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SUSTAINABLE ENERGY CONSUMPTION IN ASIA PACIFIC REGION: A COMPARATIVE STUDY

Dr. Gulab T. Singh
Asst. Professor, Department of Economics, R.K. Talreja College, Ulhasnagar.

ABSTRACT :

The present study aims to investigate the pattern of renewable energy consumption in Asia Pacific Regions which include Australia, Bangladesh, China, China Hong Kong SAR, India, Indonesia, Japan, Malaysia, New Zealand, Pakistan, Philippines, Singapore, South Korea, Sri Lanka, Taiwan, Thailand, Vietnam, and Others in Asia pacific regions between period 2010 to 2022. The research shows a remarkable shift in the uses of sustainable electricity during the study period. The majority of the countries except New Zealand, Philippines and Singapore in Asia pacific have been witnessed double digit growth in the consumption of renewable energy. The countries link Pakistan, Vietnam, China and Sri Lanka witnessed highest Compound Annual Growth Rate in consumption of renewable energy during the study period.

Objectives: *(1) To study the growth in Electricity generation in Asia Pacific Regions between 2010 to 2022 (2) To study growth in Sustainable Energy Consumption in Asia Pacific Regions between 2010 to 2022 and (3) To make comparative analysis of sustainable electricity consumption in different regions of Asia Pacific Regions between 2010 to 2022.*

Methodology/Statistical Tools: *The study is based on secondary data collected through official publications on Statistical Review of World Energy and research reports of various scholars and researchers. Growth rate and CAGR has been computed to analyse the research outcome.*

KEY WORDS: *Renewable energy, Sustainable Energy, Hydro Electricity, Solar Energy, Wind Energy, Electricity Generation, Asia Pacific Regions, Compound Annual Growth Rate etc..*

INTRODUCTION

The production of renewable energy and its supply is increasing continuously on the global level. Following the sharp rise in the oil prices and its impacts on prices of other traditional sources (coal and gas), a substantial investment has been made in recent years on renewable energy. The improvements technologies have further enabled nations to produce sustainable energy in larger advancements in technology have enabled countries to produce renewable energy in more quantity and in more effective manner. Seeing the negative externality of conventional energy, it is necessary to substitute the conventional sources by renewable energy for better sustainability

The term Sustainable development, closely connected with climate change and was discussed at the UNCED (United Nations Conference on Environment and Development) held in Brazil in 1992. The Conference sought to stabilize the concentrations of greenhouse gases. Traditionally, sustainability is

based on the three-pillars model i.e. Economy, ecology and society. Substantial parts of the world population have very limited access to modern and clean energy. From a sustainable perspective, it is essential to concentrate on expansion and availability of sustainable energy to groups that currently have limited access to it.

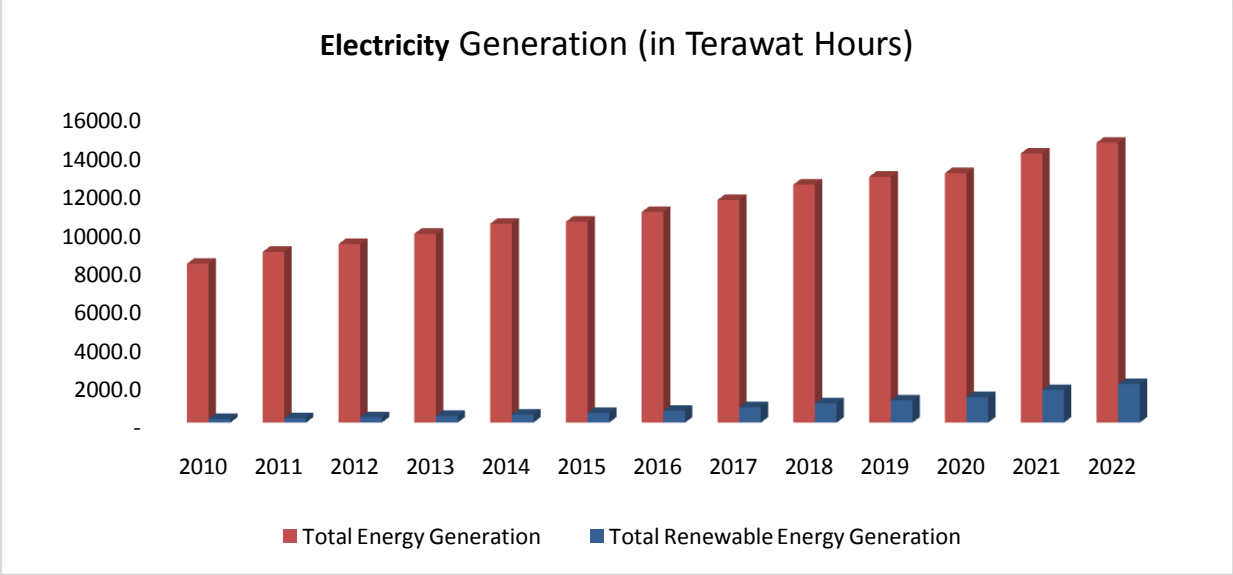
The generation of world renewable energy has on gone increasing from 8.03 in 2010 exazule to 40.8 exajule in a 2022. Talking about region specific contribution in world renewable energy generation in 2010, North America contributed 2.11 exajules, South and Central America contributed 0.57 exajules, Europe contributed 3.32 exajules, the commonwealth of independent States contributed 0.006 exajules, Middle East contributed 0.03 exajules, Africa contributed 0.07 and total Asia Pacific contribution was 1.95 exajules. Contribution of European continent was found to be highest in generation of renewable energy followed by by North America and Asian continents.

