Interdisciplinary Publication
REPA PROCEEDING SERIES

Vol 4 (1): Pages 1-7 (2025)
DOI 10.37357/1068/SIP2025.4.1.01
ISSN 2435-7308

Check for updates

Cutting-edge innovations and strategies in sustainable energy systems: *Paving the way for a greener future*

Ateeq ur Rehman
Top World Academia and Consultants, Gujrat, Pakistan

Conference Proceeding
Open Access
Published

Keywords
- Sustainable energy
- Renewable systems
- Energy policy
- Resilience
- Biomass energy
- Energy-efficient buildings

ABSTRACT

The global disruptions caused by the COVID-19 pandemic have brought to light the vulnerabilities of urban areas, particularly their dependence on global supply chains for essential resources like energy, food, and water. These interruptions have highlighted the urgent need for local solutions that can safeguard the availability of such critical supplies. Moreover, the pandemic has underscored the public health risks associated with both outdoor and indoor pollution, which have been shown to worsen the spread and impact of the virus. In response, many countries are shifting focus towards policies that promote sustainable energy solutions, particularly those that emphasize the electrification of systems powered by renewable energy sources, as outlined by the International Energy Agency. While efforts to develop a COVID-19 vaccine remain a top priority, there is an increasing recognition of the necessity for innovative strategies that integrate renewable energy technologies, policy frameworks, and management practices to drive long-term recovery. This study aims to explore vital topics such as energy policy, biomass energy, energy-efficient buildings, and sustainable power systems. This review captures the insights advancing the conversation on sustainable energy and the transition to renewable systems.

Received: December 12, 2024; Revised: January 27, 2025; Accepted: February 18, 2025; Published: June 30, 2025

1. Introduction

In 2020, the rapid global spread of COVID-19 significantly impacted both the global health system and the world economy, including the energy sector [1]. The contraction and disruption of trade severely affected the energy market and the availability of traditional energy resources, such as oil and natural gas. Given concerns about energy security [2,3], the exploitation of renewable energy sources has become more critical, especially for countries that lack fossil fuels [4]. At the same time, environmental protection and emission reduction have gained increasing global importance [5].

The potential of renewable energy to reduce emissions [6,7] has led many countries to transition their energy strategies from fossil fuels to renewable sources. In 2012, the European Union's Energy Roadmap [8] set targets for reducing CO_2 emissions by 80-95% by 2050 compared to 1990 levels. However, according to the British Petroleum Statistical Review of World Energy [9], countries like China and India are expected to account for two-thirds of the increase in global energy consumption by 2040, highlighting the need for emission reduction efforts in Asia. Given finite resources and competing demands, the development of sustainable energy systems must be cost-effective [10–12].

This paper is organized into four key research areas: energy policy for sustainable development, biomass energy application, building energy conservation, and power plant and electric systems. Fossil fuels still supply 80–85% of global energy demand, but their environmental impact has made the shift to sustainable energy increasingly urgent.

Energy policies for sustainable development, influenced by both social and technical factors, are key to this transition. Burke and Stephens [13] identified four socio-technical transitions in energy policy, while Wei et al. [14] estimated that aggressive sustainable development measures could create over 4 million renewable energy jobs. Technological advances, particularly in biomass energy, have also gained significance. Research by Bert et al. [15] and Vicente and Alves [15] highlights innovations in biomass utilization for green development.

In buildings, significant energy-saving potential remains. Studies by Mazzarella [16], Ferrari and Riva [17], and Salem et al. [18] focus on energy-saving

Corresponding author: A Rehman
Email: ateeq0074@gmail.com

measures, including improved insulation and window technology. However, the variability of renewable energy sources like solar and wind remains a challenge. Energy storage systems, such as those studied by Hast et al. [19] and Xu and Wang [20], offer solutions to stabilize energy supply and demand. Lund et al. [21] emphasize the development of smart energy systems that integrate electrification and storage.

