**Table S1**

Smart Grid Investment in the World's Leading Ten Nations

|  |  |
| --- | --- |
| **Countries**  | **Investment (One Million Dollars)** |
| **Comprehensive Infrastructure**  | **Smart grid technology** | **terminal Interaction** | **Deployment of renewable Energy** |
| China  | 1800 | 1000 | 2000 | 600 |
| US | 2500 | 1500 | 1200 | 400 |
| Japan | 250 | 1000 | 1300 | 300 |
| South Korea | 150 | 350 | 300 | 250 |
| Spain | 350 | 200 | 200 | 150 |
| Germany | 0 | 150 | 50 | 50 |
| Australia  | 0 | 120 | 20 | 30 |
| UK | 0 | 100 | 0 | 20 |
| France  | 0 | 50 | 0 | 10 |
| Brazil | 0 | 50 | 0 | 5 |

**Table S2**

Investment Progress in China across Various Stages

|  |  |
| --- | --- |
|  | **Investment (108 Yuan)** |
| **Stages**  | **Annual Average Grid**  | **Annual Average Smart Grid Investment** |
| First Stage  | 2655 | 185 |
| Second Stage  | 3500 | 355 |
| Third Stage  | 3000 | 355 |

**Table S3**

Impact on Renewable Energy and Carbon Emissions

|  |  |  |
| --- | --- | --- |
| **Key Performance Indicators**  | **Year 1 (Before)** | **Year 5 (after)** |
| Renewable Energy Penetration Rate | 15% | 35% |
| Reduction in Carbon Emissions (metric tons) | 5,00,000 | 3,50,000 |
| Energy Efficiency Gains (kWh per capita) | 6,000 kWh | 7,500 kWh |

**Table S4**

Impact on Renewable Energy, Carbon Emissions, and Job Creation

|  |  |  |
| --- | --- | --- |
| **Key Performance Indicators**  | **Year 1 (Before)** | **Year 5 (after)** |
| Growth in Renewable Energy Capacity (Megawatts) | 15% | 35% |
| Reduction in Carbon Emissions (Metric Tons) | 5,00,000 | 3,50,000 |
| Job Creation in New Energy Industry | 6,000 kWh | 7,500 kWh |

**Table S5**

Key Performance Indicators Before and After

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Key Performance Indicators**  | **Mean Before** | **Mean After** | **Mean Differences** | **S.D** | **T-statistics**  | **Sig. value** |
| Growth in Renewable Energy Capacity (Megawatts) | 2000MW | 5000MW | 3000 MW | 1000MW | 3.00 | 0.03 |
| Reduction in Carbon Emissions (Metric Tons) | 12,00,000 | 8,00,000 | -4,00,000  | 3,00,000 | 2.00 | 0.02 |
| Job Creation in New Energy Industry | 3,000 Jobs | 7,500 Jobs  | 4500 Jobs  | 1,500 Jobs | 5.00 | 0.02 |

**Table S6**

Regression Analysis

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Regression Analysis** | **Coefficient** | **Std Error** | **T-Statistic** | **P-Value** |
| **Intercept** | 100.23 | 20.45 | 4.89 | 0.001 |
| **Sustainability Indicator (e.g., Air Quality Index)** | -3.57 | 1.21 | -2.96 | 0.002 |
| **Economic Assessment (Savings/Revenue, $ millions)** | 0.87 | 0.15 | 5.80 | 0.003 |
| **Renewable Energy Capacity (Megawatts)** | 2.45 | 0.31 | 7.90 | 0.004 |