The region specific contribution in world's renewable energy generation in witnesses significant changes in 2022. North America this time contributed 7.81 exajules, South and Central America contributed 2.5 exajules, Europe contributed 10.2 exasulles, the commonwealth of independent States contributed 0.13 exajules, Middle East contributed 0.25 exajules, Africa contributed 0.48 and total Asia Pacific contribution was 19.45 exajules. The Asia specific alone contributed nearly half of the total world renewable energy generation in 2022.

Securing and acquiring energy supply and dipping the contribution of energy to environmental change are the bigger challenges that power sectors have to overcome on the way to a sustainable future. The Renewable sources of energies fill naturally without being depleted in the earth. The renewable sources arenormally composed of hydropower, solar energy, bio energy, wind energy, geothermal energy and ocean energy

Use of local sources of energy can be vital in improving energy security, accelerating employment and saving a lot of foreign exchange.

Generation in Asia Pacific Region:



Source: Statistical Review of World Energy

The gross electricity generation in Asia Pacific region increased from 8258.4 terawatt hours in 2010 to 14546.4 terawatt hours in 2022. The total growth observed in electricity total generation during the period stood at 76.1 percent. Talking about the country wise growth in the total electricity generation in the Asia continent during the study period, Australia observed 9 percent growth, Bangladesh 138.6 percent, China 110.3 percent, China Hong Kong SAR -5.8 percent, India 98.19 percent, Indonesia 96.3 percent, Japan -10.5 percent, Malaysia 46.2 percent, New Zealand -0.69 percent,

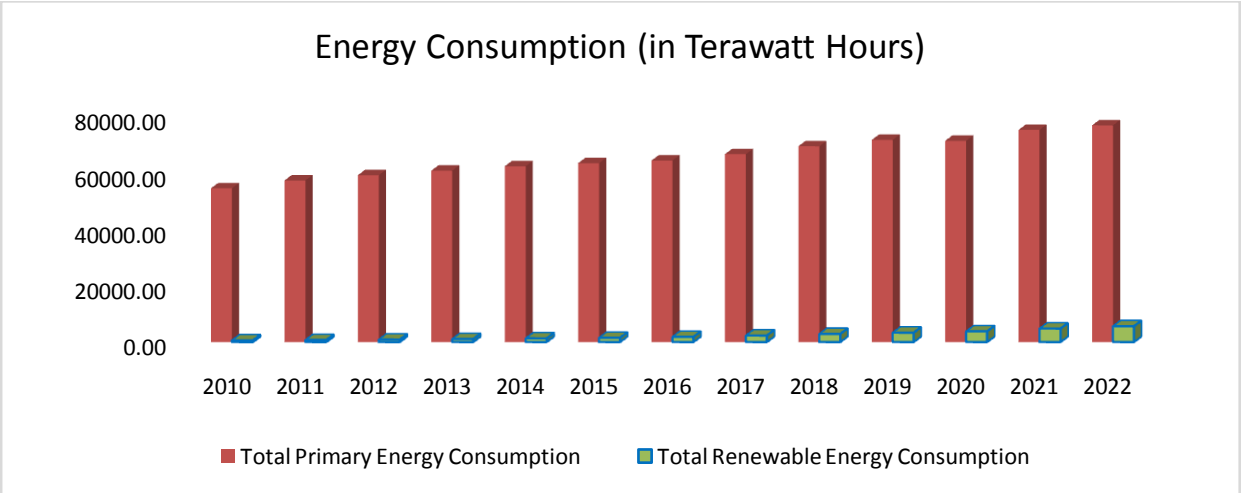
Pakistan 46-6 percent, Philippines 68.9 percent, Singapore 25.8 percent, South Korea 25.3 percent, Sri Lanka 56.6 percent, Taiwan 16.6 percent, Thailand 14.5 percent, Vietnam witnessed highest 183.4 percent, and Others Asia pacific regions observed 11.9 percent growth. Vietnam observed the optimum growth in electricity generation while Japan witnessed the minimum during the study period.