Following is some of the key areas that focus on recent advancements in sustainable energy systems: economic analysis, biomass energy applications, building energy efficiency, energy storage technologies, and emission reduction strategies.

2. Energy policy for sustainable development

With global warming becoming a key concern, substantial efforts have been made to reduce reliance on fossil fuels and adopt sustainable energy sources. Over recent decades, energy policies have shifted from relying on a single energy source to more integrated strategies with multiple objectives. Studies focusing on energy policies in countries such as Korea, Malaysia, Ghana, and China have emphasized the need for thorough economic evaluations when transitioning to renewable energy, considering factors like resource availability, production levels, and market prices.

Xu et al. [22] pointed out the importance of a risk-mitigation approach for medium- to long-term investments in renewable energy to minimize uncertainty. Economic evaluations have been applied across various energy sectors, including coal-fired efficiency, heat recovery, energy storage, CO_2 capture, and renewable integration.

For instance, Roefs et al. [23] developed an economic model for CO_2-enhanced oil recovery, showing that CO_2 capture could drastically lower the global warming potential, despite higher costs. Wiesberg et al. [24] also noted the economic burden of carbon capture technologies and suggested that collective investments in CO_2 capture installations could alleviate costs.

Economic assessments have extended to other environmental issues, such as plastic waste management. Larrain et al. [25] analyzed the economic viability of open-loop and closed-loop pyrolysis recycling, finding that open-loop systems are more cost-effective, though sensitive to volatile oil prices. In remote areas, where fossil fuel transportation costs are high, renewable energy systems are more competitive. Bertheau [26] explored energy models for off-grid islands, finding that solar power combined with battery storage offered the most cost-effective solution, though initial investments were substantial.

In the context of energy-efficient buildings, economic analysis has proven valuable. Picallo-Perez et al. [27] used a thermo-economic approach to assess building energy systems, identifying key components that contribute both to cost and environmental impact. Additionally, sustainable transport solutions have been investigated, with Kuang et al. [28] proposing a traffic management strategy that effectively reduces congestion and greenhouse gas emissions.

Many countries face challenges due to limited energy resources, and as global energy demand continues to rise, geopolitical complexities, including tensions, sanctions, and conflicts, become more pronounced.

Achieving energy security is complicated by numerous factors and uncertainties. To address this, countries are implementing dynamic energy policies that integrate diverse approaches, moving from subjective judgments to multi-criteria decision-making based on both stable and variable factors. However, a comprehensive, reliable decision-making framework for the energy sector remains absent.

In this context, Podbregar et al. [29] explored the International Energy Security Risk Index, developed by the U.S. Chamber of Commerce. This index is one of the most thorough tools available, incorporating technical, environmental, and economic factors to assess and predict energy security. It evaluates 29 indicators across multiple sectors, including transportation and fuel availability, using statistical methods like stepwise regression and principal component analysis. Their findings suggested that key variables, such as crude oil prices and global coal reserves, account for 90% of the variance.

The analysis revealed complex interrelationships among these variables, making individual analysis challenging. A total of twelve variables, including energy consumption, CO_2 emissions, and transport-related factors, were identified as crucial. The study recommended revising the index by eliminating less significant variables to enhance its accuracy and precision.

Additionally, research plays a critical role in building a sustainable society, but a top-down approach focused on Sustainable Development Goals (SDGs) has been underexplored. Asatani et al. [30] conducted an analysis using citation network analysis and natural language processing, examining over 300,000 publications related to sustainability. They observed a sharp increase in the number of sustainability-focused papers in recent years.

Topics such as "inclusive society" and "early childhood development" are now prominent in academic research. Emerging areas like nanocellulose and global health are also gaining significant attention. This study highlighted the importance of understanding the convergence between research trends and SDG topics, providing valuable insights for policymakers, businesses, and the academic community. However, to improve analysis, a model that accounts for the differences in terminology usage between SDGs and academic research should be developed and updated regularly.

