



## Investigating the effects of solar energy use on employment and sustainable development in Iraq Country

Abdolrahim Hashemi Dizj <sup>\*1</sup>, Mohammad Hassanzadeh <sup>2</sup> Mehdi Falahi Odeh Al-Ghalabi<sup>3</sup>

1. Associate Professor, Department of Economics, Faculty of Social Sciences, University of Mohaghegh Ardabili, Ardabil, Iran

2. Professor, Department of Economics, Faculty of Social Sciences, University of Mohaghegh Ardabili, Ardabil, Iran

3. MSc Student, Department of Economics, Faculty of Social Sciences, University of Mohaghegh Ardabili, Ardabil, Iran

Received Date: 01 January 2025 Accepted Date: 5 March 2025

### Abstract

**Background and Aim:** By creating jobs, attracting investment, and promoting sustainable practices, solar energy not only addresses environmental challenges but also fosters strong economic development. Studying the effects of solar energy on employment and economic growth is not only essential for a better understanding of the economic and social impacts of this energy source, but can also contribute to sustainable development and the creation of sustainable job opportunities in the future. Given the environmental challenges and the need for clean energy sources, these studies become even more important. Given the importance of solar energy and its role and place in growth and employment in Iraq and Iraq's high potential in this field, the aim of this study is to investigate the effects of using solar energy on employment and economic growth in Iraq.

**Methods and Material:** In this research, a time series approach based on the autodistribution model with wide lags (ARDL) was used to examine the effects of solar energy use on employment and economic growth in Iraq during the period 1995-2022.

**Results and Discussion:** The findings of this study showed that solar energy had a positive effect on economic growth at a 95% confidence level. The effects of solar energy on employment were also positive and statistically significant at a 90% confidence level. According to the findings, the error correction term coefficient in this model was -0.489 and was statistically significant, indicating that if a shock is introduced to the economic growth rate in Iraq, 0.489 percent of the imbalance in the economic growth rate will be adjusted during each period and will approach its long-term trend. Also, the error correction coefficient in this model is -0.365 and is statistically significant, indicating that if a shock occurs to the employment rate in Iraq, 0.365 percent of the imbalance in the employment rate will be adjusted during each period and will approach its long-term trend. According to the results obtained, Iraq can invest in solar energy to improve economic growth and employment while preserving the environment.

**Key words:** Renewable energy, solar energy, economic growth, employment, Iraq.

\* Corresponding Author Email: a.hashemi@uma.ac.ir

**Cite this article:** Hashemi Dizaj, A. , Hassanzadeh, M. and Falahi Odeh, M. (2025). Investigating the effects of solar energy use on employment and sustainable development in Iraq Country. Journal of Sustainable Urban & Regional Development Studies (JSURDS), 7(1), 13-27.

## Extended Abstract

### Introduction:

The renewable energy sector has grown significantly globally in recent years. In particular, the solar energy industry has been prominent in recent years due to its rapid expansion and the creation of economic opportunities across the globe. In countries seeking to reduce carbon dioxide emissions and use clean energy, solar technology has emerged as an optimal solution that is not only sustainable, but also creates sustainable employment and improves economic growth. Solar energy protects households and small and medium-sized enterprises from fuel price fluctuations by producing cheaper units compared to imported coal and gas. In addition, decentralized solar energy solutions enable reliable access to energy in remote areas that do not have transmission infrastructure. This will also pave the way for increasing energy access and development in remote areas without the need for high energy costs and losses in transmission. By creating jobs, attracting investment, and promoting sustainable practices, solar energy not only addresses environmental challenges but also fosters strong economic development. Studying the effects of solar energy on employment and economic growth is not only essential for a better understanding of the economic and social impacts of this energy source, but can also contribute to sustainable development and the creation of sustainable job opportunities in the future. Given the environmental challenges and the need for clean energy sources, these studies become even more important. Given the importance of solar energy and its role and place in growth and employment in Iraq and Iraq's high potential in this field, the aim of this study is to investigate the effects of using solar energy on employment and economic growth in Iraq.

### Methodology:

In this research, a time series approach based on the autodistribution model with wide lags (ARDL) was used to examine the effects of solar energy use on employment and economic growth in Iraq during the period 1995-2022. To examine the research objectives and questions, the following two patterns will be examined and analyzed:

$$GDP_t = \beta_0 + \beta_1 SOL_t + \beta_2 FORM_t + \beta_3 SC_t + \beta_4 FIN_t + \beta_5 FDI_t + \beta_6 TRD_t + \varepsilon_t$$

$$EMP_t = \beta_0 + \beta_1 SOL_t + \beta_2 INF_t + \beta_3 INF_t + \beta_4 FORM_t + \beta_5 SC_t + \beta_6 TRD_t + \beta_7 GINI_t + \varepsilon_t$$

In the above model: SOL: Solar energy production; GDP: Gross domestic product growth; INF: Food inflation; SC: Human capital index; EMP: Labor employment rate; FORM: Gross domestic fixed capital formation; FDI: Foreign direct investment; Annual rainfall; FIN: Financial development index; GINI: Inequality in income distribution (Gini coefficient index) and TRD: Foreign trade.