The Compound Annual Growth Rate (CAGR) of electricity generation in the Asia Pacific region was found to be 5 percent during the study period. Talking about the country specific compound annual growth (CAGR) in the region during the study period, it was 1 percent for Australia, 8 percent for Bangladesh, 6 percent for China and Others Asia pacific regions, 0 percent for China Hong Kong SAR and New Zealand, 6 percent for India and Indonesia, -1 percent for Japan, 3 percent for Malaysia and Pakistan, 4 percent for Philippines and Sri Lanka, 2 percent for Singapore and South Korea, 1 percent for Taiwan and Thailand, 9 percent for Vietnam witnessed highest Compound Annual Growth, while Japan observed the lowest in total electricity generation during the study period.

The gross renewable energy generation in Asia Pacific region increased from 185.9 terawatt hours in 2010 to 2002.6 terawatt hours in 2022. The total growth observed in electricity total generation during the period stood at 723.7 percent. Talking about the country wise growth in the total renewable energy generation in the Asia continent during the study period, Australia observed 26 percent growth, Bangladesh 138.6 percent, China 514.7 percent, China Hong Kong SAR 0.04 percent, India 68.5 percent, Indonesia 11.3 percent, Japan 48.7 percent, Malaysia 1.0 percent, New Zealand 1.65 percent, Pakistan 2.56 percent, Philippines 2.2 percent, Singapore 0.4 percent, South Korea 18.1 percent, Sri Lanka 0.6 percent, Taiwan 5.3 percent, Thailand 7.3 percent, Vietnam witnessed highest 13.8 percent, and Others Asia pacific regions observed 0.9 percent growth. China observed the optimum growth in renewable electricity generation while China Hong Kong SAR witnessed the minimum during the study period.

The Compound Annual Growth Rate (CAGR) of renewable energy generation in the Asia Pacific region was found to be 22 percent during the study period. Talking about the country specific compound annual growth (CAGR) in the region during the study period, it was 20 percent for Australia, 24 percent for Bangladesh, 27 percent for China and Sri Lanka, 11 percent for China Hong Kong SAR, 12 percent for Indonesia and Others Asia pacific regions, 3 percent for New Zealand, 15 percent for Japan and Taiwan, 67 percent for Malaysia, 67 percent for Pakistan, 4 percent for Philippines, 9 percent for Singapore, 30 percent for South Korea, 17 percent for Thailand, 63 percent for Vietnam. Pakistan witnessed highest Compound Annual Growth, while Philippines observed the lowest in total renewable generation during the study period.

Energy Consumption in Asia Pacific Region:



Source: Statistical Review of World Energy

The gross primary energy consumption in Asia Pacific region increased from 54725.1 terawatt hours in 2010 to 75509.8 terawatt hours in 2022. The total growth observed in primary electricity total consumption during the period was around 41 percent. Talking about the country specific growth in the total primary energy consumption in the Asian continent during the study period, Australia observed 10 percent growth, Bangladesh 99 percent, China 52 percent, China Hong Kong SAR -32 percent, India 62 percent, Indonesia 56 percent, Japan -16 percent, Malaysia 44 percent, New Zealand -0.89 percent, Pakistan 35 percent, Philippines 72 percent, Singapore 14 percent, South Korea 16 percent, Sri Lanka 36 percent, Taiwan 2 percent, Thailand 19 percent, Vietnam witnessed highest 136 percent, and Others Asia pacific regions observed 82 percent growth. Vietnam observed the optimum growth in primary electricity consumption while China Hong Kong SAR witnessed the minimum during the study period.

