

# MUHANDISLIK

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ijtimoiy-iqtisodiy, innovatsion texnik,  
fan va ta'limga oid ilmiy-amaliy jurnal



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“GLOBAL RAQAMLI INTEGRATSIYALASHUV:  
2030-YILGACHA YASHIL IQTISODIYOTGA O'TISHDA  
TEXNOLOGIK VA INDUSTRIAL SANOATNI RIVOJLANTIRISH  
ORQALI MIKRO VA MAKROIQTISODIY BARQAROR  
O'SISHNI TA'MINLASH DOLZARBLIGI”

“GLOBAL DIGITAL INTEGRATION: THE RELEVANCE OF  
ENSURING MICRO AND MACROECONOMIC SUSTAINABLE  
GROWTH THROUGH TECHNOLOGICAL AND INDUSTRIAL  
DEVELOPMENT IN THE TRANSITION TO A GREEN  
ECONOMY BY 2030”

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МИКРО- И МАКРОЭКОНОМИЧЕСКОГО РОСТА ЧЕРЕЗ  
РАЗВИТИЕ ТЕХНОЛОГИЧЕСКОЙ И ИНДУСТРИАЛЬНОЙ  
ПРОМЫШЛЕННОСТИ В ПЕРЕХОДЕ К ЗЕЛЁНОЙ  
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- 05.01.00 – Axborot texnologiyalari, boshqaruv va kompyuter grafikasi
- 05.01.01 – Muhandislik geometriyasi va kompyuter grafikasi. Audio va video texnologiyalari
- 05.01.02 – Tizimli tahlil, boshqaruv va axborotni qayta ishlash
- 05.01.03 – Informatikaning nazariy asoslari
- 05.01.04 – Hisoblash mashinalari, majmualari va kompyuter tarmoqlarining matematik va dasturiy ta'minoti
- 05.01.05 – Axborotlarni himoyalash usullari va tizimlari. Axborot xavfsizligi
- 05.01.06 – Hisoblash texnikasi va boshqaruv tizimlarining elementlari va qurilmalari
- 05.01.07 – Matematik modellashtirish
- 05.01.11 – Raqamli texnologiyalar va sun'iy intellekt
- 05.02.00 – Mashinasozlik va mashinashunoslik
- 05.02.08 – Yer usti majmualari va uchish apparatlari
- 05.03.02 – Metrologiya va metrologiya ta'minoti
- 05.04.01 – Telekommunikatsiya va kompyuter tizimlari, telekommunikatsiya tarmoqlari va qurilmalari. Axborotlarni taqsimlash
- 05.05.03 – Yorug'lik texnikasi. Maxsus yoritish texnologiyasi
- 05.05.05 – Issiqlik texnikasining nazariy asoslari
- 05.05.06 – Qayta tiklanadigan energiya turlari asosidagi energiya qurilmalari
- 05.06.01 – To'qimachilik va yengil sanoat ishlab chiqarishlari materialshunosligi
- 05.08.03 – Temir yo'l transportini ishlatish
- 05.09.01 – Qurilish konstruksiyalari, bino va inshootlar
- 05.09.04 – Suv ta'minoti. Kanalizatsiya. Suv havzalarini muhofazalovchi qurilish tizimlari
- 10.00.06 – Qiyosiy adabiyotshunoslik, chog'ishtirma tilshunoslik va tarjimashunoslik
- 10.00.04 – Yevropa, Amerika va Avstraliya xalqlari tili va adabiyoti
- 08.00.01 – Iqtisodiyot nazariyasi
- 08.00.02 – Makroiqtisodiyot
- 08.00.03 – Sanoat iqtisodiyoti
- 08.00.04 – Qishloq xo'jaligi iqtisodiyoti
- 08.00.05 – Xizmat ko'rsatish tarmoqlari iqtisodiyoti
- 08.00.06 – Ekonometrika va statistika
- 08.00.07 – Moliya, pul muomalasi va kredit
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- 08.00.09 – Jahon iqtisodiyoti
- 08.00.10 – Demografiya. Mehnat iqtisodiyoti
- 08.00.11 – Marketing
- 08.00.12 – Mintaqaviy iqtisodiyot
- 08.00.13 – Menejment
- 08.00.14 – Iqtisodiyotda axborot tizimlari va texnologiyalari
- 08.00.15 – Tadbirkorlik va kichik biznes iqtisodiyoti
- 08.00.16 – Raqamli iqtisodiyot va xalqaro raqamli integratsiya
- 08.00.17 – Turizm va mehmonxona faoliyati