### Results and Discussion:

The findings of this study showed that solar energy had a positive effect on economic growth at a 95% confidence level. The effects of solar energy on employment were also positive and statistically significant at a 90% confidence level. According to the findings, the error correction term coefficient in this model was -0.489 and was statistically significant, indicating that if a shock is introduced to the economic growth rate in Iraq, 0.489 percent of the imbalance in the economic growth rate will be adjusted during each period and will approach its long-term trend. Also, the error correction coefficient in this model is -0.365 and is statistically significant, indicating that if a shock occurs to the employment rate in Iraq, 0.365 percent of the imbalance in the employment rate will be adjusted during each period and will approach its long-term trend. According to the results obtained, Iraq can invest in solar energy to improve economic growth and employment while preserving the environment

## Conclusion:

The use of solar energy in Iraq can positively impact employment through various channels. The deployment of solar panels requires a skilled workforce for ongoing installation and maintenance, which creates numerous jobs in these areas. The establishment of local manufacturing facilities for solar components (e.g., panels, inverters) can create jobs in manufacturing and assembly. The growth of the solar industry can lead to the establishment of training centers that provide vocational training in renewable energy technologies. Current workers in traditional energy sectors can acquire new skills related to solar technology, facilitating their transition to the renewable energy workforce. Local businesses can benefit from the supply of materials and services needed for solar projects, from construction to logistics. The use of solar energy in Iraq can positively impact economic growth through several key channels. The solar energy sector can create jobs in the production, installation, and maintenance of solar panels and systems, providing employment opportunities for local communities. Growth in the solar industry strengthens related sectors, including logistics, sales, and support services, creating more jobs. Solar energy projects can attract both foreign and domestic investment, stimulating economic activity and infrastructure development.

## Declarations

- **Funding:** There is no funding support for this study.
- **Authors' Contributions:** All authors contributed equally to the conceptualization and writing of the article. The authors approved the manuscript's content and agreed on all aspects of the work.
- **Conflict of Interest:** The authors declare no conflict of interest.
- **Acknowledgments:** The authors extend their gratitude to all scientific consultants who provided invaluable insights during this research

## References

- Abunouri, Esmail, Gholizadeh, Aratabani, Mehdi. (1401). Economic evaluation of solar electricity (photovoltaic) based on the space available in the building in different climatic climates of Iran. *Journal of Renewable and New Energies*, 9(2), 150-157. [https://www.jrenew.ir/article\\_152217.html](https://www.jrenew.ir/article_152217.html)
- Tahamipour, Morteza, Abedi, Samaneh, Baba Ahmadi, Reza Karimi, Ebrahimzadeh, Morteza. (2016). Studying the impact of renewable energies on the real economic growth per capita of Iran. *Iranian Energy Economics Research Journal*, 5(19), 53-77. [https://jiece.atu.ac.ir/article\\_7304.html](https://jiece.atu.ac.ir/article_7304.html)
- Ghaed, Ebrahim, Dehghani, Ali, Fattahi, Mohammad. (2019). Studying the impact of various renewable energies on the economic growth of Iran. *Economic Growth and Development Research*, 9(35), 137-148. [https://egdr.journals.pnu.ac.ir/article\\_5671.html](https://egdr.journals.pnu.ac.ir/article_5671.html)
- Karimpour, Sanaz, Shakeri Bostanabad, Reza, Ghasemi, Abdolrasoul. (2019). The impact of renewable energy consumption on economic growth in selected MENA countries: Application of Panel VAR model. *Iranian Energy Economics Research Journal*, 8(32), 99-129. [https://jiece.atu.ac.ir/article\\_13012.html](https://jiece.atu.ac.ir/article_13012.html)
- Hassanzadeh, Mohammad, Hashemi Dizaj and Montazer Hashem (2014), The impact of energy consumption and technology on the sustainability of economic development in Iraq,

Quarterly Journal of Sustainable Urban and Regional Development Studies, 5(3), 275-288.  
[https://www.srds.ir/article\\_216277.html](https://www.srds.ir/article_216277.html)

Hashemi Dizaj, Abdolrahim, Hassanzadeh, Mohammad and Abdolvahid Berij, Mojtaba.(1404). The Impact of Information and Communication Technology and Global Competitiveness Index on Economic Growth of Selected Countries. Quarterly Journal of Sustainable Urban and Regional Development Studies, 6(1)283-296.