The Compound Annual Growth Rate (CAGR) of primary energy consumption in the Asia Pacific region was found to be around 3 percent during the study period. Talking about the country specific compound annual growth (CAGR) in the region during the study period, it was 1 percent for Australia, Singapore, South Korea and Thailand, 6 percent for Bangladesh, 4 percent for China, India and Indonesia, Sri Lanka, -3 percent for China Hong Kong SAR, -1 for Japan, 3 percent for Malaysia, Pakistan and Sri Lanka, zero percent for New Zealand and Taiwan and 5 percent for Philippines and Others Asia pacific regions and 7 percent for Vietnam. Vietnam witnessed highest Compound Annual Growth, while China Hong Kong SAR observed the lowest in total renewable generation during the study period.

The gross renewable energy consumption in Asia Pacific region increased from 596 terawatt hours in 2010 to 5622 terawatt hours in 2022. The total growth observed in renewable electricity consumption during the period was around 843 percent. Talking about the country specific growth in the total renewable energy consumption in the Asian continent during the study period, Australia observed 626 percent growth, Bangladesh 1152 percent, China 1451 percent, China Hong Kong SAR 383 percent, India 438 percent, Indonesia 634 percent, Japan 359 percent, Malaysia 506 percent, New Zealand 41 percent, Pakistan 46345 percent, Philippines 61 percent, Singapore 162 percent, South Korea 1346 percent, Sri Lanka 1461 percent, Taiwan 373 percent, Thailand 341 percent, Vietnam witnessed 29705 percent, and Others Asia pacific regions observed 267 percent growth. Vietnam observed the optimum growth in renewable electricity consumption while New Zealand witnessed the minimum growth in consumption during the study period.

The Compound Annual Growth Rate (CAGR) of renewable energy consumption in the Asia Pacific region was around 21 percent during the study period. Talking about the country specific compound annual growth (CAGR) in the region during the study period, it was 18 percent for Australia and Indonesia, 23 percent for Bangladesh, 26 percent China and Sri Lanka, 14 percent for China Hong Kong SAR, Taiwan and Japan, 15 Percent for India, 18 percent for Indonesia, 16 percent for Malaysia,3 percent for New Zealand, 67 Percent for Pakistan, 4 percent for Philippines, 8 percent for Singapore, 25 percent for South Korea,13 percent for Thailand, 61 percent for Vietnam and 11 percent for Other Asia Pacific Regions. Pakistan witnessed highest Compound Annual Growth, while New Zealand observed the lowest growth in consumption of total renewable generation during the study period.

FINDINGS AND CONCLUSION:

The consumption of sustainable energy was on the rise in Asia pacific region during the study period. Every country in the Asia Pacific region witnessed positive shift towards consumption of renewable energy with some country witnessing more growth while some in lesser volume. Pakistan was found to be witnessing the highest growth followed by Vietnam, China and Sri Lanka in consumption of renewable energy while New Zealand was found to be at bottom followed Philippines and Singapore during the study period.

As energy sector has generally been perceived as key to economic development with a strong correlation between economic growth and expansion of energy consumption. In the long term, the potential for fossil fuel scarcity and decreasing quality of fossil reserves represents an important reason for a transition to a sustainable worldwide RE system. (Greene et al., 2006).

Renewable energy sources are among the most cost-effective and efficient options available. That is why there is an intimate connection between renewable energy and sustainable development. Since fossil fuels are limited resources and most projections indicate that proven oil reserves won't be enough to supply global demand by at least the middle of the 21st century, society is moving toward a dependence on renewable energy today

Renewable Energy Resources are innovative options for electricity generation and their potential is enormous as they can in principle, meet the world's energy demand many times over.

The sustainable energy development has evolved to become an important policy objective addressed by governments around the world. Initially, energy was viewed narrowly in conjunction with emissions and air quality. Now, energy is considered to be a necessary enabler for social and economic development and, consequently, sustainable development.

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