3. Biomass energy application

Biomass energy is derived from the photosynthesis process of plants and is stored in various biomass carriers such as crops, vegetation, waste, wood, and algae. This energy can be converted into forms such as bio-oil, biogas, and biosolid fuels, or used in co-firing with conventional fuels like coal. Biomass energy utilization has seen substantial advancements in developed countries, while its potential to achieve sustainable development is increasingly recognized in developing regions.

Key challenges limiting the growth of biomass energy include inefficiencies in production and environmental standards, along with the high operating costs associated with biomass systems. To improve biomass technology for long-term sustainability, Vukasinovic et al. [31] introduced an integrated analytical method combining optimization and backcasting techniques. This approach was applied to maximize the utilization of forest residues in Serbia, enhancing local energy supply and reducing biomass waste.

Further research by Ancona et al. [32] investigated biomass gasification, suggesting that pruning residues can reduce contaminants and improve the process. They also found that calcium in the biomass and soil had a catalytic effect, aiding in tar cracking. Caputo et al. [33] evaluated district heating plants powered by biomass, concluding that utilizing a consistent biomass source is beneficial for energy efficiency, environmental protection, and reducing reliance on fossil fuels.

Biomass ash, which contains valuable potassium salts and silica, can be repurposed in agriculture. Wang et al. [34] developed a method to extract useful salts from straw and wood ashes, with cotton straw ashes yielding the highest extraction rate, thus providing a more efficient option for utilizing biomass waste.

While biofuels are a promising alternative, concerns about indirect greenhouse gas emissions such as land-use changes and transportation are significant. Ko et al. [35] examined biofuel production from agricultural residues, noting that improper waste management practices, such as open burning, could lead to significant CO_2 emissions, potentially offsetting the benefits of biofuels. However, biofuels used in biogas and bioethanol production, along with co-combustion methods, can result in substantial reductions in CO_2 emissions.

Biomass combustion residues, such as soot and char, often contain various chemicals. Ruzickova et al. [36] studied emissions from hardwood briquette combustion, revealing that the char contained organic compounds like alkanes and nitriles. Wang et al. [20] examined the co-pyrolysis of biomass with polyurethane and found that it effectively reduced soot formation and volatile compound release, with higher pyrolysis temperatures further decreasing soot production.

4. Building energy saving

The energy consumed in buildings extends beyond construction, with operational energy costs often far outweighing construction expenses throughout a building's lifecycle. To improve energy efficiency, a holistic system should be designed, considering factors like HVAC systems, building envelope, energy harvesting technologies, and intelligent control of systems and occupant behaviors to ensure comfort and safety.

Given the difficulty in modeling energy profiles at the district level, Ferrari et al. [37] reviewed multiple studies and proposed criteria for stakeholders involved in energy demand assessment and source classification, focusing on demand reduction and energy-saving strategies. Energy efficiency improvements in buildings are generally pursued through two main strategies: enhancing the building envelope (such as windows, facades, and roofs) and improving the performance of essential systems (including heating, cooling, ventilation, and lighting).

The building envelope plays a critical role in thermal comfort and overall energy balance.

Research by Krstić-Furundžić et al. [38] assessed energy performance in an office building in Belgrade, showing that alternative shading strategies effectively reduced energy demand and environmental impact. Similarly, the materials used for roofs significantly influence a building's energy efficiency. Ramos and Aires [39] studied a small house prototype and found that natural ventilation of roof cavities during summer could help regulate indoor temperatures, reducing heat transfer and improving overall comfort.

For historic buildings, energy-saving policies are often constrained by preservation requirements. However, Tettey and Gustavsson [40] demonstrated that energy renovation in a Swedish residential building could achieve significant energy savings by installing energy-efficient windows, doors, and heat recovery systems, reducing space heating energy use by more than 50%. Bottino-Leone et al. [41] proposed an evaluation method for enhancing energy performance in historic buildings while maintaining their facades, with a focus on minimizing environmental impact through effective retrofitting techniques.

