. However, we wanted to go further and meet the Portugal 2030 strategy, looking for a solution that would boost the circular economy of the city and its surrounding region, without neglecting the participation of all and the maintenance of the city's heritage, in its broadest sense, increasing the happiness of its inhabitants in an intelligent way.

Keywords: Urban art, "City Smart/Happy", virtual reality, cultural territory, Portugal 2030



My Dream School: An Experiential Learning Project for Elementary School Children

Mirela-Adriana Szitar-Sirbu ^{1*}, Simona-Elena Romas ² & Brindusa Raluca Havași ¹

¹ Department of Architecture Polytechnic University of Timișoara

² Profesori Învatamant Primar Scoala Gimnaziala Nr.25 Timisoara

ABSTRACT

It is well known that experiential and group learning has beneficial effects on the development of skills and knowledge, understanding, motivation and relating to peers, whether adults or children. In primary education in Eastern Europe, alternative methods of teaching and learning continue to be under-used; optional classes in primary education fill this gap and are a fertile ground for pedagogical experiments. “De-a arhitectura” is a program developed by the association with the same name made of architects and teachers in 2013. The need to propose school-based education for the built environment comes from the idea that people should learn how to advocate for better living places and also as a response to the sustainability challenge. The name means "Let's play the game of architecture" and all programs are developed on the idea that the best way to learn is through play, promoting experiential learning and collaborative learning. The program was introduced nationwide firstly in third and fourth grade - "Let's play architecture in my city". The approach to these programs is free and based on a guide, so tutors can choose from the activities proposed in the guide or develop new activities. It should also be noted that the primary school teacher is complemented by a volunteer architect or student. This year the authors decided to do a model for a school - “My dream school” the children called it. Experiential learning is based on a cyclical loop: thinking - acting - experiencing - reflecting. In addition to this cycle we wanted to make the transition from individual learning, to learning in pairs and finally to the level where the whole class has to work together for the success of the project. The steps are presented in the methodology chapter, which presents the passage from the drawing to the 3D model, from the individual approach, to the approach in teams of 2-3 children with specific tasks (a specific classroom, hallway, one of the courtyards, gym, etc.), to the three variants of floor plan made by the architect from which the pupils voted and chose the favorite design, to the realization of the model in pieces and finally the assembly of the model in two groups of 12-13 children. The final step was the presentation of the model as the final result of a year of “De-a arhitectura” in the third grade (9-10 years old) in front of the other classes in the city in a festive setting. From the educational process perspective, there is a chapter dedicated to observations at each stage, both in terms of group dynamics and output. For the teachers the process was particularly interesting, and the cohesion effects at class level were beyond expectations. As a conclusion, once such a process of experiential and group learning is used, the results show that it is really worth the effort.

Keywords: Experiential learning; primary school education; collaborative learning; hands-on activities; sustainable development

Designing for Social Innovation: Apps as a Tool for Co-Creation

Irem Ercan ^{1*}, Didem Kan ² & Onur Mengi ¹

¹ Department of Industrial Design Izmir University of Economics

² Department of Interior Architecture and Environmental Design Izmir University of Economics

ABSTRACT

A shared understanding of active participation of many urban actors is necessary for a socially sustainable urban environment. This study explores how various urban stakeholders including government agencies, city collectives, citizens, academic institutions, and businesses co-create by leveraging their unique skills and exchanging work and knowledge via an online platform in order to foster social innovation at urban scale. The present research hypothesizes that establishing a participatory mobile application enabling city inhabitants to actively engage and assume shared responsibilities in urban processes can strengthen the sense of belonging of citizens. The design research methodology employed in this study is rooted in the context of co-creation and participatory design. The study is structured around the hypothetical development of the Give a Hand mobile application, a participatory platform designed to make education, health, culture, and art services more accessible for everyone. By enabling participation and co-creation among city inhabitants, the platform aims to optimize public service delivery, saving both time and resources as well as to achieve more inclusive urban environments. More importantly, this platform facilitates urban value creation through mechanisms of volunteering and donations, contributing to the enhancement of the public services. This conceptual framework also helps us understand how designers serve as social innovation facilitators by developing community-driven, inclusive platforms for public service delivery and engagement. The practical implications of this study provide a sustainable network, fostering a stronger sense of belonging among the citizens. By incorporating social networking features, the app facilitates communication, collaboration, and the creation of new community networks, thereby enhancing active participation and contributing to the overall social fabric of the city. The results show that digital platforms can serve as scalable instruments for participatory governance when they are created using the concepts of social innovation and co-creation. The conceptual mobile app provides a flexible and transparent framework for cooperation between corporations, colleges, citizens, and public agencies.

Keywords: Social innovation; social impact; co-creation; mobile app; urban belonging

Theorizing Zero Degree from Junkspace to Running Room: Rem Koolhaas vs Hall Foster

Melis Yazici ^{1*} & Serap Durmus Ozturk ²

¹ Department of Architecture Artvin Çoruh University

² Department of Architecture Karadeniz Teknik University

ABSTRACT

Every time the author draws a set of words, the existence of the text is a matter of debate. According to Barthes (2006), the proliferation of writings is a contemporary phenomenon that forces the author to make a choice, transforms the form into a behavior and leads to a literary ethics. Contemporary writing is an independent organ that develops around the literary organization. It adorns it with a value unknown to its orientation, constantly leading it to a double existence. Barthes places a secondary history on the content of words. In addition, he places opaque signs that carry a secondary compromise to it. Rem Koolhaas calls his architectonic discourse, which includes his disciplinary criticisms, as 'zero degree architecture'. In these disciplinary critiques, he talks about the epistemic fragilities of traditional urbanism and architectural formation and the regimes of constructing that restrict life. 'Zero degree architecture' means the resetting of traditional architecture, which designs spaces that "do not allow anything" other than its own fiction. Unlike traditional architecture, it is also a call to create possibilities by defining "nothing" and "void" with its "typical" and "generic" character. The study, which accepts the concept of junkspace produced by Rem Koolhaas as the zero point, intensifies in the context of translating, renaming, and rethinking trio. In this context, "Junkspace with Running Room" book (2016) written by Rem Koolhaas and Hal Foster was selected as research material. The book discusses architect Rem Koolhaas's concept of junkspace and architectural critic Hal Foster's concept of the Running Room as a response to junkspace. In this context, the concept of junkspace, which is the word with the highest frequency (junkspace frequency: 227) in the book, has become meaningful in defining it as the zero degree of discussion. The concept of junkspace, first introduced by Rem Koolhaas in 2001, defines a condition of imbalance that proliferates in the uncertain space of the metropolis. In junkspace, conventional architecture loses its mathematical dimensions and plastic forms. Claiming a new architecture without a design philosophy, junkspace can be considered as zero degree where conventional architecture is reset. The selected research material in this study will be fragmented at the textual level through the trio of translating, renaming, and rethinking. In the translating step, the theoretical introduction of the Rem Koolhaas-junkspace and Hal Foster-running room sections in the book will be made. In addition, in this step, the sections of the book will be uploaded to AntConc software separately and content analysis will be made. The renaming step will concentrate on the 28 concepts (Autonomy, Bigness, Bonaventure, Conditional, Consumerist, Design, Environment, Finitude, Gesamtkunstwerk, Hell, In/discipline, Junk, Kool, Lite, Mimetic, Nobrow, Outmoded, Post-Fordism, Quarantine, Running Room, Spectacle, Typology, Universal, Virtual, Without Qualities, X, Yes, Zone) that Hal Foster presented in response to junkspace. In the rethinking step, the relationship between junkspace and running room concepts will be reproduced through the zero degree discussion.

Keywords: Zero Degree Architecture, Junkspace, Running Room, Koolhaas, Hal Foster

Preservation and Restoration of Sacred Monuments in Ukraine: A Scientific Approach to the Restoration of the Transfiguration Church

Oksana Diachok ^{1*}, Oleksandra Kolodrubska ¹, Yuriy Verbovetskyi ¹, Oksana Pasichnyk ² & Sofiia Myroniuk ³

¹ Department of Architecture and Design West Ukrainian National University

² Department of Architecture and Design Lutsk Nation AI Technical University

³ Private Architect Private Architect

ABSTRACT

Cultural heritage is a crucial factor in shaping national identity and historical memory. During wartime, as Ukraine fights for its freedom and independence, its preservation becomes particularly relevant. Among numerous historical landmarks, ancient churches hold a special place, serving not only a sacred function but also symbolizing the cultural continuity and spirituality of the Ukrainian people. The war has caused extensive losses, including the deliberate destruction of religious buildings, posing a threat to national security and cultural identity. The Transfiguration Church in the village of Zaluzhzhia, built in 1600, is an architectural monument of national significance, distinguished by its unique artistic expressiveness. However, its current state raises concerns and requires professional analysis for proper restoration. Research Objective and Tasks. The objective of this study is to analyze the historical stages of development, architectural features, and authentic structure of the Transfiguration Church in Zaluzhzhia, as well as to justify scientific approaches to restoration work. The research tasks included: a. Analyzing the current state of preservation and identifying key issues requiring restoration intervention; b. Studying the historical stages of construction, reconstruction, and development of the Transfiguration Church; c. Examining the architectural features of the church, including structural elements, stylistic characteristics, and decorative details; d. Determining the authentic structure of the church based on iconographic data and comparative analysis; e. Developing recommendations for restoration measures aimed at preserving the monument's authenticity and ensuring its harmonious restoration. As the research methods, the study uses comprehensive research methods that allowed for an in-depth analysis of the architectural monument: a. Historical and archival method – studying documentary sources, ancient descriptions, and archival materials; b. Comparative analysis – examining similar architectural objects from the same period to identify common trends in sacred architecture; c. Field studies – site inspection, assessment of structural features, identification of damage, and evaluation of the building's preservation state; d. Iconographic analysis – researching images of the church from different historical periods to identify its authentic appearance; e. Architectural and restoration analysis – developing scientifically based recommendations for the preservation and restoration of the monument according to modern principles of historical building restoration. The study yielded the following key results: a. The main historical stages of the Transfiguration Church's development in Zaluzhzhia were identified, revealing significant transformations over time; b. Architectural analysis confirmed the presence of authentic structural elements characteristic of

Ukrainian sacred architecture from that period; c. The current state of the monument was analyzed, highlighting existing damages, loss of decorative elements, and structural changes due to previous restoration efforts; d. Based on historical documents, photographic materials, and analogous architectural objects, a reconstruction hypothesis of the church's original appearance was developed; e. A set of comprehensive restoration measures was proposed to preserve the building's authenticity. In the conclusion, this study confirms that the Transfiguration Church in Zaluzhzhia is an important monument of sacred architecture that embodies key features of Ukrainian church construction. The research identified major threats to the preservation of the church and proposed restoration measures aimed at maintaining its authenticity and ensuring its harmonious renewal.