[https://www.srds.ir/article\\_212957.html](https://www.srds.ir/article_212957.html)

Breetz, H. (2020). The economic impacts of solar energy: Evidence from the U. S. renewable energy sector. Renewable Energy, 147, 1034-1045. <https://doi.org/10.1016/j.renene.2019.09.098>

Ceballos, A. , & Ceballos, J. (2021). The socioeconomic impacts of solar energy adoption in rural communities. Renewable Energy, 165, 1012-1021. <https://doi.org/10.1016/j.renene.2020.12.034>

Huseynli, B. , & Huseynli, N. (2022). Econometric analysis of the relationship between renewable energy production, traditional energy production and unemployment: The case of Azerbaijan. International Journal of Energy Economics and Policy, 12(4). , 379–384..

<https://www.econjournals.com/index.php/ijeep/article/view/13233>

Kahia, M. , Omri, A. , & Jarraya, B. (2021). Green Energy, economic growth and environmental quality nexus in Saudi Arabia. Sustainability. (Switzerland). , 13(3). , 1–13.

<https://doi.org/10.3390/su13031264>

Lantz, E. J. , & Tegen, S. (2020). The impact of solar energy on job creation: A review of the literature. Energy Policy, 138, 111268. <https://doi.org/10.1016/j.enpol.2020.111268>

Lee, K. (2020). The impact of solar energy on employment and the economy. National Renewable Energy Laboratory. <https://www.nrel.gov/docs/fy20osti/78000.Pdf>

Lin, B. , Zhu, R. , & Raza, M. Y. (2022). Fuel substitution and environmental sustainability in India: Perspectives of technical progress. Energy, 16(3).: 125-139.

<https://doi.org/10.1016/j.energy.2022.125309>

Liu, X. , & Wang, K. (2021). Economic growth and employment effects of solar energy deployment: A case study in China. Energy Economics, 93, 105018. <https://doi.org/10.1016/j.eneco.2020.105018>

<https://doi.org/10.1016/j.eneco.2020.105018>

Long, M. , & Wang, Y. (2022). Analyzing the relationship between solar energy deployment and employment growth in emerging economies. Energy Research & Social Science, 83:189-198. <https://doi.org/10.1016/j.egyrs.2019.09.029>

<https://doi.org/10.1016/j.egyrs.2019.09.029>

Morales, M. D. , & Garcés, J. (2022). The role of solar energy in economic development: Insights from Latin America. Renewable and Sustainable Energy Reviews, 150, 111537.

[DOI: 10.31875/2410-2199.2020.07.4](https://doi.org/10.31875/2410-2199.2020.07.4)

Rathi, S. , & Gupta, A. (2021). Solar energy and its impact on employment generation in India: A quantitative analysis. Journal of Cleaner Production, 304, 127017.

<https://doi.org/10.3390/su141811354>

Raza, M. Y. , & Lin, B. (2022). Analysis of Pakistan’s electricity generation and CO2 emissions: Based on decomposition and decoupling approach. Journal of Cleaner Production, 359, 132-145. [DOI: 10.1016/j.jclepro.2022.132074](https://doi.org/10.1016/j.jclepro.2022.132074)

[DOI: 10.1016/j.jclepro.2022.132074](https://doi.org/10.1016/j.jclepro.2022.132074)

Saidu Musa, K. , & Maijama’a, R. (2020). Causal relationship between renewable energy consumption and unemployment in Nigeria: Evidence from Toda and Yamamoto causality technique. Energy Economics Letters, 7(1). , 46–60. [DOI: 10.18488/journal.82.2020.71.46.60](https://doi.org/10.18488/journal.82.2020.71.46.60)

Sarkodie, S. A. , Adams, S. , Owusu, P. A. , Leirvik, T. , & Ozturk, I. (2020). Mitigating degradation and emissions in China: The role of environmental sustainability, human capital and renewable energy. Science of the Total Environment, 16(2).: 159-172. [doi: 10.1016/j.scitotenv.2020.137530](https://doi.org/10.1016/j.scitotenv.2020.137530)

[doi: 10.1016/j.scitotenv.2020.137530](https://doi.org/10.1016/j.scitotenv.2020.137530)

[10.1016/j.scitotenv.2020.137530](https://doi.org/10.1016/j.scitotenv.2020.137530)