Finally, occupant behavior significantly influences energy consumption in buildings. Piselli and Pisello [42] analyzed occupancy patterns over two years in an office building, using real data to create a model that more accurately reflects occupants' daily behaviors. This study highlighted the discrepancies in energy predictions based on standard models, emphasizing the importance of incorporating human-centered design to more accurately forecast and manage energy usage.

5. Power Plants and Electric Systems

The combustion of fossil fuels remains the dominant method for electricity generation due to their abundance and low cost, despite their environmental and health impacts. Incomplete combustion in engines produces particulate matter, while nitrogen oxides and carbon dioxide, primarily from electricity generation, agriculture, and transportation, contribute to pollution. Research has focused on improving combustion processes and reducing pollutant emissions. Technologies such as CO_2 capture and storage aim to mitigate the effects of global warming. Several studies have explored reducing CO_2 emissions in natural gas and biofuel-powered plants. Using biofuel blends in internal combustion engines, for instance, can lower nitrogen oxide emissions. Additives like silicon oxide in diesel engines have been found to reduce fuel consumption and emissions. Pyrolysis, a method of converting waste into renewable fuels, has also proven effective in reducing particulate emissions [43].

CO_2 emissions are largely linked to energy generation and consumption. The dry carbonate process for CO_2 capture, when integrated with renewable energy sources, has shown promise in reducing emissions. However, the cost of CO_2 capture remains a challenge, with potential cost reductions through technological advancements. Energy-saving measures, such as recovering energy from waste and implementing CO_2 capture systems, can significantly lower emissions and energy demand in the coming decades.

Energy storage plays a critical role in balancing the supply and demand for energy, especially with the rise of renewable sources. Different types of energy storage, including thermal, electric, and chemical systems, are essential for managing the intermittent nature of renewable energy.

Hydrogen storage is commonly used in areas with high wind power, while battery storage is more common in Europe. Innovations in energy storage, such as thermal energy storage and reversible systems, are being developed to improve efficiency and reduce costs [40].

Simulators for power plants and battery storage systems are being used to improve grid stability and reduce operational costs. Integrating energy storage into microgrids with renewable energy sources, such as solar panels, can optimize energy use and reduce emissions. However, the high cost and safety issues surrounding large-scale energy storage remain significant obstacles.

Thermochemical energy storage, which can store energy for longer periods, also shows promise for future applications. Additionally, liquefied natural gas (LNG) storage is being considered as an efficient method for long-distance energy transport. Potential storage sites in Portugal, such as porous rocks and salt formations, could help support large-scale energy storage solutions [41].

6. Conclusion

The paper highlights the importance of energy policy in achieving sustainable development and decarbonization goals. Effective energy planning strategies and the optimal mix of technologies are crucial for future energy scenarios. Biomass stands out as a key renewable resource due to its global availability and diverse conversion technologies, including anaerobic digestion and gasification.

Additionally, optimizing fossil fuel-based power plants is vital for transitioning to renewable energy by improving efficiency, reducing fuel consumption, and lowering emissions. Technologies like integrated gasification combined cycle (IGCC) offer promising solutions with low greenhouse gas emissions.

This study also emphasizes reducing building energy consumption, which accounts for over 40% of Europe's total energy use. This can be achieved through efficient HVAC systems, such as ground-source heat pumps, and the integration of renewable technologies like solar PV panels and thermal collectors.

References

[1] Ghiani E, Galici M, Mureddu M, Pilo F (**2020**) "Impact on Electricity Consumption and Market Pricing of Energy and Ancillary Services during Pandemic of COVID-19 in Italy" *Energies* (vol. 13, no. 13, pp. 3357) https://doi.org/10.3390/en13133357

[2] Graff M, Carley S (**2020**) "COVID-19 assistance needs to target energy insecurity" *Nat Energy* (vol. 5, no. 5, pp. 352–354) https://doi.org/10.1038/s41560-020-0620-y

[3] Guo Y, Hawkes A (**2019**) "The impact of demand uncertainties and China-US natural gas tariff on global gas trade" *Energy* (vol. 175, pp. 205–217) https://doi.org/10.1016/j.energy.2019.03.047