Keywords: Cultural heritage, national identity, architectural monument, restoration



Transmitting Values Related to Built Heritage: An Educational Approach

Otilia-Alexandra Tudoran ^{1*}, Mirela-Adriana Szitar-Sirbu ¹, Brindusa Raluca Havași ¹ & Bâldea Maja ¹

¹ Department of Architecture Polytechnic University of Timișoara

ABSTRACT

This article aims to examine the effectiveness of an interdisciplinary learning approach in enhancing students' understanding of cultural heritage during a summer school program. The summer school brought together undergraduate students from the first, second, and third years, middle school students, teachers from the Faculty of Architecture, teachers from Secondary School & High School, and professionals from various related fields. This multidisciplinary collaboration facilitated knowledge exchange, enabling participants to explore heritage buildings from Romanian villages through direct engagement and cross-disciplinary interaction. The primary objective of the summer school was to create awareness and recognition of the heritage value of traditional wooden houses in rural areas. Integrating these structures into an educational framework is essential to ensure their accessibility, comprehension, and preservation as part of an open-air museum. The pedagogical approach employed was experiential learning, emphasizing hands-on engagement through study excursions, lectures, and direct interaction with experts from different fields and generations. Participants had the opportunity to collaborate with architects specializing in restoration, craftsmen, artists, and museum curators. This way they enriched their understanding of cultural heritage through practical experience. This approach proved to be significantly more effective in deepening and sustaining students' knowledge acquisition compared to conventional lecture-based learning. Middle school students, in particular, showed a more profound curiosity concerning heritage buildings and architectural ensembles through active participation in the program. Data on information retention and learning outcomes were collected via questionnaires administered at the conclusion of the summer school. The majority of respondents gave a positive feedback regarding the experience, highlighting its effectiveness in providing knowledge acquisition. Furthermore, an unexpected yet notable outcome was the formation of friendships between certain university and middle school students within a short timeframe. Additionally, several participants expressed a newfound interest in pursuing careers dedicated to the preservation and restoration of built heritage.

Keywords: Teaching methods, built heritage, wooden heritage, experiential learning



Historical Units of Measurement in Architecture and their Reflection in Historiography and Cultural Heritage Restoration in Slovakia

Jana Pohaničová ¹, Kamila Kráľová ^{2*}, Pavol Pauliny ¹ & Matúš Kiaček ¹

¹ Institute of History and Theory of Architecture and Monument Restoration Slovak University of Technology in Bratislava, Bratislava, Slovakia

² Department of Architectural Restoration Slovak University of Technology

ABSTRACT

The topic of historical units of measurement, as well as geometric and proportional relationships in architecture, has not yet been systematically addressed in historiography or in cultural heritage restoration, neither in Slovakia nor in the wider European context. Although historical units and proportional principles played a fundamental role in architectural design, they are still not consistently integrated into the current methodology of research and restoration of historical buildings. This paper argues that deeper knowledge of these topics has the potential to contribute to a comprehensive understanding of authorial creative practices, architectural form and design principles of historical buildings. The paper presents a brief historical overview of historical units of length, their application in architecture and reflections on their use in architectural practice. This is complemented by an exploration of their current relevance for research in the field of architectural history and heritage conservation. Special attention is devoted to selected case studies from Slovakia – a territory shaped by European influences – illustrating the importance of historical principles of scale and proportion in architectural design. The first case study analyses a Classicist manor house in Blatnica, in which proportional schemes based on classical principles were identified. The second case study focuses on selected works by Michal Milan Harminc (1869–1964), an exceptional architect from the Central European region, whose works oscillate between historicism, modernism and functionalism across the former Austro-Hungarian Empire and its successor states: Serbia, Hungary, Ukraine, and Slovakia. His relationship to historical architecture, its proportions and scale is evident in his designs and renovations of buildings of various typologies, including religious architecture and cultural buildings with national content. His knowledge of historical measurement systems is applied to the reconstruction of the Church of the Visitation of the Virgin Mary in the village of Rabča in the Orava region. The functionalist reconstruction of the church from the 1930s was based on the original architecture of the Baroque church. It took place after the Metre Convention, which introduced the metre as the only official unit of measurement. Although Harminc no longer used historical units when designing the reconstruction, he incorporated the geometric and proportional principles of Baroque aesthetics into his design. The final case study analyses three of Harminc's buildings for the Slovak National Museum, which reflect classical design principles. These buildings exhibit an evolution – from the subsiding neoclassical language in Martin, through the distinctive formation of official monumentality in Bratislava, to the definitive adoption of rational functionalist forms once again in Martin. The paper underscores the need for further research into historical units and proportions as a prerequisite for the future development of

more sophisticated methodological approaches in the study and restoration of historical buildings. It also highlights the importance of this knowledge for preserving architectural authenticity and deepening our understanding of its historical context in the regional setting. Finally, it offers new insights into the background of the work of architect and builder M. M. Harminc, an important personality for the wider European territory.

Keywords: Architecture; historical measurements; proportions; traditional units; Harminc; Slovakia; heritage conservation; photogrammetry; photogrammetric measurement; geometric analysis; Slovak architecture; non-metric systems; modular analysis

On the Use of Sustainability Rating Systems in the Green-BIM Environment: A Methodological Approach

Zhiyuan Xin ^{1*}, Giuliano Dall'O' ¹, Marco Torri ¹ & Xinyan Chen ¹

¹ Department of Architecture, Built Environment and Construction Engineering Politecnico Di Milano

ABSTRACT

Environmental concerns such as global warming are increasing the demand for green buildings. The most important decisions about a building's sustainable character are made during the design and pre-construction phases. Green building design needs to comprehensively consider factors such as geography, climate, materials, and cost, which is a highly complex multidisciplinary research problem. There is an urgent need for collaboration and the adoption of advanced modelling and simulation technologies, including BIM, parametric design, cloud platforms, and performance simulation. With its ability to facilitate a seamless flow of information throughout the entire design phase, BIM technology plays a pivotal role in sustainable building design. It can exchange data with various sustainability analysis software through common format files, enabling the simultaneous realization of the design, simulation, and optimization processes. The paper proposes the results of a research carried out at the ABC Department (Politecnico di Milano), whose aim is to define, model and test an interactive sustainable architectural design methodology using the LEED® Protocol in a BIM environment. The study explores how to effectively combine BIM technology with green building information statistics, performance analysis, and green building evaluation systems in the design phase of the project, to refine the process of optimizing green building strategies. In this research, a case study of a student residence complex in Milan is demonstrated for the use of BIM in the sustainable design and LEED® certification process. The study demonstrates that applying BIM-based sustainability statistics and analysis software for preparing documentation can significantly ease the process of achieving LEED® credits, thus reducing the time and resources needed for LEED® certification. As a result, up to 61 LEED® points and two prerequisites can be documented using results generated by BIM-based software, which is already over half of the total points in the LEED® rating system. This study has contributed to the field of multidisciplinary sustainability research, and is an important supplementary optimization for green building evaluation.

Keywords: Building information modeling; green building evaluation; LEED® rating system; performance optimization; sustainability



Thermal Mass and Low-Tech Air Cooling as Ecological Climate Adaptation: Simulating Overheating Mitigation in German Multistorey Buildings

Alexander Kader

Urban Planning and Architectural Design (Upad) German University of Technology in Oman (Gutech)

ABSTRACT

This paper explores strategies to retrofit the existing building stock with effective cooling solutions to address the growing challenge of heat waves under future climate conditions. In Germany, many multistorey apartment buildings constructed after the second world war experience interior temperatures during summer heat waves that exceed comfort thresholds, often reaching intolerable levels. These buildings typically have no air conditioning, and with climate change, extreme heat events are becoming increasingly frequent and intense. Historically, efforts to improve building performance have focused primarily on insulation and energy efficiency to retain warmth during colder seasons. As heat waves were milder in the past, active cooling was seldom a priority. The paper seeks to illustrate the extent to which passive cooling strategies, specifically the use of thermal mass and low-tech ventilation systems, can improve indoor climate conditions in existing buildings. By employing simulation tools, the study aims to demonstrate the effectiveness of these measures in mitigating indoor overheating in summer, thereby supporting the development of practical, climate-responsive retrofit approaches. To what extent can overheating during summer in typical post-war and contemporary apartment buildings be minimized through passive strategies such as enhanced thermal mass and natural or low-tech ventilation? Can these measures adequately prepare the existing building stock for the longer, more intense heat waves anticipated in the coming decades? Three representative multistorey residential buildings were selected for analysis. Using "Climate Studio" software, a series of thermal simulations were conducted to assess indoor environments, focusing on temperature, humidity, and airflow. Various retrofitting options were modeled, testing combinations of thermal mass enhancement and passive (primarily nocturnal) ventilation strategies. From these simulations, the most effective measures were identified, leading to the development of adaptable design principles for broader application. The study shows that indoor temperatures can be substantially lowered through the use of thermal mass and passive ventilation techniques. In the simulated scenarios, temperature reductions of approximately 5 to 7°C compared to outdoor conditions were achieved, effectively maintaining indoor temperatures within the thermal comfort range during most summer heat waves. However, a few exceptional periods were identified where indoor temperatures rather briefly exceeded comfort limits during extreme heat events. The combination of passive ventilation and thermal mass proves to be a key strategy for effectively and ecologically reducing indoor overheating in existing buildings. However, the extent to which these measures can be implemented depends on factors such as the structural capacity to add thermal mass and the feasibility of integrating measures like cross-ventilation, ventilation shafts, or other related

passive design techniques such as sun shading. While general principles for effective retrofitting can be established, their application must be carefully adapted to the specific characteristics and constraints of each building.

Keywords: Climate change adaptation, ecological retrofitting, natural ventilation, passive cooling, thermal mass

Efficiency and Rethenology Works of Irrigation Systems Applied in Local Irrigation Arrangements

Ioana-Alina Cretan

Hydrotechnical Engineering Department Polytechnic University of Timișoara

ABSTRACT

The importance of the topic addressed should no longer be questioned, if we only take into account the current state of irrigation systems in Romania, the current decline of national agriculture, a decline aggravated by the droughts of the last decade, the alarm signals raised by local specialists in the field and the need to take the first steps towards functional efficiency, at least of the irrigation systems still usable. Among these are the irrigation systems in the west of the country, the Fântânele – Șag Arad irrigation system, being just one of the systems taken into consideration as an analyzed case study.

Keywords: Irrigation systems, local irrigation arrangements

Green Building Transformation in Riyadh: A Data-Driven LEED Analysis

Hala Sirror ^{1*} & Asad Ullah Khan ²

¹ Department of Architecture Prince Sultan University

² Sustainability and Certification Management Department Qatar Green Leaders.

ABSTRACT

Sustainable development is becoming a defining theme in global urban planning, with the LEED (Leadership in Energy and Environmental Design) certification system widely recognized as a key benchmark for environmentally responsible construction. In Saudi Arabia, this momentum aligns strongly with Vision 2030, which prioritizes ecological stewardship, energy efficiency, and resilient urban growth. This study investigates the growth of LEED-certified and registered projects in Riyadh between 2008 and 2024, focusing on certification trends, registration patterns, certification levels, and the adoption of LEED rating system versions. A total of 702 projects achieved certification during this period, with the majority (622) completed under the LEED 2009 (v2008) system. Silver-level certifications were most prevalent (533 projects), followed by Gold (117), with the remainder distributed among Certified and Platinum levels. The analysis reveals a steady upward trajectory in both registrations and certifications, reflecting increasing commitment to green building standards. These insights contribute to a more profound understanding of Riyadh's evolving sustainability landscape and offer guidance for future urban and environmental planning.