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# OPPORTUNITIES FOR APPLYING NATURAL RESOURCE CONSERVATION TECHNOLOGIES IN HOTEL MANAGEMENT

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**Abstract:** This article examines the opportunities for applying natural resource conservation technologies in hotel management within the framework of sustainable tourism development. The study analyzes international and national experiences in implementing renewable energy sources, water-saving systems, waste recycling technologies, and environmentally friendly construction materials in hotel operations. Particular attention is given to the role of solar energy, wind power, and resource-efficient technologies in reducing operational costs, improving environmental performance, and increasing the competitiveness of accommodation facilities. The findings indicate that the adoption of innovative environmental technologies contributes to energy efficiency, environmental protection, and the long-term sustainable development of the hospitality industry.

**Keywords:** hotel management, sustainable tourism, renewable energy, resource conservation, solar energy, energy efficiency, environmental technologies, green hotels.

**Annotatsiya:** Mazkur maqolada mehmonxona xo'jaligini boshqarishda tabiiy resurslarni tejash texnologiyalarini qo'llash imkoniyatlari barqaror turizmni rivojlantirish nuqtayi nazaridan tahlil qilingan. Tadqiqotda qayta tiklanuvchi energiya manbalari, suvni tejash tizimlari, chiqindilarni qayta ishlash texnologiyalari hamda ekologik qurilish materiallarini mehmonxona faoliyatiga joriy etish bo'yicha xorijiy va milliy tajriba o'rganilgan. Quyosh va shamol energiyasidan foydalanishning ekspluatatsiya xarajatlarini kamaytirish, ekologik samaradorlikni oshirish hamda joylashtirish vositalarining raqobatbardoshligini kuchaytirishdagi ahamiyati yoritilgan. Tadqiqot natijalari innovatsion ekologik texnologiyalarni joriy etish mehmonxona xo'jaligining energiya samaradorligi va barqaror rivojlanishini ta'minlashini ko'rsatadi.

**Kalit so'zlar:** mehmonxona xo'jaligi, barqaror turizm, qayta tiklanuvchi energiya, tabiiy resurslarni tejash, quyosh energiyasi, energiya samaradorligi, ekologik texnologiyalar, yashil mehmonxonalar.

**Аннотация:** В статье исследуются возможности применения технологий ресурсосбережения в управлении гостиничным хозяйством в контексте устойчивого развития туризма. Проанализированы международный и национальный опыт внедрения возобновляемых источников энергии, водосберегающих систем, технологий переработки отходов и экологически безопасных строительных материалов в деятельность гостиниц. Особое внимание уделено использованию солнечной и ветровой энергии как инструментов снижения эксплуатационных затрат, повышения экологической эффективности и конкурентоспособности средств размещения. Результаты исследования показывают, что внедрение инновационных экологических технологий способствует повышению энергоэффективности, охране окружающей среды и устойчивому развитию гостиничной индустрии.

**Ключевые слова:** гостиничное хозяйство, устойчивый туризм, возобновляемая энергетика, ресурсосбережение, солнечная энергия, энергоэффективность, экологические технологии, экологические гостиницы.

