

# How Can Solar Energy Solve the Current Energy Crisis in Pakistan?



Presented by: Faisal Ali Mastoi  
 Supervised by: Deborah McGraw  
 Jacqueline Schneider



## Abstract

Since independence, burning fossil fuels to fulfill the energy demand of Pakistan has led to the deterioration of the environment and an increase in air pollution in major cities such as Karachi and Lahore. Correspondingly, rapid industrialization and economic growth has also resulted in a large difference between the demand and supply of electricity in Pakistan due to rolling blackouts, which are common. This study focuses on the optimal utilization of solar energy as an alternative to fossil fuels which will lead to improvements in Pakistan's environment, economy and energy supply (EEE).

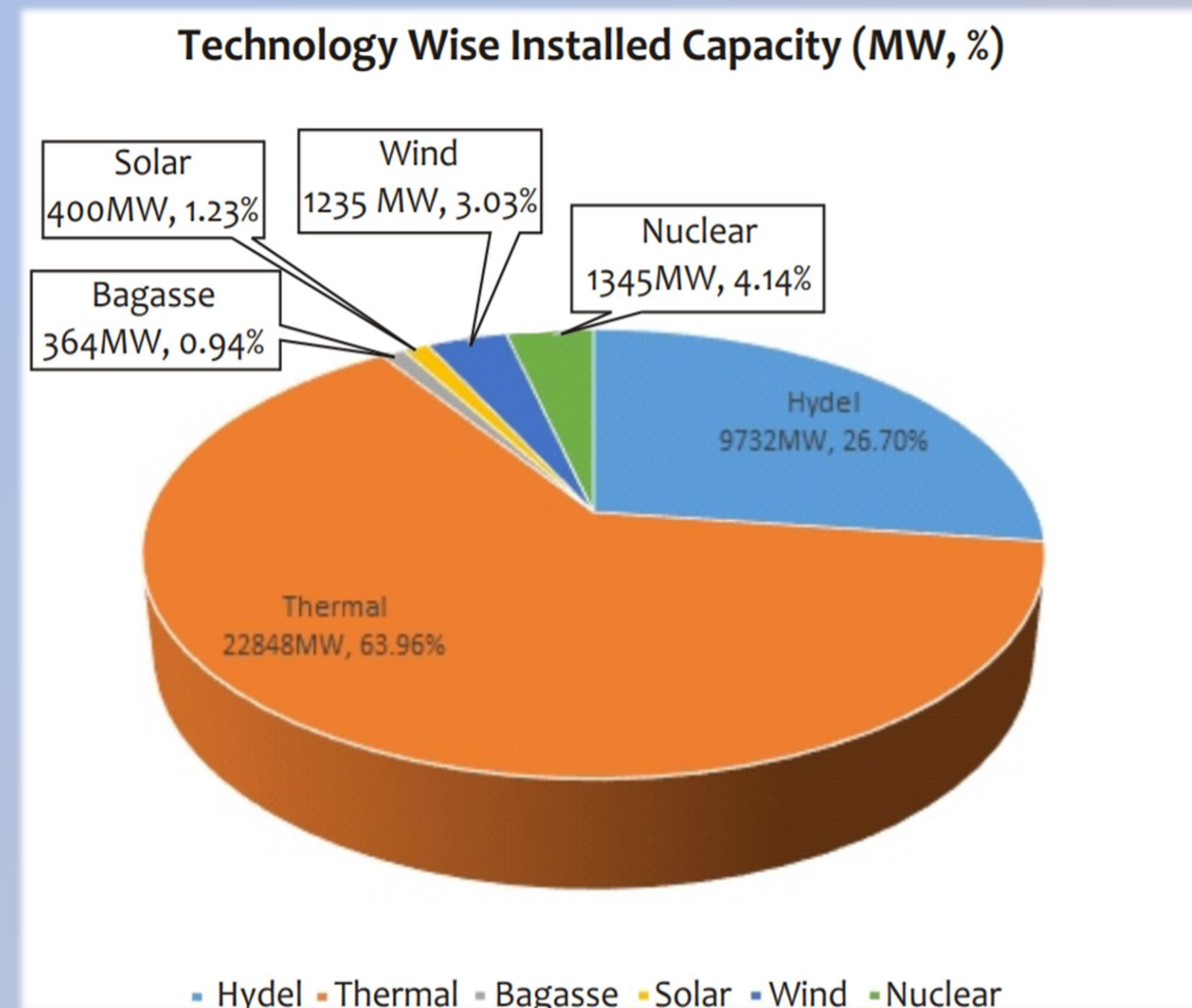


Figure 1 : Electricity Mix of Pakistan in 2019 (NEPRA, 2019).