Keywords: LEED certification, Riyadh, sustainable buildings, Vision 2030, green urban development

Sustainable Buildings for Next Generation – Between Technology, Aesthetics and Ethics

Mirela-Adriana Szitar-Sirbu

Department of Architecture Polytechnic University of Timișoara

ABSTRACT

Sustainable development has become in the past decades the main topic of political and academic discourse at global level. Addressing the issue of sustainable buildings involves a paradigm shift and an overall change in scientific research and also in design practice, moving towards interdisciplinary approaches, but in architecture education sustainability is understood by most of the students in technical and ecological terms. A previous study of the author revealed that the same is true for most of the architects and engineers. This is a simplistic way of perception, which does not take into account all the changes that the concept of sustainable buildings has undergone over the last 20 years. For this reason, a reformulation of the problem is necessary. Beyond the issue of the pillars of sustainable development that was dealt with by the students in the discipline “Sustainable Buildings” in the previous year, in this year in the “Aesthetics” discipline a critical development of the subject continues starting from an article published in 2001, “Reinterpreting Sustainable Architecture: The Place of Technology” by S.Guy and G.Farmer. This approach relates the image of space, the source of environmental knowledge, the building image, technologies and the idealized concept of place in order to define what the authors define six types of competing "logics" of sustainable architecture. The authors' approach was considered more relevant in terms of openness to diversity and questioning what is considered the status quo in sustainable buildings. As the future sustainable architecture depends on how the young generation relates to the concept and tries to find best solutions, this article presents a research that has been conducted over the last two years on the relationship of future architects with the ideas presented in the 6 types of "logics": eco-technic, eco-centric, eco-aesthetic, eco-cultural, eco-medical and eco-social. The methodology aimed in the first phase to clarify the concepts and present them through specific examples. In the second phase, students were asked to individually answer the question: “In approaching sustainability in your future career as an architect, what would be the two most important logics for you and why do you think this is the right path?”. By answering this question, they develop their critical thinking related to the subject. In 2025, 53 students chose to answer this questionnaire. The third phase consisted of centralizing and analyzing the results. The research has a quantitative aspect, on the one hand, because it shows trends of the younger generation, but also a qualitative aspect on the other hand, because it answers the question of why. As for the qualitative analysis, it tries to relate aspects considered important by future architects to personal opinions and, respectively, to the way architecture is taught and learned within FAUT. The conclusions speak for themselves and show us that we live in a world with multiple opinions, in which architecture will continue to be diverse and inclusive.

Keywords: Sustainable buildings, architecture education, aesthetics, technology, ethics, critical thinking



Optimizing Energy Efficiency and Renewable Energy Integration at the Mechanical Engineering Faculty Building, Sarajevo

Nurin Zečević^{1*}, Azrudin Husika² & Ejub Dzaferovic²

¹ Department of Process Engineering Mechanical Engineering Faculty, University of Sarajevo

² Department of Energy, Process Engineering and Environmental Engineering University of Sarajevo, Mechanical Engineering Faculty

ABSTRACT

This study presents a methodological framework for determining the optimal combination of energy efficiency measures and renewable energy sources technologies, through a case study of the Mechanical Engineering Faculty at the University of Sarajevo. The main objective is to define a strategy for enhancing building sustainability by simultaneously addressing energy performance, environmental impact, and financial feasibility. The proposed framework enables multi-criteria decision-making in complex energy retrofit projects where conflicting objectives are often encountered. The methodology is based on the creation of six retrofit scenarios, each integrating various energy efficiency measures (e.g., building envelope insulation, high-efficiency heating, and cooling systems) and renewable energy sources technologies (e.g., solar thermal systems, photovoltaic panels). Scenario evaluation is conducted through defined criteria divided into three categories: energy (e.g. energy consumption for heating, cooling, and domestic hot water preparation), environmental (e.g. direct and indirect carbon-dioxide emissions, embodied carbon), and financial (e.g. total implementation cost). Energy simulations were performed using the KiExpert software, while the scenario ranking was conducted using the VIKOR multi-criteria decision-making method. The results indicate that Scenario S5 (ground-source heat pump combined with a natural gas condensing boiler, a mechanical ventilation system with heat recovery, graphite EPS insulation, and PVC–aluminium windows) is the most favourable from energy and investment standpoints. Conversely, Scenario S3 (biomass boiler, hemp insulation, wood–aluminium windows, and external shading devices) offers the best environmental performance while also ranking second in terms of investment. These findings suggest that the final choice depends heavily on investor preferences, underscoring the need to balance sustainability targets and economic constraints (e.g. decreasing energy consumption, increasing RES share, minimizing costs). The developed methodology is applicable to energy retrofitting of various building types, particularly in contexts of integrating EE and RES measures. A comprehensive, integrated design approach and implementation of synergistic solutions in the field of energy efficiency and renewable energy sources, are key factors in the transition to a sustainable and resilient construction sector, with the aim of reducing energy consumption and operating costs, improving the quality of the living environment and reducing the negative impact on the environment.

Keywords: Energy efficiency, RES, optimization, public buildings, multicriteria analysis

Designing the Virtual Landscape Observation Tower (VLOT) and Optimizing Its Location Using Network Modelling as a Form Oof Tourism Activation

Anna Maria Kowalczyk ^{1*}, Szymon Czyża ² & Renata Pelc-Mieczkowska ²

¹ Department of Geodesy University of Warmia and Mazury in Olsztyn

² Department of Geoinformation and Cartography University of Warmia and Mazury in Olsztyn

ABSTRACT

Motivation for undertaking the research was rising of a question – what is the most rational way of choosing areas in the cities, in which it would be appropriate to invest so that the whole city structure would benefit? Also - what kind of element could be applied to the area in a way that it would not interfere with a landscape but would be attractive for tourists? The authors of this article used a theory of six value aggregation paths, to model esthetic values of a landscape in a network. Then, by exploring the character of these networks, they used a scale-free network theory to identify nodes – centers of this network, but also they have defined and identify leading nodes which can, or even should become a centers to solidify a network structure. Scale-free network theory says that scale-free structures have center nodes, which are points of greatest importance in the structure of the whole network. It is based on the fact that if their functionality is cut off, or they become destroyed it would lead to serious disturbances in the functioning of the whole structure of the network and that improving, expansion and development of new centers leads to greater resistance for disturbances in functioning. In this regard, modelling of the spatial phenomenon into a network and its analysis in terms of scale free structures, could bring very useful conclusions.

Keywords: Virtual landscape observation tower, theory of six value aggregation paths, scale-free network, digital placemaking, GIS, UAV, landscape management



Assessing Public Transport Accessibility through the PTQC System: The L'Aquila Case Study

Martin Grabner ^{1*} & Gino D'Ovidio ²

¹ Faculty of Architecture and Planning Technical University of Vienna

² Civil, Construction-Architectural and Environmental Engineering Department University of L'Aquila

ABSTRACT

Assessing public transport accessibility is crucial for effective urban and regional planning. This paper focuses on the Austrian Public Transport Quality Classes (PTQC) system, a standardized assessment method, which is utilized to evaluate accessibility in various geographical contexts. Based on Swiss methodologies, the PTQC system considers several factors, including service frequency, transport hierarchy, and pedestrian access to stops. It categorizes transport areas into seven quality classes (A-G), ranging from high accessibility in well-served urban zones to more basic service in peripheral areas. This study investigates the development, methodology, and application of the PTQC system, emphasizing its importance in spatial planning, infrastructure management, and public transport optimization. To test its applicability, the PTQC methodology was adapted to the city of L'Aquila, located in central Italy's Apennine region. L'Aquila presents distinct challenges, including its hilly landscape, historic urban structure, and ongoing post-earthquake reconstruction. The analysis involved a comprehensive approach, incorporating data collection, adjustments to classification criteria, and spatial analysis using GIS tools. The findings reveal significant disparities in public transport accessibility. Only a few key transport corridors leading to the city center met the required quality standards, indicating near-sufficient coverage. In contrast, peripheral areas show a noticeable decline in public transport quality, with longer waiting times and less frequent service. Notably, several districts rebuilt after the earthquake remain inadequately served, creating mobility issues for residents. The study also emphasizes the need to improve intermodality, particularly enhancing connections between low-accessibility residential areas and major transport hubs. A comparative analysis with an Austrian city revealed a functional gap in public transport within the study area and demonstrated the PTQC system's adaptability to different urban settings. However, the integration of real-time data is critical to refine the accuracy of assessments, especially in areas with fluctuating seasonal transport demand. Ultimately, the PTQC system proves to be an effective tool for urban mobility planning and the optimization of public transport services in diverse territorial contexts.

Keywords: Urban and spatial planning, urban development, public transportation accessibility, Infrastructure management, GIS analysis



Reflections Beyond the Mountain: Expressing the Everyday Life of the Territory and Its People on Walls

Cláudia Beato ^{1*}, Daniel Pacheco ² & Paulo Carvalho ³

¹ Deca -Architecture and Civil Eng. Department Ubi -Beira Interior University and Geobiotech

² Deca - Architecture and Civil Engineering Department Ubi - Beira Interior University

³ Department of Civil Engineering and Architecture and Gebiotec Beira Interior University

cbeato7@gmail.com

ABSTRACT

This article explores the evolution of urban art, emphasizing its connection to everyday life, territory, cultural identity, and urban design. Urban art is presented as a form of expression that mirrors the social, cultural, and political dynamics of contemporary cities, fostering dialogue and driving transformations in public spaces. The research aims to understand how urban art has evolved over time, considering historical, social, and environmental factors. It also examines the relationship between territory and artistic identity, the diversity of artistic languages, and the social impact of art on local identities. From this perspective, urban art is viewed as a tool for social transformation, capable of provoking reflection on issues such as inequality, politics, and the environment. It encourages interaction with residents by promoting community participation in related discussions and events. In Portugal, urban art gained prominence in the 1980s with the emergence of groups like the Criminal Assassins Crew (CAC) and the Pain Rackin' Máfia (PRM), which helped establish graffiti as a significant art form in the country. From the 2000s onward, urban art began to be recognized as a legitimate form of artistic expression, supported by spaces such as the Urban Art Gallery (GAU) and the Underdogs platform, which promote urban art and public engagement. Covilhã, a city in the interior of Portugal, has emerged as a significant national hub for urban art, integrating this form of expression into its urban and cultural fabric. Here, the Urban art not only reflects local identity but also contributes to the revitalization of public spaces and promotes the city as a cultural and tourist destination. The city, once a major center of Portugal's textile industry, has seen many of its industrial buildings fall into disrepair over the years. Urban art has become a tool for rehabilitating these spaces, transforming old factories and dilapidated walls into canvases that tell stories and celebrate the region's cultural heritage. Many of the murals in refer wool and the textile industry, paying homage to the city's past while projecting a contemporary and creative vision for the future. The primary catalyst for urban art in Covilhã has been the Wool – Festival of Urban Art, which began in 2011 and has turned the city into an open-air museum. The festival invites national and international artists to create murals and artistic interventions in buildings and public spaces, addressing themes ranging from Covilhã's industrial history, known for its textile tradition, to contemporary social and environmental issues. The festival not only enhances the city's aesthetic appeal but also fosters dialogue between art, the community, and local heritage. In addition to the Wool Festival, the city has seen the rise of other initiatives that promote urban art, such as workshops, exhibitions, and community projects that involve the local population in the creation and appreciation of art. These initiatives not



only enrich the urban environment but also strengthen the sense of belonging and identity among the city's residents. Urban art I've also had a significant tourist impact, as murals and artistic interventions attract visitors interested in art and culture, contributing to the local economy and diversifying the region's tourism offerings. The importance of urban art for the city's urban design is undeniable. The integration of murals and artistic interventions in public spaces not only revitalizes degraded areas but also redefines the urban landscape, making it more attractive and dynamic. Urban art contributes to the creation of a unique visual identity for the city, reflecting its history, culture, and future aspirations. Furthermore, urban art promotes social interaction and citizen participation, strengthening the bond between residents and the spaces they inhabit. Through interviews, a historiography of the evolution of urban art interventions, and the collection of significant testimonies, this article seeks to highlight the specificities of this artistic expression. It aims to understand urban art in the context of its historical evolution and to critically and proactively analyze the spaces, emotions, and landscapes it creates, particularly in the case of Covilhã. This analysis can be further expanded with the introduction of new technologies, such as augmented reality.