[4] Eroğlu H (**2021**) "Effects of Covid-19 outbreak on environment and renewable energy sector" *Environ Dev Sustain* (vol. 23, no. 4, pp. 4782–4790) https://doi.org/10.1007/s10668-020-00837-4

[5] Jin S (**2020**) "COVID-19, Climate Change, and Renewable Energy Research: We Are All in This Together, and the Time to Act Is Now" *ACS Energy Lett* (vol. 5, no. 5, pp. 1709–1711) https://doi.org/10.1021/acsenergylett.0c00910

[6] Streimikiene D, Lekavičius V, Baležentis T, Kyriakopoulos GL, Abrhám J (**2020**) "Climate change mitigation policies targeting households and addressing energy poverty in European Union" *Energies* (vol. 13, no. 13, pp. 3389) https://doi.org/10.3390/en13133389

[7] Karlsdottir MR, Heinonen J, Palsson H, Palsson OP (**2020**) "High-temperature geothermal utilization in the context of European energy policy - Implications and limitations" *Energies* (vol. 13, no. 12, pp. 3187) https://doi.org/10.3390/en13123187

[8] Energy Roadmap 2050 (**2011**) Brussels, Belgium, *European Commission*. (Energy Roadmap 2050) *Accessed*: *17 February **2025***

[9] Dudley B (**2019**) "BP statistical review of world energy 2019" *bp*. (https://www.bp.com/content/dam/bp/business-sites/en/global/corporate/pdfs/energy-economics/statistical-review/bp-stats-review-2019-full-report.pdf) *Accessed*: *17 February **2025***

[10] Fortuński B (**2020**) "Sustainable Development and Energy Policy: Actual CO2 Emissions in the European Union in the Years 1997–2017, Considering Trade with China and the USA" *Sustainability* (vol. 12, no. 8, pp. 3363) https://doi.org/10.3390/su12083363

[11] Fawcett T, Killip G (**2019**) "Re-thinking energy efficiency in European policy: Practitioners' use of 'multiple benefits' arguments" *J Clean Prod* (vol. 210, pp. 1171–1179) https://doi.org/10.1016/j.jclepro.2018.11.026

[12] Calise F, Costa M, Wang Q, Zhang X, Duić N (**2018**) "Recent Advances in the Analysis of Sustainable Energy Systems" *Energies* (vol. 11, no. 10, pp. 2520) https://doi.org/10.3390/en11102520

[13] Burke MJ, Stephens JC (**2018**) "Corrigendum to "Energy democracy: Goals and policy instruments for sociotechnical transitions" *Energy Res Soc Sci* (vol. 42, pp. 198) https://doi.org/10.1016/j.erss.2018.03.030

[14] Wei M, Patadia S, Kammen DM (**2010**) "Putting renewables and energy efficiency to work: How many jobs can the clean energy industry generate in the US?" *Energy Policy* (vol. 38, no. 2, pp. 919–931) https://doi.org/10.1016/j.enpol.2009.10.044

[15] Bert V, Allemon J, Sajet P, Dieu S, Papin A, et al. (**2017**) "Torrefaction and pyrolysis of metal-enriched poplars from phytotechnologies: Effect of temperature and biomass chlorine content on metal distribution in end-products and valorization options" *Biomass Bioenergy* (vol. 96, pp. 1–11) https://doi.org/10.1016/j.biombioe.2016.11.003

[16] Mazzarella L (**2015**) "Energy retrofit of historic and existing buildings. The legislative and regulatory point of view" *Energy Build* (vol. 95, pp. 23–31) https://doi.org/10.1016/j.enbuild.2014.10.073

[17] Blázquez T, Ferrari S, Suárez R, Sendra JJ (**2019**) "Adaptive approach-based assessment of a heritage residential complex in southern Spain for improving comfort and energy efficiency through passive strategies: A study based on a monitored flat" *Energy* (vol. 181, pp. 504–520) https://doi.org/10.1016/j.energy.2019.05.160