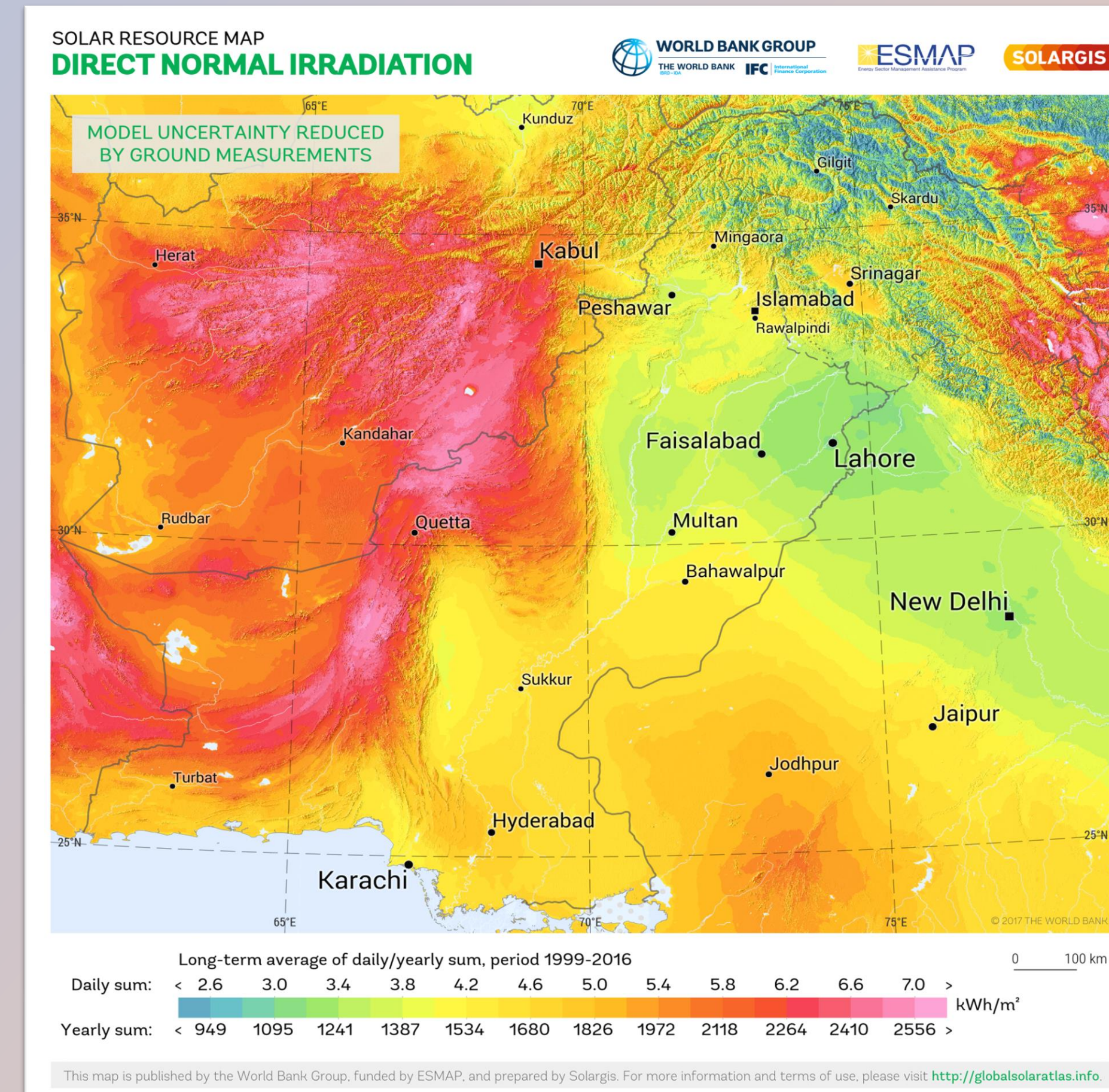


Figure 2 : Direct Normal Irradiation (DNI) of Pakistan (The World Bank, 2020).

## Solar Energy Potential in Pakistan

- Pakistan can generate about 2.9 million MW of electricity by utilizing solar energy (Farooq, M. K., & Kumar, S., 2013).
- 90% of the territory receives annual Global Horizontal Irradiance (GHI) values of 1500 kWh/m<sup>2</sup> (Schillings, C., & Stokler, S., 2015).
- 83% of the territory receives annual Direct Normal Irradiance (DNI) values of 2000 kWh/m<sup>2</sup> (Schillings, C., & Stokler, S., 2015).
- Small-scale photovoltaic (PV) systems rely on GHI values, while large-scale concentrating solar power (CSP) systems require the values of DNI.