Keywords: Urban art, cultural identity, public space revitalization, Covilhã, urban design

Proximity to Priority: the 15-Minute City Reframed for Timișoara – Survey-Based Study

Ioana Antonia Tănase^{1*} & Cristina Maria Povian¹

¹ Department of Architecture Polytechnic University of Timisoara

ABSTRACT

15-Minutes City Concept has recently gained increased attention from specialists focused on accessibility, comfort and functional urban spaces. It primarily promotes spatial proximity of essential needs in terms of living. When adapted to the specific context of each city, it can become a powerful tool for increasing the quality of life. One of the groups that benefit the most consists of people with disabilities and those facing accessibility challenges. The study aims to analyze the compatibility of Timișoara, Romania with the 15-Minute City concept. As the European Capital of Culture in 2023, the city had experienced a notable increase in civic engagement and cultural activities. It has contributed to a new population outlook, focused more on accessibility and inclusive design. As most of the studies on this topic are focused on western Europe, analyzing technical data (maps, GIS, mobile data), this study, at this initial state, is focused on citizen opinion, behaviors and needs. The methodology used was a written survey, conducted among a total of 605 participants, of which 506 live in Timișoara or in its suburbs. Approximately 20% of the responders experience some form of disability or impairment. The survey was addressed online and also randomly on the street, in order to ensure inclusion of individuals that are not active on social media, particularly elderly respondents. The street-based data collection was addressed in three different areas of Timisoara: city center (Liberty Square), residential area (Bălcescu district) and a commercial area (Iulius Town). The survey is focused on respondents' willingness to walk, frequency of accessing different types of public spaces and the factors influencing their pedestrian route choices. The charts resulting from the survey can provide a clearer understanding of which urban functions citizens consider essential over others, a fact that leads to the need of locating these spaces in closer proximity than others. The results provide a short sight of the perspective of how the citizen align with the characteristics of the city in the context of 15 minutes city concept. There are major compatibilities in terms of walking time, frequents visits to green spaces, but also, in contrast with these, current limitations are car dependency, gaps in services like healthcare and accessibility services. Overall, the results are valorous, being able to lead the future technical research to have a better understanding of the phenomena and implementing a 15-Minutes City model for Eastern European context.

Keywords: 15-minute city model, Timișoara, urban planning, public spaces, inclusive design, survey, accessible spaces

Cities and Extreme Weather Phenomena: How Urban Design Can Work in Mountain Cities and Promote a Smarter City - The Case of Covilhã, Portugal

Cláudia Beato ^{1*}, Luis Manuel Ferreira-Gomes ², Daniel Pacheco ³, Rui Mendes ⁴ & Paulo Carvalho ⁵

¹ Deca -Architecture and Civil Eng. Department Ubi -Beira Interior University and Geobiotech

² Department of Civil Engineering and Architecture University of Beira Interior

³ Deca - Architecture and Civil Engineering Department Ubi - Beira Interior University

⁴ Department of Engineering Municipality of Ameida

⁵ Department of Civil Engineering and Architecture and Geobiotec Beira Interior University

ABSTRACT

Covilhã is a mountain city in the central interior of Portugal, currently with around 46,000 inhabitants, relatively close to the Spanish border, with its center at an average elevation of 700 meters. Its location on the slopes of the Serra da Estrela, the highest mountain range in mainland Portugal at around 2,000 meters, was due to its importance as a defensive site in the face of Spanish and Arab raids during the Middle Ages. The settlement is said to have had a fence and later a castle and developed mainly with the increase in the production of home-made cloths, since flocks of sheep grazed in the hills and there was plenty of water, especially in the two streams that ran north and south of the settlement. Until the second half of the last century, the town developed around its medieval core, expanding a little, especially from the 17th century onwards, between two streams that would delimit it to the north - Ribeira da Carpinteira, and to the south - Ribeira da Degoldra, and where the main wool industries would be located. Around the city, the hillsides were wooded, and the city's climate was characterized by four distinct seasons, with winters where it snowed in the city and hot summers. After a major fire at the beginning of the 1980s, most of the trees on the hillside burned down. Since then, especially in the last decade, the four seasons have blurred, with a significant variation in temperature and rainfall, with intense rainfall and hot, dry weather. It is thus in the upper area, with its narrow, sloping streets and narrow sidewalks, that the greatest circulation and mobility problems are felt when it rains heavily, where the water accumulates and/or runs violently into the valley, without being used for any purpose. This article shows some of the solutions proposed for the design of sidewalks and complementary means of using water to produce energy to meet lighting needs, among other ways. While still in the study phase, the aim is to show a rethinking of the urban design of this type of place, where the construction of a smart city is done through urban design and its integration into the circular economy, bearing in mind the use of the characteristics of the place to build "new images of the city".

Keywords: Covilhã, climate changes, urban design, Portugal 2030, resilient city

Proposals for Nature-Based Solutions (NBS) for the Sustainable Rehabilitation of the Ponte Gêa Neighborhood in Mozambique

Michael Mendes Dos Santos ^{1*}, Ana Teresa Vaz Ferreira ² & João C. G. Lanzinha ¹

¹ Department of Civil Engineering and Architecture University of Beira Interior

² Civil Engineering Department Polytechnic Institute of Castelo Branco

ABSTRACT

The increasing impacts of climate change on urban areas, particularly in vulnerable regions like coastal Mozambique, necessitate innovative approaches to urban planning and management. Nature-Based Solutions (NBS) have gained recognition as effective strategies to address urban challenges, offering sustainable methods for managing water resources, enhancing resilience, and improving living conditions. Despite their proven benefits in various global contexts, there is limited application and research on NBS in African cities, making this study particularly relevant. This research focuses on the sustainable rehabilitation of the Ponte Gêa neighborhood in Beira, Mozambique, utilizing NBS to improve environmental performance, mitigate climate risks, and promote social inclusivity. The methodology involves a comprehensive assessment of the local climatic conditions, hydrological systems, and socio-economic characteristics of the Ponte Gêa neighborhood. Field surveys and data collection were conducted to identify critical areas for intervention, focusing on flooding risks, urban heat island effects, and the availability of green spaces. Analytical methods include hydrological modeling and spatial analysis to determine optimal locations for NBS implementation, such as rainwater harvesting systems, urban reforestation, and green corridors. The main results demonstrate that the proposed NBS can significantly reduce the risk of urban flooding through enhanced infiltration and rainwater retention. The implementation of green spaces and vegetative barriers is shown to decrease surface temperatures, mitigating the urban heat island effect. Moreover, the integration of NBS has the potential to increase local biodiversity and provide new recreational areas for residents, fostering a stronger sense of community ownership and well-being. A critical discussion highlights the challenges of adapting NBS to the local socio-economic context, including initial investment costs and the need for capacity building within the community. In conclusion, this study provides a model for the sustainable rehabilitation of urban areas in Mozambique through Nature-Based Solutions, emphasizing their role in building climate resilience in coastal regions. The findings suggest that NBS can serve as a viable alternative to traditional engineering approaches, with long-term benefits for environmental management and community development. The proposed interventions in Ponte Gêa could be adapted for similar contexts across Sub-Saharan Africa, contributing to the broader discourse on sustainable urban development in climate-vulnerable regions.

Keywords: Nature-Based Solutions (NBS); Sustainable Rehabilitation; Climate Resilience; Urban Flooding Mitigation; Mozambique

Retention Canals as an Effective Approach to Retention of the Rainwater in Urban Area

Daniel Słyś^{1*} & Józef Dziopak¹

¹ Department of Infrastructure and Water Management Rzeszow University of Technology

ABSTRACT

The increasing urbanisation of urban areas, combined with the development of underground infrastructure, requires an efficient way to drain and manage rainwater in urbanised areas. Planned cubic structures, which are mainly used to collect excess rainwater and control its flow in the network, are very expensive and require open land for their construction, which in many cases limits their use. A modern system that allows the temporary retention of rainwater in the sewerage network is an innovative storm sewer system equipped with baffles. This solution has been used in dozens of large infrastructure investments in Poland. The publication discusses the idea and the principle of operation of the solution, addresses the issue of financial efficiency of the investment and presents a selected case study.

Keywords: Rainwater, drainage, innovation, water management, infrastructure, urban areas, wastewater system

Green Roof Systems in Civil Engineering and Urban Resilience

Szymon Dawczynski

Department of Structural Engineering Silesian University of Technology

ABSTRACT

The paper explores the role of green roof systems in advancing sustainable urban development and enhancing civil engineering practices in the face of growing climate-related and environmental challenges. The primary objective is to provide a comprehensive overview of green roofs as multifunctional, nature-based solutions that address key urban issues such as storm water management, urban heat island mitigation, air quality improvement, and biodiversity support. Drawing on recent research, and technical guidelines, the paper examines the structural engineering requirements, environmental performance metrics, regulatory frameworks, and urban planning strategies related to green roofs. It highlights both the benefits and limitations of current systems, including structural load constraints, maintenance challenges, and different local policies. The findings emphasize that successful implementation of green roofs depends on interdisciplinary collaboration, standardization of performance criteria, and supportive economic and regulatory instruments. Ultimately, the paper concludes that green roof systems represent a critical component of climate-resilient urban infrastructure and should be mainstreamed into civil engineering design, public policy, and sustainability agendas to meet the complex demands of future cities.