The hospitality industry is increasingly adopting sustainable development principles through the implementation of innovative technologies that improve resource efficiency and reduce environmental impacts. Rising energy costs, climate change, and growing environmental awareness have encouraged hotels to integrate renewable energy systems, water-saving technologies, and environmentally friendly construction materials into their operations. Resource conservation technologies not only reduce operating expenses but also enhance service quality, strengthen environmental responsibility, and improve the competitiveness of accommodation facilities. This study examines international and national experiences in applying natural



resource conservation technologies in hotel management and explores their potential for improving operational efficiency and promoting sustainable tourism development.

“When introducing innovative technologies in the hotel industry, it is necessary to focus on several key objectives, including saving time, financial resources, and energy. In urban hotels, the implementation of innovative technologies primarily begins with the conservation of natural energy resources. In this regard, the experience of a number of foreign hotels deserves particular attention. An Innovation Hotel, or eco-innovative hotel, is equipped with rooftop solar panels for water heating, wind generators for electricity production, and windows and furniture manufactured from recycled materials. Such hotels are capable of generating heat and energy from household waste, collecting rainwater for toilet flushing, and improving thermal and acoustic insulation through the use of thin layers of soil and vegetation. Installing up to four solar panels on the roof for water heating helps reduce dependence on non-renewable energy sources. Rainwater is collected in rooftop and underground storage tanks and is used for toilets, irrigation of green areas, and laundry facilities. Waste cooking oil from the kitchen is recycled into biofuel. Directional signs made of basalt replace conventional metal and plastic signs in entrance areas and landscaped gardens. Food waste is utilized as organic fertilizer” [1].

“The five-star Emirates Palace Hotel in Abu Dhabi, United Arab Emirates, is equipped with a comprehensive environmental protection system. At the beginning of 2009, the hotel succeeded in saving 2.1 million kilowatt-hours of electricity and 111,500 cubic meters of natural gas. Technological innovations, including the replacement of metal-halide lamps with LED lighting, significantly extended the service life of lighting systems while simultaneously improving the quality of services provided to guests. Hotels in Samarkand have also introduced local energy-efficiency measures, supported by the implementation of major investment projects. In the field of ecological innovation, both developed and rapidly developing countries are actively expanding the practical use of alternative energy sources as global reserves of hydrocarbon fuels continue to decline. The development of renewable energy has become one of the key factors in ensuring sustainable economic growth and enhancing national competitiveness. Worldwide, the number of solar power stations that convert solar radiation into large-scale electricity generation is steadily increasing. Large heliostat mirrors installed over thousands of square meters continuously track the movement of the sun and concentrate solar radiation onto containers filled with a working fluid, typically water. The subsequent processes are similar to those of conventional thermal power plants: the heated water turns into steam, which drives a turbine connected to a generator, thereby producing electricity” [2].

“In Uzbekistan, considerable scientific and experimental experience has been accumulated in the field of utilizing alternative energy sources, particularly solar energy, and research in this area has been conducted for several decades. The country established the ‘Physics–Sun’ Scientific and Production Association of the Academy of Sciences, a unique research and experimental center in Central Asia whose scientific achievements have gained international recognition. Extensive research and experimental design activities are being carried out on the development of low-potential systems for hot water supply and heating, photovoltaic and thermodynamic converters for electricity generation, the synthesis of advanced materials, and the application of solar energy in material processing and thermal treatment technologies” [3].