[18] Salem R, Bahadori-Jahromi A, Mylona A, Godfrey P, Cook D (**2019**) "Investigating the potential impact of energy-efficient measures for retrofitting existing UK

hotels to reach the nearly zero energy building (nZEB) standard" *Energy Effic* (vol. 12, no. 6, pp. 1577–1594) https://doi.org/10.1007/s12053-019-09801-2

[19] Hast A, Rinne S, Syri S, Kiviluoma J (**2017**) "The role of heat storages in facilitating the adaptation of district heating systems to large amount of variable renewable electricity" *Energy* (vol. 137, pp. 775–788) https://doi.org/10.1016/j.energy.2017.05.113

[20] Xu ZY, Wang RZ (**2017**) "A sorption thermal storage system with large concentration glide" *Energy* (vol. 141, pp. 380–388) https://doi.org/10.1016/j.energy.2017.09.088

[21] Lund H, Østergaard PA, Connolly D, Ridjan I, Mathiesen BV, et al. (**2016**) "Energy Storage and Smart Energy Systems" *Int J Sustain Energy Plan Manag* (vol. 11, pp. 3–14) https://doi.org/10.5278/ijsepm.2016.11.2

[22] Xu Z, Yang P, Zheng C, Zhang Y, Peng J, et al. (**2018**) "Analysis on the organization and Development of multi-microgrids" *Renew Sustain Energy Rev* (vol. 81, pp. 2204–2216) https://doi.org/10.1016/j.rser.2017.06.032

[23] Roefs P, Moretti M, Welkenhuysen K, Piessens K, Compernolle T (**2019**) "CO2-enhanced oil recovery and CO2 capture and storage: An environmental economic trade-off analysis" *J Environ Manage* (vol. 239, pp. 167–177) https://doi.org/10.1016/j.jenvman.2019.03.007

[24] Wiesberg IL, Brigagão GV, de Medeiros JL, de Queiroz Fernandes Araújo O (**2017**) "Carbon dioxide utilization in a microalga-based biorefinery: Efficiency of carbon removal and economic performance under carbon taxation" *J Environ Manage* (vol. 203, pp. 988–998) https://doi.org/10.1016/j.jenvman.2017.03.005

[25] Larrain M, Van Passel S, Thomassen G, Kresovic U, Alderweireldt N, et al. (**2020**) "Economic performance of pyrolysis of mixed plastic waste: Open-loop versus closed-loop recycling" *J Clean Prod* (vol. 270, pp. 122442) https://doi.org/10.1016/j.jclepro.2020.122442

[26] Bertheau P (**2020**) "Supplying not electrified islands with 100% renewable energy based micro grids: A geospatial and techno-economic analysis for the Philippines" *Energy* (vol. 202, pp. 117670) https://doi.org/10.1016/j.energy.2020.117670

[27] Picallo-Perez A, Catrini P, Piacentino A, Sala J-M (**2019**) "A novel thermoeconomic analysis under dynamic operating conditions for space heating and cooling systems" *Energy* (vol. 180, pp. 819–837) https://doi.org/10.1016/j.energy.2019.05.098

[28] Kuang Y, Yen BTH, Suprun E, Sahin O (**2019**) "A soft traffic management approach for achieving environmentally sustainable and economically viable outcomes: An Australian case study" *J Environ Manage* (vol. 237, pp. 379–386) https://doi.org/10.1016/j.jenvman.2019.02.087

[29] Podbregar I, Šimić G, Radovanović M, Filipović S, Šprajc P (**2020**) "International Energy Security Risk Index—Analysis of the Methodological Settings" *Energies* (vol. 13, no. 12, pp. 3234) https://doi.org/10.3390/en13123234

[30] Asatani K, Takeda H, Yamano H, Sakata I (**2020**) "Scientific Attention to Sustainability and SDGs: Meta-Analysis of Academic Papers" *Energies* (vol. 13, no. 4, pp. 975) https://doi.org/10.3390/en13040975