Keywords: Green roofs; sustainable urban development; urban resilience; ecosystem services; green infrastructure; environmental performance; climate adaptation

New Political Terrains? Mosaic Mowing in Timișoara's Parks

Mihai-Cristian Cojocaru

Faculty of Government and Communication Sciences West University of Timisoara

ABSTRACT

This article offers a critical media analysis around the topic of mosaic mowing as the newly adopted and then abruptly discontinued public parks maintenance strategy by the city hall in Timișoara, Romania, in the spring of 2025. The newly established green spaces mowing regime lasted less than five weeks after a series of significant media criticisms about the ecological disservices of the new mowing regime brought onto the local community, which ultimately forced the mayor to call off the new strategy. Within this context, the article explores the competing urban nature representations at play in Timișoara's local urban discourses, as it unpacks the discursive media articulations around the topic of mosaic mowing and the competing visions around the nature's role and place in rapport with the urban in the context of this technique's claimed benefits to improve urban biodiversity. The application of the critical discourse analysis on the bodies of text produced on this topic by the two most popular local online journals, Tion and Opinia Timișoarei, indicated divergent public understandings in the local urban discourses around the role of nature in rapport with the urban, as either 'domesticated nature' or 'ecologically-centric nature'. More specifically, the urban nature representations portrayed in the local media appear to stem from a vision of 'rational', standardized and organized urban aesthetics, that depict a certain model of urban nature that is in need of 'domestication' in order to become 'urban-friendly', which contrasts with the city hall's newly discovered, and then abandoned, 'license' to experiment with the non-design of urban natures that promotes 'spontaneous urban nature' and eco-centric urban dynamics.

Keywords: Urban nature, urban development, urban aesthetics, mosaic mowing, biodiversity



Human and Environmental Risks and Humanitarian Planning in Covilhã

Cláudia Beato ^{1*}, Paulo Carvalho ² & Luis Manuel Ferreira-Gomes ³

¹ Deca -Architecture and Civil Eng. Department Ubi -Beira Interior University and Geobiotech

² Department of Civil Engineering and Architecture and Geobiotec Beira Interior University

³ Department of Civil Engineering and Architecture University of Beira Interior

ABSTRACT

This study, still in its exploratory phase, aims to identify some of the natural and human risks in the city of Covilhã, analyzing them from various perspectives, including the human, environmental and architectural impacts of tourism. Covilhã is home to a university with around 10,000 students and is in the Serra da Estrela Mountain range, which has made it more attractive to tourists. Regarding human risks, it has already been observed that there are workers, especially foreigners, in precarious working conditions, many of them employed in the hotel and primary sector. The shortage of affordable housing has been a growing problem, with rent prices rising since 2021, making it difficult to access decent housing, with intensifying competition for housing between non-Portuguese workers and the local middle class, which has put even more pressure on the real estate market. In methodological terms, this work seeks to combine quantitative data, namely from the municipality, and qualitative data (through interviews and focus groups with stakeholders), with the aim of analyzing trends in rent prices, housing costs and pressure on resources. At the same time, it seeks to assess perceptions and data on environmental and human risks. The first results indicate a significant increase in the number of accommodations for tourists and students, accompanied by a decrease in the availability of rental housing, which seems to be generating high pressure on the market. These aspects coexist with an improvement in the image of certain areas due to the requalification of heritage, but also with greater pressure on infrastructure, particularly in areas at risk of collapse or flooding. To mitigate the risks identified, some solutions could include the creation of social housing programs aimed at tourism workers and the middle class, with controlled prices and located close to workplaces, as well as encouraging the use of renewable energies in tourist establishments. Another gap that seems evident is the near absence of local community participation in urban and tourism planning, through public consultations and discussion forums, which may be resulting in less inclusive and sustainable urban and tourism development. Covilhã has the potential to become an example of sustainable tourism if it manages to balance economic growth with environmental protection and social justice. Continuous monitoring of housing prices and rents, coupled with inclusive policies, will be essential to ensure that tourism benefits the whole community, avoiding the exclusion of the middle class and workers in the sector.

Keywords: Human and environmental risks, Covilhã city, housing, tourism , humanitarian planning



Desiltation of the Pucioasa Reservoir, a Romanian case study

Adam Roxana ¹, Altan Abdulamit ^{2*}, Bedreaga Gheorghe ¹ & Asman Iulian ³

¹ Buzau-Ialomita River Basin Directorate National Administration “Romanian Waters”

² Hydrotechnical Engineering Technical University of Civil Engineering Bucharest

³ Monitoring of Dams Romanian National Committee On Large Dams

ABSTRACT

The Pucioasa earthfill dam, with a maximum height of 30.50 m, was designed for water supply with an initial volume at the Normal Operation Elevation (NOE) of 10.6 hm³. The main parts of the hydraulic development are: the earthfill contour dams, the spillway dam, the reservoir, the water intake and the hydroelectric power plant (HPP). The Pucioasa Reservoir is located in an area with geologic conditions mostly represented by fine compact layered, locally sandy marls, overlapped by formations of medium to large alluvial deposits along the main stream (Ialomita River) and clay-sand deluvium on the side slopes. Hence, the reservoir's sedimentation process was observed even from the first years of operation (1974-1976), mainly during the floods. The bathymetric survey revealed a continuously increasing degree of sedimentation, with an annual rate of about 2.30%, with the siltation percentages as follows: 70.0% in 2006, 76.6% in 2016, 83.27% in 2019, reaching almost 100% in 2024. The siltation endangers the safety of the dam structure itself and also there is a risk of overflowing the right bank of the contour dam. The overflowing risk of the right bank contour dam is favored by both the alluvial deposits in the reservoir close to the NOE and the backwater phenomenon. The backwater phenomenon is caused by the development of vegetation at the reservoir entrance, increasing the roughness and also reducing the stream's access section. Due to the high degree of reservoir sedimentation it is very difficult to provide its main uses, i.e. water supply and flood protection, extremely important since the reservoir is the sole water supply source for the region and taking into account the climate change and its effects context. The paper presents a practical case of desilting, part of a complex project carried out by The National Administration “Romanian Waters”, the main dam owner in the country. It aims to highlight and analyze the challenges during the implementation of the project (e.g., the emptying of the reservoir and its consequences) and to provide insights on how to possibly overcome those challenges and to reduce the negative effects that may occur.

Keywords: Dam safety, sedimentation, reservoir uses, desiltation



H House – A Contemporary Model of Rural Sustainable Construction in Bosnia and Herzegovina

Nejra Mujagic

Civil Engineering Bhvn Doo

ABSTRACT

H House is a prototype of sustainable rural housing developed in Bosnia and Herzegovina, designed to demonstrate the application of natural materials and near Zero Energy Building (nZEB) standards in low-tech, low-cost environments. The project explores the synergy between traditional construction techniques and modern ecological principles, utilizing locally sourced materials such as straw bales, timber, and clay to reduce embodied energy and carbon footprint. The structural system consists of a timber frame with straw bale infill, finished with breathable earthen plasters, ensuring thermal efficiency, vapor permeability, and occupant comfort. Passive solar orientation, high-performance insulation, and natural ventilation strategies enable the house to function with minimal energy demand, while a biomass stove and solar thermal collector provide heating and hot water. The construction process was conceived as an educational platform, involving young engineers, architecture students, and local craftspeople through hands-on workshops, bridging academic knowledge with practical skills. In addition to its technical innovation, H House contributes to the revitalization of rural areas by offering a replicable, resilient model of self-built, climate-responsive architecture. It promotes ecological literacy, gender inclusion in construction, and the empowerment of local communities through knowledge-sharing and sustainable practices. As such, the project serves as both a built experiment and a social intervention, reflecting the urgent need for regenerative building approaches in the face of environmental, economic, and demographic challenges.

Keywords: Sustainable construction, rural housing, straw bale architecture, natural materials, nZEB, passive design

Social Justice, the Elderly Mobility, and Sustainable Development in the Transport Sector

Elisabetta Venezia

Department of Economics and Finance University of Bari Aldo Moro

ABSTRACT

Policymakers and scientific literature have long focused on sustainability tools that enable the UN Sustainable Development Goals to be achieved. The elderly population's sustainable mobility will be the main topic of this paper. This is due to the fact that sustainability for the elderly will be a major focus for many countries. Therefore, by using a methodological approach of analysis, the paper will show how to achieve these goals, with the use of indicators that consider the primary mobility factors in relation to infrastructures devoted to the mobility of the elderly and the ensuing services that this population group can access will be compared. The idea is to be able to create a preliminary comparison of various realities and to arrive at representing how prioritizes equitable sustainable development. This method serves as the foundation for tracking the sustainability of mobility in relation to the Sustainable Development Goals of the UN. Therefore, making sure that no one is left behind—basically, a pursuit of social justice—is the fundamental idea driving the Sustainable Development Goals. Spatial equity gauges how rationally public services are distributed, while equity in the distribution of public resources means that all people have equal access to and rights over them. Therefore, this paper's primary contribution is to offer a technique that enables policymakers to assess the equity of transport services in light of the SDGs and to comprehend the efficacy and efficiency of the SDG-aligned European transport policy.

Keywords: Transport infrastructures, indicators, equity, social justice, elderly



Sustainable Methodologies and Strategies in School Rehabilitation

Ana Martha Carneiro Pires De Oliveira ^{1*}, João C. G. Lanzinha ², Ana Teresa Vaz Ferreira ³
& Andrea Parisi Kern ⁴

¹ Departamento De Engenharia E Arquitetura Universidade Da Beira Interior

² Department of Civil Engineering and Architecture University of Beira Interior

³ Civil Engineering Department Polytechnic Institute of Castelo Branco

⁴ Escola Politécnica Universidade Do Vale Do Rio Dos Sinos

ABSTRACT

This study investigates the importance of rehabilitating school buildings as a sustainable solution to improve teaching conditions, align school infrastructures with contemporary pedagogical requirements, and preserve architectural heritage. The research addresses the challenges schools face, such as structural deterioration, lack of thermal comfort, low energy efficiency, and inadequacy of new educational demands, proposing interventions that integrate sustainability, technological innovation, and architectural flexibility. The methodology critically analyzes specialized literature focusing on sustainable rehabilitation practices and integrating modern technologies in school settings. We considered criteria such as energy efficiency, waste management, and incorporating pedagogical technologies. The priority was identifying solutions that minimize environmental impacts while maximizing interventions' social and economic benefits. The main results highlight that school rehabilitation can reduce operating costs, extend the useful life of buildings, and create more comfortable and inclusive environments for students and teachers. In addition, the use of modern and less polluting materials, associated with up-to-date construction techniques, favors adaptation to environmental standards and the requirements of the twenty-first century. However, challenges such as high upfront costs, technical limitations, and lack of professional training still restrict the implementation of these practices on a large scale. Rehabilitating school buildings is crucial for promoting quality education in sustainable and innovative environments. To overcome barriers and make practical projects feasible, investments in public policies, technical training, and developing specific methodologies tailored to the school context are essential. This rehabilitation process transforms schools into conducive learning spaces and catalysts for urban revitalization and social inclusion, contributing to a more sustainable and equitable future.