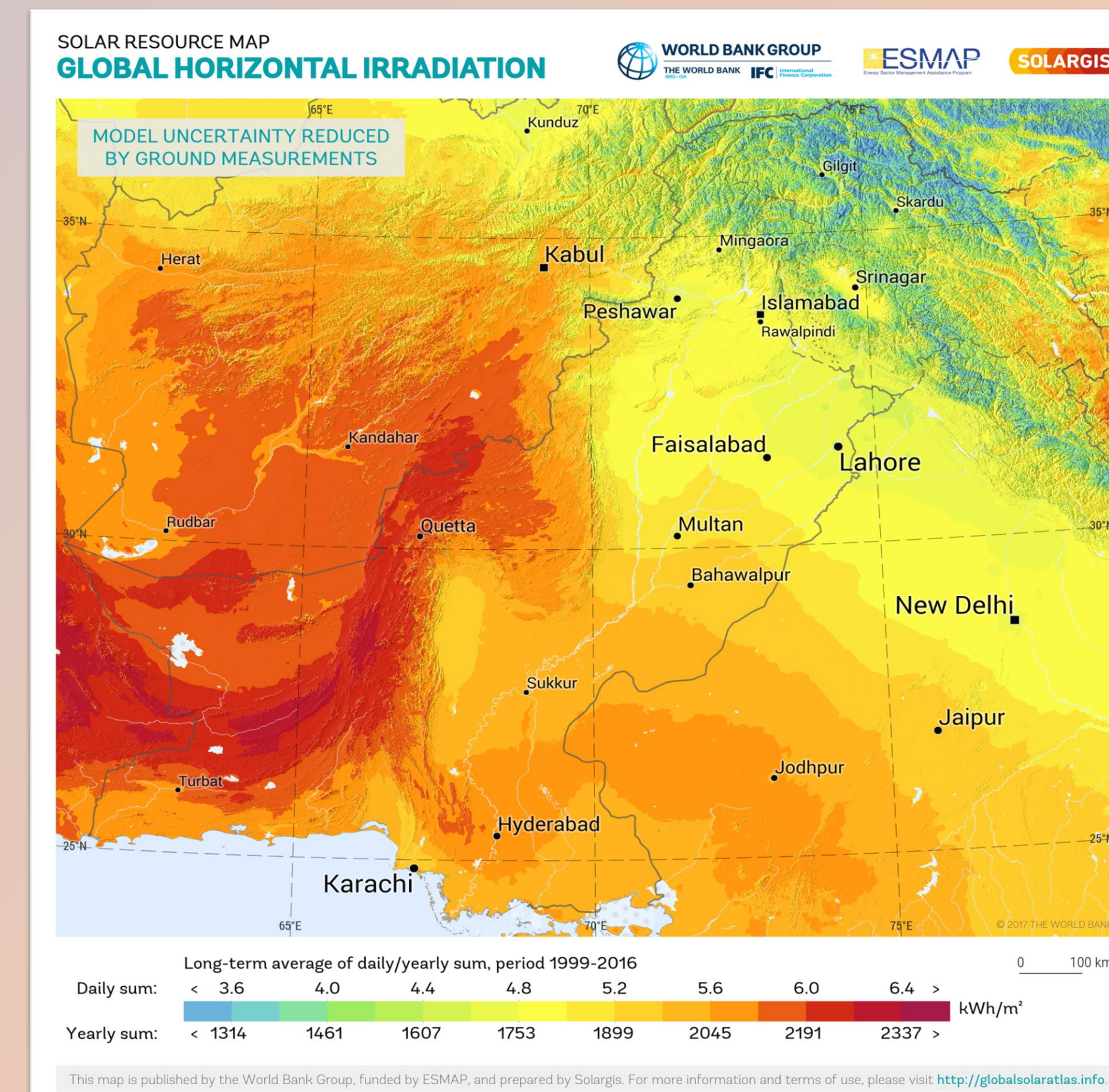


Figure 3 : Global Horizontal Irradiation (GHI) of Pakistan (The World Bank, 2020).

## Introduction

- Pakistan is a developing country and has an ideal location for solar energy utilization.
- Electricity is the backbone of any country and is crucial to its survival in the modern age (Mirjat N.H. et al., 2018).
- A large amount of electricity is produced through fossil fuels.
- The capital costs of solar powerplants are high, but the rising fuel prices in Pakistan and significant solar energy resources potential will be helpful for achieving energy security.

## Conclusion

Thus, by utilizing solar energy, Pakistan can expect the following:

- CO<sup>2</sup> emissions will be reduced.
- The electricity demand-supply gap will be reduced.
- Economic growth will increase.
- Various job opportunities will be created.
- Rural communities will also benefit from increased energy security.

## References

- Farooq, M. K., & Kumar, S. (2013). An assessment of renewable energy potential for electricity generation in Pakistan. *Renewable and Sustainable Energy Reviews*, 20, 240-254.
- Mirjat, N. H., Uqaili, M. A., Harijan, K., Walasai, G. D., Mondal, M. A. H., & Sahin, H. (2018). Long-term electricity demand forecast and supply side scenarios for Pakistan (2015–2050): A LEAP model application for policy analysis. *Energy*, 165, 512-526.
- NEPRA; Annual Report 2018-19. Available online: <https://www.nepra.org.pk/publications/Annual%20Reports/Annual%20Report%202018-19.pdf> (accessed on 29 July 2020).
- Perwez, U., Sohail, A., Hassan, S. F., & Zia, U. (2015). The long-term forecast of Pakistan's electricity supply and demand: An application of long range energy alternatives planning. *Energy*, 93, 2423-2435.
- Schillings, C., & Stokler, S. (2015). *Solar resource mapping in Pakistan: solar modeling report* (No. 95710, pp. 1-32). The World Bank.
- The World Bank, Download maps for your country or region July 27, 2020, Available: <https://globalsolaratlas.info/downloads/pakistan> (2020).