[31] Vukasinovic V, Gordic D, Zivkovic M, Koncalovic D, Zivkovic D (**2019**) "Long-term planning methodology for improving wood biomass utilization" *Energy* (vol. 175, pp. 818–829) https://doi.org/10.1016/j.energy.2019.03.105

[32] Ancona V, Barra Caracciolo A, Campanale C, De Caprariis B, Grenni P, et al. (**2019**) "Gasification treatment of poplar biomass produced in a contaminated area restored using plant assisted bioremediation" *J Environ Manage* (vol. 239, pp. 137–141) https://doi.org/10.1016/j.jenvman.2019.03.038

[33] Caputo P, Ferla G, Ferrari S (**2019**) "Evaluation of environmental and energy effects of biomass district heating by a wide survey based on operational conditions in Italy" *Energy* (vol. 174, pp. 1210–1218) https://doi.org/10.1016/j.energy.2019.03.073

[34] Wang Y, Tan H, Wang X, Du W, Mikulčić H, et al. (**2017**) "Study on extracting available salt from straw/woody biomass ashes and predicting its slagging/fouling tendency" *J Clean Prod* (vol. 155, pp. 164–171) https://doi.org/10.1016/j.jclepro.2016.08.102

[35] Ko C-H, Chaiprapat S, Kim L-H, Hadi P, Hsu S-C, et al. (**2017**) "Carbon sequestration potential via energy harvesting from agricultural biomass residues in Mekong River basin, Southeast Asia" *Renew Sustain Energy Rev* (vol. 68, pp. 1051–1062) https://doi.org/10.1016/j.rser.2016.03.040

[36] Růžičková J, Kucbel M, Raclavská H, Švédová B, Raclavský K, et al. (**2019**) "Comparison of organic compounds in char and soot from the combustion of biomass in boilers of various emission classes" *J Environ Manage* (vol. 236, pp. 769–783) https://doi.org/10.1016/j.jenvman.2019.02.038

[37] Ferrari S, Riva A (**2019**) "Insulating a Solid Brick Wall from Inside: Heat and Moisture Transfer Analysis of Different Options" *J Archit Eng* (vol. 25, no. 1, pp. 04018032) https://doi.org/10.1061/(ASCE)AE.1943-5568.0000334

[38] Krstić-Furundžić A, Vujošević M, Petrovski A (**2019**) "Energy and environmental performance of the office

building facade scenarios" *Energy* (vol. 183, pp. 437–447) https://doi.org/10.1016/j.energy.2019.05.231

[39] Ramos J, Aires L (**2020**) "The effect of a naturally ventilated roof on the thermal behaviour of a building under mediterranean summer conditions" *J Sustain Dev Energy Water Environ Syst* (vol. 8, no. 3, pp. 508–519)

[40] Ayikoe Tettey UY, Gustavsson L (**2020**) "Energy savings and overheating risk of deep energy renovation of a multi-storey residential building in a cold climate under climate change" *Energy* (vol. 202, pp. 117578) https://doi.org/10.1016/j.energy.2020.117578

[41] Bottino-Leone D, Larcher M, Herrera-Avellanosa D, Haas F, Troi A (**2019**) "Evaluation of natural-based internal insulation systems in historic buildings through a holistic approach" *Energy* (vol. 181, pp. 521–531) https://doi.org/10.1016/j.energy.2019.05.139

[42] Piselli C, Di Grazia M, Pisello AL (**2020**) "Combined effect of outdoor microclimate boundary conditions on air conditioning system's efficiency and building energy demand in net zero energy settlements" *Sustainability* (vol. 12, no. 15, pp. 6056) https://doi.org/10.3390/su12156056

[43] Caputo P, Ferrari S, Ferla G, Zagarella F (**2020**) "Preliminary energy evaluations for the retrofit of rural protected buildings in a peripheral context of Milan" *J Sustain Dev Energy Water Environ Syst* (vol. 8, no. 4, pp. 715–734)