Keywords: School rehabilitation; sustainability; pedagogical buildings

Characterization of Groundwater Quality by Statistical and Hydrochemical Methods of the Aquifer of Bazer Sekhra North –East Algeria

Bounab Samia

Département Des Mines Et Géologie, Université A.mira De Béjaia Algérie Faculté De Technologie, Université A.mira De Béjaia Algérie

ABSTRACT

The present study is an investigation into the characterization of groundwater quality, with a particular focus on statistical and hydrochemical methodologies. A total of twenty groundwater samples were collected and analyzed for a variety of physical (pH, electrical conductivity (EC), total dissolved solids [TDS]) and chemical (sodium [Na⁺], potassium [K⁺], calcium [Ca²⁺], magnesium [Mg²⁺], bicarbonate [HCO₃⁻], chloride [Cl⁻], sulfate [SO₄²⁻], and nitrate [NO₃⁻]) parameters. The objective of this analysis was to assess the quality of the groundwater. one sampling campaign was conducted in 2022 to describe the chemistry of the water and its interaction with the rock. The interpretation of the geological-geophysical and hydrogeological data reveals the presence of numerous formations, including the highlands of Djemila in the north, the Cenomanien clays formation, the Maestrichien marl, and the Ypresian clays. The Mio-Plio-Quaternary is predominantly present in the central region of the study area, encompassing the alluvial aquifer. The methodology used for the processing of the analysis results is based on multivariate statistical methods and characteristic ratios coupled with hydrochemical methods, as well as Stabler diagram and the descriptive statistics of physical and chemical parameters were applied to the data set. These analyses show that the tendency of the cations in the most samples of the groundwater are in the order of **Ca⁺⁺ > Na⁺ > Mg⁺⁺ > K⁺**, where **70%** of calcium are considered a dominant cation. However, tendency of anions is in the order of **HCO₃⁻ > SO₄²⁻ > Cl⁻**, where **50%**, consist of bicarbonate present in 80% of the groundwater samples. Evaluation of the water types using stabler diagram, show that the majority of the samples represents the **HCO₃⁻- Ca⁺⁺** type of water. Thus, the dominance of bicarbonates and calcite facies is about 80%. In addition, the water quality index (WQI) was used to evaluate the quality of water intended for drinking purposes. The results of the WQI showed that 40% of the total samples were suitable for drinking, according to the standards of the World Health Organization (WHO).

Keywords: Characterization, groundwater, hydro chemical methods, WQI, water quality.



Assessment of Surface Water Quality Using the Water Quality and IPO Index in Soummam Wadi, Algeria

Bounab Samia

Département Des Mines Et Géologie, Université A.mira De Béjaia Algérie Faculté De Technologie, Université
A.mira De Béjaia Algérie

ABSTRACT

Surface waters are subject to strong anthropogenic pressures caused by the development and extension of agricultural activities, as well as industrial and domestic activities. However, surface water is exposed to significant pollution as they collect domestic and industrial sewage and irrigation effluents. One of the most important resources in Algeria is the water of valley of Soummam (north-eastern Algeria). This study aims to assess and characterize water quality of Soummam wadi. For this purpose, the water quality parameters p H, the biological oxygen demand (BOD₅), chemical oxygen demand (COD), nitrites (NO₂⁻), nitrates (NO₃⁻), orthophosphate (PO₄³⁻), dissolved oxygen (O₂%), and ammonium (NH₄⁺) concentrations were included to assess the pollution status of the water. A number of water quality index are being used for assessing water quality and evaluated state of organic pollution in surface water in Soummam wadi including: organic pollution index (IPO), surface Water Quality Index according to Demmak.A, 2014, and nitrates (NO₃) toxicity following classification of Isaac et al 2009 were also determined. The results achieved in this study show that all stations indicate a moderate degree of pollution based on IPO index. According to the results obtained by index quality of water, and the classification of Isaac, they looked both similar and complemented the majority of stations have high concentration of BOD₅, DCO, and NO₃, showed the poor and very poor surface water quality.

Keywords: Surface water, pollution organic, IPO index, Soummam

Mineralization in the Tamezguida Region (North Central Algeria)

Hadj Mohamed Nacira ^{1*} & Abdelhak Boutaleb ²

¹ Earth Sciences Djillali Bounaama University

² Department of Geology Houari Boumedienne University

ABSTRACT

The Tamezguida mine (formerly “Mouzaia les mines”) is situated in north-central Algeria. The deposit Cu-Fe (Ni) of Tamezguida (former Mouzaïa mines) is located at the southwest end of the massif of Blida, 15km north-west of the city of Medea and at 80 km from the capital (Algiers). This deposit was exploited for copper by open pits from 1900 to 1963. The study area is an anticlinal structure, approximately axis oriented NE-SW. The main formation occurred in this area are represented by clayey sandstone shale (Neocomian, Barremian, Aptian) belonging to indigenous groups "Shale Chiffa", the Clayey sandstone formations topped by a limestone-marl facies belonging to the unity of the Albian, the Grés-conglomerate and marl formations, belonging to the Neogene sets (Miocene Lower and Middle). These formations are affected by a combined network of faults, trending NE-SW (sinistral) and NW-SE (dextral) and normal and reverse faults of direction E-W. The vein mineralization Tamezguida cashed in the unity of the Albian, characterized by a filling tension gashes, main NE-SW direction. This mineralization consists of gray copper that is the most abundant mineral, siderite, gersdorffite, chalcopyrite, pyrite, bornite and hematite. The results of this study show that the mineralizing fluids are quite warm with ice melting probably corresponding to a H₂O-NaCl system. In view of melting ice temperatures, salinities remain low.

Keywords: Tamezguida, copper, mineralization, Algeria.

Preliminary Assessment of the Effects of Controllable Factors on Rock Fragmentation at Djebel Medjounes Limestone, Setif, Algeria

Mohamed Fredj ^{1*}, Riadh Boukarm ², Abderrazak Saadoun ³, Kamel Menacer ⁴ & Radouane Nakache ⁵

¹ Department of Mining and Geology University of Bejaia

² Mining and Geology University of Bejaia

³ Mining and Geology Department University of Bejaia

⁴ Mining University of Badji Mokhtar Annaba

⁵ Mining Department University of Badji Mokhtar Annaba

ABSTRACT

This paper focuses on the critical role of blasting in quarrying and mining processes. Blasting efficiency significantly impacts all downstream operations, including loading, hauling, and crushing. The study identifies two categories of factors affecting blast results: controllable (blast geometry and explosive properties) and non-controllable (geological factors). The objective is to analyze how various blast design parameters influence rock fragmentation at Djebel Medjounes Quarry. The research was conducted at the Cement Company of Ain El-Kebira (SCEAK), located in Setif, Algeria. The quarry sits within the mountain of Djebel Medjounes, a region characterized by heavily jointed and fractured limestone. The area produces around 2 million tons of limestone annually for the SCEAK cement industry. The study analyzed five different blast events, considering various blast design parameters such as hole diameter, depth, burden, spacing, stemming length, and explosive properties. Rock samples were collected to evaluate uniaxial compressive strength (UCS) through laboratory tests. The fragmentation was analyzed using digital image processing with WipFrag software. The blasts were performed using a staggered pattern technique. The study used bulk explosives with an open cup density of 1 g/cm³ and a velocity of detonation of 4500 m/s at a hole diameter of 110 mm. Blast holes were drilled to depths ranging from 15 to 16.8 meters. Digital images of muck piles were captured post-blast and analyzed using WipFrag software. The software helped generate particle size distribution graphs, correlating the mean fragment size with various blast design parameters. The study found significant correlations between the blast design parameters and the resulting fragmentation: 1. Stiffness Ratio: High correlation with mean fragment size (correlation coefficient of 0.86). The stiffness ratio increases with the mean fragment size. 2. Powder Factor: A higher powder factor leads to finer fragmentation (correlation coefficient of 0.74). The powder factor also correlates with the UCS of the rock. 3. Spacing to Burden Ratio: Exhibited a weak correlation with fragment size. All the studied blast events produced good fragmentation, with a uniformity index ranging from 2 to 2.6. The study emphasized the importance of regularly assessing rock fragmentation to optimize blasting efficiency and reduce operational costs. The research concluded that controllable blast design parameters significantly

influence rock fragmentation. The stiffness ratio and powder factor showed high correlations with mean fragment size. Regular assessment and optimization of these parameters can enhance the efficiency and productivity of quarrying operations. Only five blast events were studied and analyzed in this research for a preliminary assessment. Further detailed research involving many blast events is required to contribute to the position of this research for the quarry studied based on their current practices and geological conditions. Uniaxial compressive strength is not the only rock factor influencing fragmentation. Further research should also include other rock mass properties, spacing and orientation of discontinuities, and the influence of explosives characteristics on fragmentation.

Keywords: Fragmentation, powder factor, stiffness ratio, uniaxial compressive strength, uniformity index, WipFrag



Effect of Blasting Parameters on Rock Size Induced by Fragmentation in Quarries: A Case Study

Abderrazak Saadoun ^{1*}, Mohamed Fredj ², Riadh Boukarm ³ & Kamel Menacer ⁴

¹ Mining and Geology Department University of Bejaia

² Department of Mining and Geology University of Bejaia

³ Mining and Geology University of Bejaia

⁴ Mining University of Badji Mokhtar Annaba

ABSTRACT

The blasting process in quarries and open-pit mines plays a very important key to achieving optimum performance from the mining company's technical and economic point of view. The magnitude of rock fragmentation is a crucial factor from an economic standpoint in any surface mining operation. The size of rock fragments directly affects drilling, blasting, loading, secondary blasting, and crushing expenses. However, the large number of parameters involved makes it difficult to control this operation. A number of studies have shown the benefits of taking into account all the parameters that affect the results of blasting. In particular, this study has highlighted the importance of designing a blast plan. The aim of our work is to study the influence of one of the controllable parameters (spacing between blastholes) on the results of blasting as a function of the parameters used in the quarry (Ain kebira cement limestone quarry, Setif - Algeria) in order to identify the most influential ones. This was done by simulating blasting plans using the digital software Wip Frag and the Kuz-Ram model, in which we changed the spacing between the holes, in order to evaluate and monitor the distribution of the size of the blocks in the blasted piles. The results of analyses performed using the empirical Kuz-Ram model and image processing using Wip Frag software, show that the reduction in the distance between blasting holes ensured good rock fragmentation.

Keywords: Rock size, blast design, spacing, KuzRam, Wip Frag



A comparative Analysis of Blast Fragmentation in Limestone Quarry of Lafarge Cement of M'sila (Algeria) Using WipFrag Image Software and the Kuz-Ram Empirical Model

Kamel Menacer ^{1*}, Abderrazak Saadoun ², Abdellah Hafsaoui ³, Mohamed Fredj ⁴, Riadh Boukarm ⁵, Djamel Eddine Boudjellal ³ & Tabet Abdelhak ⁶

¹ Mining Department Faculty of Earth Science, University of Annaba, Algeria.

