Statistical Perspectives
Focus Areas for Enhanced Energy Security

**ENERGY ACCESS**
Working towards universal access to modern energy services can advance inclusive social and economic development.

**ENERGY EFFICIENCY**
Adopting efficiency measures can significantly enhance economic competitiveness and reduce greenhouse gas emissions.

**RENEWABLE ENERGY**
Developing new and renewable energy sources can diversify the energy mix and create new job opportunities.

**ENERGY AND ENVIRONMENT**
Shifting consumption towards sustainable energy can minimise environmental impacts and improve the future outlook for the well-being of our citizens and planet.

**ENERGY ECONOMICS**
Improving fiscal policy and financing mechanisms can incentivise and strengthen markets for sustainable energy.

**ENERGY TRADE AND INVESTMENT**
Promoting trade and investment can optimise the development and utilisation of current and emerging energy resources.

**ENERGY CONNECTIVITY**
Developing infrastructure and harmonised energy policies can increase regional economic integration and resilience.

The statistics presented in this publication primarily cover member States located in the Asia-Pacific region. However, Associate and Non-regional members appear in select charts and tables. Due to data limitations, only selected countries are used in several of the statistical representations. Additionally, "Pacific (AUS, NZ)" indicates that data for the Pacific subregion represents only Australia and New Zealand.

This publication is for reference only. Graphs and charts are based on data sources consulted for this publication. Additional data sources may exist that are not represented. In some cases, data sets may not be complete. ESCAP cannot confirm methodologies of data sources.

Member states listed in blue are considered “Asia-Pacific Developed Countries”. Other member States are considered “Asia-Pacific Developing Countries”.

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<thead>
<tr>
<th>East and North-East Asia</th>
<th>North and Central Asia</th>
<th>South-East Asia</th>
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<table>
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<th>Associate Members</th>
<th>Non-regional Members</th>
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<tr>
<td>American Samoa</td>
<td>France</td>
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<td>Cook Islands</td>
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<td>French Polynesia</td>
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<td>Guam</td>
<td>United States of America</td>
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<td>Hong Kong, China</td>
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<td>Macau, China</td>
<td>Northern Mariana Islands</td>
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<td>New Caledonia</td>
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</tbody>
</table>
**Per Capita Final Energy Consumption, 2010**

- **South and South-West Asia**: 593 kg of oil equivalent (kgoe)
- **East and North-East Asia**: 220 kgoe
- **South-East Asia**: 37 kgoe
- **North and Central Asia**: 1,777 kgoe
- **Pacific (AUS, NZ)**: 1,551 kgoe

**2010 Population (million)**

**Per Capita Energy Consumption by Global Region**

- **South and South-West Asia**: 593 kgoe
- **East and North-East Asia**: 220 kgoe
- **South-East Asia**: 37 kgoe
- **North and Central Asia**: 1,777 kgoe
- **Pacific (AUS, NZ)**: 1,551 kgoe

**Energy Consumption and Human Development**

The **HUMAN DEVELOPMENT INDEX (HDI)**, developed by UNDP, is a measure of human development and is a composite statistic of life expectancy, education, and income indices. The index is published annually.

In this chart, the 2010 index was used to match against the most recent data for energy consumption.

The **HUMAN DEVELOPMENT INDEX** ranges from 0 to 1, with higher values indicating higher levels of human development.

**Per Capita Energy Consumption**

- **Low**: 0.3
- **Medium**: 0.4
- **High**: 0.5
- **Very High**: 0.6
- **Overconsumption**: 0.7
- **BASIC NEEDS**: 0.8

**Data sources**:
- ESCAP Statistical Database based on data from IEA
- ESCAP Statistical Database based on data from WPP2010
- World Bank, UNDP, and ESCAP Statistical Database based on data from IEA
Total Energy Consumption and Population by Global Region

Data source: ESCAP Statistical Database based on data from IEA and WPP2010

Total Energy Consumption and Population by Asia-Pacific Subregion

Data source: ESCAP Statistical Database based on data from IEA

Asia-Pacific Per Capita Energy Consumption

Data source: ESCAP Statistical Database based on data from IEA and WPP2010

Asia-Pacific Urbanisation Trends

Data source: ESCAP Statistical Database based on data from WPP2010
Global Cumulative Carbon Dioxide (CO₂) Emissions