“The primary objective of alternative energy is to identify and utilize non-conventional energy sources. In general, energy resources consist of naturally occurring substances and processes that enable humans to obtain the energy required for their existence. Alternative energy sources are renewable resources that serve as environmentally friendly substitutes for conventional fossil fuels such as oil, natural gas, and coal, whose combustion releases carbon dioxide into the atmosphere and contributes to the greenhouse effect and global warming. The search for alternative energy sources is driven by the necessity of utilizing renewable or virtually inexhaustible natural resources and phenomena while ensuring environmental protection and economic efficiency. International experience in the development of alternative energy demonstrates the active participation of numerous organizations and environmental movements that promote environmental conservation and the widespread adoption of renewable energy technologies worldwide. These include:

1. 350.org
2. BirdLife International
3. Earth First!
4. Plant-for-the-Planet
5. Rainforest Alliance
6. World Wide Fund for Nature (WWF)
7. Global Green
8. Global Environment Facility (GEF)
9. Greenpeace
10. Voluntary Human Extinction Movement (VHEMT)
11. Green Parties



12. European Green Belt
13. Green Cross International
14. International Union for Conservation of Nature (IUCN)
15. United Nations Environment Programme (UNEP)
16. Earth Liberation Front (ELF)."<sup>1</sup>

"In 2006, approximately 18% of global energy consumption was supplied by renewable energy sources, including 13% from traditional biomass such as firewood. By 2010, renewable sources accounted for 16.7% of global energy consumption, increasing to 19.3% in 2016. While the share of traditional biomass has gradually declined, the contribution of modern renewable energy sources has continued to grow. Between 2004 and 2013, the share of electricity generated from renewable sources in the European Union increased from 14% to 25%. Hydropower remains the largest source of renewable energy, providing 3.3% of global energy consumption and 15.3% of global electricity generation in 2010. Wind energy capacity has been expanding by approximately 30% annually, with installed capacity reaching 318 gigawatts (GW) worldwide by 2013, particularly across Europe, the United States, and China. The production of photovoltaic panels has also grown rapidly. In 2008, photovoltaic panels with a total capacity of 6.9 GW (6,900 MW) were manufactured, representing nearly a sixfold increase compared with 2004. Solar power plants are widely used in Germany and Spain, while solar thermal power stations operate in the United States and Spain. The largest of these is the Mojave Desert Solar Power Plant, with an installed capacity of 354 MW."

"The world's largest geothermal power facility is The Geysers in California, with a nominal capacity of 750 MW. Brazil has implemented one of the world's largest renewable energy programs based on the production of fuel ethanol from sugarcane. Ethanol currently supplies approximately 18% of the country's automotive fuel demand. Fuel ethanol is also widely used in the United States. Major non-energy corporations actively support the use of renewable energy. IKEA announced its intention to become completely energy self-sufficient through renewable energy by 2020. Apple owns some of the world's largest solar power facilities, and all of the company's data centers operate on renewable energy. Approximately 35% of Google's energy consumption is supplied by renewable sources, while the company's investments in renewable energy have exceeded USD 2 billion."

"The dissertation proposes the introduction of resource-efficient technologies, including a solar power station, solar collectors, and a wind generator, in order to increase the attractiveness of accommodation facilities by reducing operating costs through the use of alternative energy sources. The hotel examined in the study is located in the village of Nanay, Tashkent Region. The six-story hotel contains 34 rooms of various categories with a total floor area of 700 m<sup>2</sup> and accommodates up to 67 guests. The hotel also includes a parking area, laundry room, sauna, conference hall, three office rental spaces, a restaurant, and a housekeeping department. In addition to providing standard hotel services, the property is situated within a tourism and wellness destination" [2].

Therefore, the use of resource-efficient environmental technologies provides significant benefits not only for hotel guests and the hotel itself but also for tourists and the surrounding environment. The hotel's indoor and outdoor lighting systems are connected to the city's centralized electricity grid, while hot water is supplied through electric water heaters. The energy consumed by the hotel is primarily used for space heating, lighting, and powering various electrical appliances. Conventional natural gas is utilized for heating purposes. The introduction of alternative energy sources would make it possible to partially or completely eliminate the consumption of grid electricity and natural gas. At this stage, the proposed work includes planning and analyzing the operation of photovoltaic solar panels.

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# **muhandislik**

# **& iqtisodiyot**

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fan va ta'limga oid ilmiy-amaliy jurnal

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