² Mining and Geology Department University of Bejaia

³ Department of Mining Badji Mokhtar University-Annaba

⁴ Department of Mining and Geology University of Bejaia

⁵ Mining and Geology University of Bejaia

⁶ Mining Department Faculty of Earth Science -University of Annaba, Algeria

ABSTRACT

Blasting is the least expensive excavation technique for extracting hard rock from mines and quarries. It must be designed to produce rock of optimum size distribution for downstream processes such as loading, transport and crushing. The most profitable mining operation is one that achieves maximum production at minimum cost. The design of a blast design to achieve the optimum fragment size required will take into account controllable parameters to ensure that the desired blast yield achieved. Fragment size is the main parameter used to assess the effectiveness of a blast. This paper analyses the use of numerical methods using Wip Frag software and empirical methods using Kuz Ram to assess the fragment size distribution of a blast at the Lafarge cement quarry in M'sila (central eastern Algeria). This quarry faces several problems, especially in the size of the large rocks after each blasting, and this is due to the nature of the highly cracked rocks. As part of the study, five blasts carried out and the rock pile obtained after the blast analyzed using two methods: Wip Frag and Kuz-Ram. To assess the fragment size distribution, blasting parameters used for the KuzRam models and scaled Muckpile images were used for the Wip Frag analysis. The tree parameters X50, which indicates the average particle size, D80 and D90, which represent the size at which 80% and 90% of the material passes respectively, calculated for the five blasts. In conclusion, the results note that, when changing one of the parameters of the blast design, the results changed by both methods in the quality of the fragmented rocks. The Muckpile fragment size distribution results obtained using the Kuz-Ram model differ significantly from the fragment size distribution results obtained using Wip Frag. However, the size distribution curves show the same trend in both methods.

Keywords: Blast design, fragment size, rock blasting, Kuz-Ram, Wip Frag.



Design Blast Factors Assessment and its Effect on Rock Fragmentation at Limestone Quarry, Setif, Algeria

Mohamed Fredj^{1*}, Riadh Boukarm², Abderrazak Saadoun³, Kamel Menacer⁴ & Radouane Nakache⁵

¹ Department of Mining and Geology University of Bejaia

² Mining and Geology University of Bejaia

³ Mining and Geology Department University of Bejaia

⁴ Mining University of Badji Mokhtar Annaba

⁵ Mining Department University of Badji Mokhtar Annaba

ABSTRACT

Blasting outcomes significantly impact all subsequent operations in quarrying and mining. The factors affecting blasting results are categorized as controllable, such as blast geometry and explosive characteristics, or non-controllable, including geological conditions and regulatory requirements. Achieving optimal fragmentation requires careful adjustment of controllable parameters to align with non-controllable parameters. This study analyzed four distinct blast designs by examining the influence of blast design parameters on rock fragmentation. Rock samples from each blast face were tested, and digital images of the resulting muckpiles were processed using WipFrag 3.3 software to assess the fragmentation. Particle size distributions (PSD) were established for each blast, and mean particle fragment sizes (MeanPS) were correlated with the respective blast design parameters. For a gyratory crusher with a 1200 mm feed size, the percentage cumulative passing ranged from 89.1%–100%. The study found strong correlations between MeanPS and factors such as the stiffness ratio and powder factor (PF). Specifically, MeanPS increased with the stiffness ratio (correlation coefficient: 76.13%) and decreased as PF increased (correlation coefficient: 98.74%). Conversely, the spacing-to-burden ratio had a minimal effect on the fragment size. All four-blast events studied produced good fragmentation, with a uniformity index ranging from 1.16 to 1.61. The study concluded that blast design parameters significantly influence rock fragmentation. The stiffness ratio and PF showed a high correlation with MeanPS. Regular assessment and optimization of these parameters can enhance the efficiency and productivity of quarrying operations in the long term.

Keywords: Blasting, Fragmentation, Mean fragment size, limestone quarry, Djebel Medjounes, Powder factor, Spacing to Burden ratio

Effects of Spacing-to-Burden Ratio and Stemming Length to Reducing the Size of Blasted Rock

Abderrazak Saadoun ^{1*}, Mohamed Fredj ², Riadh Boukarm ³ & Kamel Menacer ⁴

¹ Mining and Geology Department University of Bejaia

² Department of Mining and Geology University of Bejaia

³ Mining and Geology University of Bejaia

⁴ Mining University of Badji Mokhtar Annaba

abderrazak.saadoun@univ-bejaia.dz

ABSTRACT

Effective rock fragmentation is critical for optimizing mining and quarrying operations, directly impacting downstream processes and costs. This study investigates the influence of two key blast design parameters, the spacing-to-burden ratio and stemming length on the reduction of oversize fragments during rock blasting at Lafarge limestone quarry of M'sila (CE of Algeria). The Rigidity Ratio (R R) of spacing/Burden and the length of the stemming are the most important parameters in the design of the blast, and they have a significant influence on the size of the rock fragments blasted. Different blasting at the quarry and field data of the particle fragment size distribution generated by the image processing software Wip Frag 3.3 demonstrate an inverse relationship between the spacing-to-burden ratio and mean fragment size, with optimal fragmentation achieved at ratios between 1.1 and 1.3. Similarly, stemming length significantly affects energy confinement within blast holes; an optimal stemming length, typically around 0.5 to 0.7 of the burden, maximizes energy utilization and reduces oversize large fragment production of quarry from 35 to 5 %. The interplay of these parameters with geological factors such as rock joint orientation and discontinuities further modulates fragmentation outcomes, and evaluating and continually optimizing these parameters can improve the effectiveness and productivity of extraction operations. The findings underscore the importance of carefully optimizing spacing-to-burden ratios and stemming lengths tailored to site-specific conditions to minimize oversize fragments, enhance fragmentation uniformity, and improve overall blast efficiency.

Keywords: Spacing; burden; stemming length; size of blasted rock; oversize fragments.

Investigation of Blast-Induced Fire, Smoke, and Gas behavior for the Protection of Underground Facilities

Mikheil Chikhradze ^{1*}, Edgar Mataradze ² & Nikoloz Chikhradze ³

¹ Engineering Physics Georgian Technical University; G.tsulukidze Mining Institute

² Explosion Technologies Laboratory G.tsulukidze Mining Institute

³ Director, Chief Researcher Lepi Grigol Tsulukidze Mining Institute

ABSTRACT

Underground facilities such as tunnels, bunkers, and transit systems are increasingly at risk from blast-related incidents, whether accidental or deliberate. The confined nature of these environments can amplify the hazards associated with explosions, particularly due to the propagation of fire, smoke, and toxic gases. This study investigates the behavior of blast-induced fire, smoke, and gas in underground spaces with the aim of enhancing protective measures and emergency response strategies. Using a combination of simulation and scaled experimental models, key parameters such as overpressure, temperature distribution, gas concentration, and smoke visibility were analyzed under varying real and improvised conditions. The results reveal critical insights into the dispersion patterns and time-dependent behavior of hazardous elements post-detonation. Based on these findings, the study proposes optimized design and operational guidelines for ventilation, detection, and suppression systems tailored to underground facilities. This research contributes to the development of safer underground infrastructure by providing a scientific basis for mitigating the effects of blast-related incidents. Preliminary investigations were undertaken to identify key parameters and signals associated with explosions, fires, and toxic gas emissions using a newly constructed sectional shock tube. The experimental studies were conducted at the G. Tsulukidze Mining Institute of Georgia, specifically within the tunnels of its underground explosion testing facility. For simulation and modeling purposes, both physical and virtual modeling laboratories at Georgian Technical University were utilized. Based on the obtained results, a prototype for the identification of multiple threats will be developed and tested under real conditions in tunnel environments.

Acknowledgments: This work was supported by Shota Rustaveli National Science Foundation of Georgia (SRNSFG) [grant number FR-22-4193]

Keywords: Blast identification, Underground protection, Overpressure, gas explosion

Evaluation of the Organic Pollution Level in the Surface Water: A Case Study from Oued Melouk Dam in the Ain Defla (N Algeria)

Ahmed Guenfoud

Earth'S Sciences University of Khemis Miliana

ABSTRACT

The objective of this work is, firstly, to characterize the water quality of the Oued Melouk dam in the north of Algeria by determining certain physico-chemical parameters and to evaluate the level of organic pollution using index approaches, secondly. The analysis of the results relating to the mineral quality of the waters of the Oued Melouk dam shows that the ions of Cl^- , SO_4^- , Ca^{++} , Mg^{+2} , Na^+ and K^+ for the year 2017 are of average quality compared to admissible national standards. As for organic quality, the COD and BOD5 values oscillate between good to average quality. For nitrogen compounds, the waters of the Oued Mellouk dam contain high levels of NO_2^- - exceeding the admissible tolerated for surface waters (0 - 0.01 mg/l). Concerning orthophosphates (PO_4^-), the data show that the waters of this lentic environment are characterized by the presence of significant pollution in relation to this parameter. The evaluation of the level of organic pollution shows that the chemical quality of the raw water from the Oued Melouk dam is characterized by the presence of organic pollution whose degree generally varies between the low to moderate level, which requires measures against pollution upstream of the dam in order to preserve this important water resource.

Keywords: Surface water, Oued Melouk dam, physicochemical quality, organic pollution



Innovative Solar Distillation System for Cost-Effective Water Purification and Salt Recovery

Samir Remli ^{1*} & Kamel Menacer ²

¹ Department of Mining University of Badji Mkhtar Annaba.

² Mining University of Badji Mokhtar Annaba

ABSTRACT

This study introduces an innovative solar distillation system designed to reduce the production cost of distilled water from brackish sources, seawater, or saline lake brines. Unlike traditional solar stills that rely on passive evaporation in open environments, our system operates within a closed environment, enhancing evaporation rates through natural factors. Water vapor generated from the heated saline water is actively extracted using an aspirator positioned above the evaporating surface within a sealed tank. This approach draws inspiration from recent inventions by Kristof Retezár and M. Parent, who developed devices capable of harvesting water from atmospheric humidity. Additionally, chemical analyses of the residual brine, characterized by high concentrations of NaCl, indicate the potential for salt recovery, particularly relevant in the purification of chott brines. Theoretical results suggest promising outcomes, encouraging further in-situ implementation and study.

Keywords: Solar distillation, brackish water treatment, closed-environment evaporation, atmospheric water harvesting, salt recovery, chott brines



Organic Dye-Polluted Water Treatment Using ZnO Nanocatalysts

Alexander Jishiashvili ¹, Ekaterine Sanaia ², Mikheil Chikhradze ^{3*}, Zeinab Shiolashvili ¹,
Nino Makhatadze ¹, Avtandil Sichinava ⁴ & David Jishiashvili ⁵

¹ Institute of Cybernetics Georgian Technical University

² Director / Esearch Department of Radiophysics Ilia Vekua Sokhumi Institute of Physics and Technology

³ Engineering Physics Georgian Technical University; G.tsulukidze Mining Institute

⁴ Laboratory of Semiconducting and Radiation Technologies Ilia Vekua Sokhumi Institute of Physics and
Technology

⁵ Andronikashvili Institute of Physics Tbilisi State University

ABSTRACT

The wastewater purification via photocatalytic decomposition of pollutants is considered as one of the possible methods to increase the clean water resources. The purpose of this work was to synthesize the ZnO microspheres and nanoplatelets, and to study their photocatalytic activity for the degradation of organic dye diluted in water. The catalysts were synthesized using the pyrolytic process, which involved the formation of volatile ZnCl₂ species by interaction of Zn and ZnO source powders with gaseous products obtained after pyrolytic decomposition of 1 mass.% water containing ammonium chloride. The source and substrate temperatures varied between 400-600 and 250-410°C, respectively. After reaching the substrate (polished Si or glass) and reacting with H₂O and residual oxygen, ZnO nanomaterials with different morphologies were produced. The process parameters included the source and substrate temperature, the distance between them, and the atomic ratio of source components. Several micrometer-sized platelet-like ZnO were synthesized at the substrate temperature of 320°C. Most of them had hexagonal shapes and an average thickness of 80 nm. XRD patterns and energy dispersive spectroscopy revealed that ZnO with a stable hexagonal wurtzite structure was produced. Depending on the process parameters, they contained up to 9 at.% chlorine. As the literature explains, chlorination suppresses the growth of ZnO along the c-axis and promotes the lateral growth and formation of platelet-like nanomaterials. When the substrate temperature reached 360°C, the spheres comprising sintered ZnO crystallites were formed. At 400°C, several micrometer-sized, rough spheres were synthesized, which were formed by the attachment of nano- and micro-sized crystallites. The imperfect shapes of attached crystallites and the curved interfaces of adjacent particles evidenced that the simultaneous growth of neighboring ZnO crystallites formed the spheres. The obtained spherical shape minimizes the surface energy, making the material thermodynamically stable. No chlorine was found in these spheres, and they had the hexagonal wurtzite structure. The photocatalysts, with a concentration of 100 mg/L, were added to the methylene blue aqueous solution and irradiated with the UV Xe lamp (100W). The optical absorbance at $\lambda=662\text{nm}$ wavelength was measured after a predefined time interval to analyze the photocatalytic decolorization of the pollutant. ZnO platelets showed superior decolorization activity as compared to hollow microspheres. They degraded more than 90% of the pollutant within 80 min of UV illumination. This was explained by the high activity of the chlorinated (0001) base plane, increased

light absorbance, and formation of the effective channel for charge carriers, which caused the photodecomposition of methylene blue.

Acknowledgement: This work was supported by Shota Rustaveli National Science Foundation of Georgia (SRNSFG) [grant number YS-24-1927].

Keywords: Zinc oxide, microsphere, hexagonal platelets, photocatalyst, methylene blue



Investigation of Georeferencing Accuracy Using Sphere Targets in Point Cloud Registration

Gergana Antova

Surveying and Geoinformation, Uaceg

ABSTRACT

This paper discusses the feasibility of georeferencing point clouds derived from terrestrial laser scanning (TLS) using sphere targets. A common practice when performing TLS measurements is to use different targets to register and georeference the resulting point cloud. Typically, these targets are placed at random points and coordinated using conventional surveying methods, as total station measurements. They are then used to transform the point cloud into a desired global coordinate system. However, if sphere targets were used and placed centered on points on the working geodetic datum, this would increase the efficiency of the measurements. The accuracies achieved with different sphere configurations are discussed and evaluated. Conclusions and recommendations on the accuracy of georeferencing point clouds based on three projects are made.

Keywords: Sphere targets, georeferencing, point clouds, accuracy, registration, terrestrial laser scanning

Adjustment of a Precise Levelling Network Without Using the Means of Line Elevations

Christina Mickrenska^{1*} & Gergana Antova²

¹ Department of Geodesy and Geoinformatics University of Architecture, Civil Engineering and Geodesy

² Surveying and Geoinformation Uaceg

ABSTRACT

The precise geometric levelling has been the main method for establishing height reference systems since the eighteenth century. Despite evaluating the methodology of measurements, levelling equipment, and the knowledge about the systematic effect of some natural processes, some systematic errors in the levelling data processing are still used in the geodetic practice. Such a systematic data processing error is using the mean of the measured line elevations in both opposite directions. A newly revealed distribution $Cv(n)$ gives the probability that the mean of n observations has the least true error than each of these n observations. The maximum value of the $Cv(n)$ probability density function is in the case of the uniformly distributed data and $n=3$. In this case, $Cv(n=3) < 0.50$. The common case for the precise levelling is a line elevation to be measured twice, i.e. $n=2$. Then, the probability $Cv(n=2) < 0.33$. Consequently, using original values of the measured line elevations as initial data in an adjustment of a levelling network is expected to give better results than their means. The expected increase in accuracy is estimated to be twice. To test this theory, we readjusted the Third Levelling of Bulgaria network /1975-1984/ by selecting one of the two measured line elevations by a greedy algorithm. Comparison of the samples of benchmark height standard errors obtained by applying only the original measurements on the one hand, and the means of the other, shows the superiority of the proposed approach. Comparison of the means by t-test confirms this conclusion at a significance level higher than 99.99%. Comparison of the variations of the benchmark standard error samples rejected the null hypothesis of the sample variance equality at a significance level higher than 99%. In addition, the analysis of the differences between the adjusted benchmark heights reveals a systematic inclination of the classical adjusted variant in the Southeast-Northwest direction greater than +0.10 mm/km. The last value is close to the estimated systematic error of the Third Levelling of Bulgaria.

Keywords: Height reference systems, jackknife, entropy, probability, precise levelling

Effect of Sintering Temperature on the Interfacial Adhesion Strength and Corrosion Behaviour of Hydroxyapatite Coatings on Mild Steel

Laksham Sanassee ^{1*} & Teevan Venkatachellam ¹

¹ Mechanical and Production Engineering Department University of Mauritius

ABSTRACT

This study investigates the upcycling of fish scale waste into hydroxyapatite (HAp)-based coatings for sustainable corrosion protection of mild steel. Using locally available parrot fish scale as renewable raw material together with polyvinyl alcohol and tapioca starch as eco-friendly binders, the research promotes a circular economy strategy for developing sustainable alternative to conventional corrosion protection used in the construction industry. HAp powder was extracted through calcination and the steel specimens were dip coated and sintered at 100°C, 150°C and 200°C. The HAp coated mild steels were placed in a salt spray test environment for 45 days to determine the corrosion rate by the weight loss method according to ASTM B117 and ISO 13779 standards. Statistical analysis revealed that the best corrosion resistance was achieved at a sintering temperature of 100°C, with a corrosion rate of approximately 0.1 mm per year over 45 days of exposure. In terms of coating adhesion, a sintering temperature of 200°C yielded the highest performance, with a mean tensile adhesion strength of 3.85 MPa. These findings suggest that the adhesion properties of HAp coating are comparable to that of existing protective coatings, including the widely used red oxide primer (4.9 MPa). By transforming waste into a value-added protective material, this study provides a blueprint for industrial adaptation of biomaterial coatings in corrosion-prone environment. Nanoscale HAp particles can be explored in the sol-gel matrix to further enhance adhesion and flow properties for a uniform coating while minimizing the presence of air pockets between the substrates. The low-energy sintering requirement and the use of non-toxic renewable bio-materials make this coating highly scalable for large -scale steel production industries while reducing environmental risk associated with fish waste disposal and creating valuable product through effective waste management to recover useful resources.

Keywords: Fish scale, sustainable coating, corrosion resistance, recycled biomaterials, circular economy

Recycled Glass Powder and Eggshell Powder as Supplementary Cementitious Materials in Concrete for a Global Shift Towards Sustainable Production

Laksham Sanasseer ^{1*} & Abdus Cadarsa ²

¹ Mechanical and Production Engineering Department University of Mauritius

² Department of Civil Engineering University of Mauritius

ABSTRACT

Solid waste management presents a significant global challenge, demanding innovative and sustainable solutions. Recycling waste into construction materials is a promising approach for sustainable development. Eggshells and glass wastes can be recycled to recover valuable materials. This study investigates the amalgamation of these two waste materials for partial cement replacement in mortar and concrete and focuses on the impact of varying recycled glass particle (GP) size within concrete mixtures containing 75 µm eggshell powder (ESP). Mortar specimens were prepared with a 1:3:0.5 cement: sand: water ratio, incorporating 10% and 15% (by weight of cement) of treated and untreated ESP, along with recycled GP. Results indicated that a 10% cement replacement ratio yielded optimal compressive strength. Notably, mortar containing 10% recycled GP (75 µm) exhibited superior compressive strength compared to ESP of the same size. Interestingly, calcination treatment of ESP did not significantly impact 28-day compressive strength compared to untreated eggshell mortar. However, calcination appeared to accelerate the hydration process during casting. Based on these findings, subsequent concrete testing employed only 10% untreated ESP and GP as partial cement replacements. The investigation focused on the effect of GP particle size (45 µm and 75 µm) on the mechanical properties of the concrete mixtures. Concrete containing 75 µm GP achieved a higher compressive strength after 28 days compared to ESP of the same size. Further reduction of the GP particle size to 45 µm resulted in a significant increase in compressive strength (almost 50%) exceeding traditional concrete mixtures by 6%. However, this improvement came at the cost of reduced workability in the concrete mix. Similarly, ESP-GP mixtures containing GP of particle size 45 µm displayed increased compressive strength (27.6 MPa) compared to the ESP-GP mixtures containing particle size of 75 µm after 28 days. Additionally, the split tensile strength of the ESP-GP concrete mix also improved with the reduction of GP particle size. These findings suggest that incorporating recycled GP, particularly with a finer particle size (45 µm), presents a promising strategy for enhancing the mechanical properties of concrete containing ESP as a partial cement replacement.

Keywords: Eggshell powder; glass powder; sustainability; waste material recycling; cement replacement.

Defining Critical Design Criteria for Minimizing Construction Waste

Gulden Gumusburun Ayalp ^{1*} & Hakan Yılmaz ¹

¹ Department of Architecture Hasan Kalyoncu University
gulden.ayalp@hku.edu.tr

ABSTRACT

In recent decades, construction waste generation has escalated, presenting a major sustainability challenge for the construction industry and environmental efforts. A substantial share of urban waste comes from construction, with this sector contributing around 10-30% of the total waste in landfills in numerous cities worldwide. Given its significant environmental impact, reducing construction waste has emerged as a top priority. This issue has gained the attention of researchers, leading to multiple studies focused on waste reduction in construction. Nonetheless, although design-stage decisions greatly influence structural waste generation, most waste management initiatives have been directed toward the construction phase. Consequently, there is a noted gap in the literature concerning key factors within the design process that could reduce waste in construction projects. Addressing this gap, the present study aimed to identify critical design criteria (CDCs) to reduce construction waste. Through a systematic literature review (SLR) of 115 articles, 57 design criteria (DCs) were extracted. A questionnaire incorporating these 57 DCs was developed, employing a 5-point Likert scale for assessment, and distributed among construction stakeholders (architects, engineers, and contractors) in Turkey. A total of 148 valid responses were collected and analyzed rigorously using reliability analysis and normalized mean values (NMVs). From the 57 DCs reviewed, this study pinpointed 33 as critical for minimizing construction waste in Turkey.

Keywords: Construction waste, demolition waste, normalized mean value analysis, architectural design



World Summit - from EARTH to URBAN - for Safe & Sustainable Cities
CIVIL ENGINEERING • ARCHITECTURE • URBAN PLANNING CONGRESS



World Summit
from EARTH to URBAN - for Safe & Sustainable Cities
CIVIL ENGINEERING • ARCHITECTURE • URBAN PLANNING
CONGRESS

CAUSummit 2025

1-5 September, 2025- Antalya (Turkiye)

www.causummit.org

SPONSORS

SPONSORS



SAVE THE DATE & NEXT YEAR JOIN US AGAIN for the CAUSummit 2026 - 31 August-4 September 2026