GDP in 2005 Constant Prices

Asia-Pacific* Total Primary Energy Demand Outlook in the New Policies Scenario**

Asia-Pacific Total Primary Energy Demand 1990-2035, by Scenario**

Data source: ESCAP Statistical Database based on data from MDG Indicators database

Data source: ESCAP Statistical Database based on data from NAMAD

Source: Based on data from IEA World Energy Outlook (WEO) 2012

Data excludes the following ESCAP member States: Armenia, Azerbaijan, Bhutan, Georgia, Iran IR, Kazakhstan, Kyrgyzstan, Marshall Islands, Micronesia, Nauru, Palau, Tajikistan, Turkey, Turkmenistan, Tuvalu, Uzbekistan.

** See References and Notes section for an explanation of the IEA Current Policies Scenario, New Policies Scenario and 450 Scenario.
The HUMAN DEVELOPMENT INDEX (HDI) is a composite statistic of life expectancy, education, and income indices.

Data sources: IEA WEO 2011, UNDP

Access to Electricity and Human Development, Selected Countries, 2010

The HUMAN DEVELOPMENT INDEX (HDI) is a composite statistic of life expectancy, education, and income indices.

Number of people without electricity access (millions)

- India: 253
- Bangladesh: 68
- Indonesia: 63
- Pakistan: 56
- Myanmar: 56
- Afghanistan: 46
- Korea, DPR: 38
- Philippines: 35
- Vietnam: 16
- Cambodia: 10
- Thailand: 8
- Nepal: 7
- Sri Lanka: 6.2
- China: 5
- Lao PDR: 2.2
- Rest of Asia: 2.1
- Rest of the World: 2.1

Access to Electricity 2010 (% of Population)

Note: Due to rounding, total differs from the sum of all countries.
Data source: IEA WEO 2012

People without Access to Electricity, 2010

- Rural electrification rate
- Urban electrification rate

Data source: IEA WEO 2011
Solid Fuel* Use and Gender Inequality, Selected Countries

The GENDER INEQUALITY INDEX (GII) is a composite measure reflecting inequality in achievements between women and men in three dimensions: reproductive health, empowerment and the labour market.

Solid fuels include coal, charcoal, wood, crops or other agricultural waste, dung, shrubs, grass, straw, and others.

People Using Traditional Biomass 2010 (millions)

Data sources: UNDP, UN Data
Data source: IEA WEO 2012

Energy Access

Energy Access
Data source: WHO Household Energy Database

Primary Cooking Fuel Mix for Selected Asia-Pacific Countries, 2010

Estimated DALYs Per 1,000 Capita from Indoor Air Pollution, 2004

The disability-adjusted life year (DALY) is a measure of overall disease burden, expressed as the number of years lost due to ill-health, disability or early death.

Data source: WHO

Estimated Deaths from Indoor Air Pollution, 2004

The numbers reflect the estimated deaths per 1,000 inhabitants.
**Energy Efficiency**

### Selected Energy Use and Intensity Reduction Targets

<table>
<thead>
<tr>
<th>Region</th>
<th>Energy Use (TPES)</th>
<th>Energy Intensity</th>
<th>Reduction Target (%)</th>
<th>Baseline Year</th>
<th>Target Year</th>
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<td>Indonesia</td>
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<td>1% /yr</td>
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<td>New Zealand</td>
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<td>1.3% /yr</td>
<td>2010</td>
<td>2021</td>
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**Note:**
- TPES = Total Primary Energy Supply
- TFC = Total Final Consumption
- BAU = Business as usual

### The GLOBAL COMPETITIVENESS INDEX

The GLOBAL COMPETITIVENESS INDEX is a composite statistic published annually by the World Economic Forum. The index is comprised of over 100 variables under 12 pillars including: institutions, infrastructure, macroeconomy, health and primary education, higher education, goods market efficiency, labour markets, financial markets, technological readiness, market size, business sophistication, and innovation.

**Data source:** World Economic Forum

### The ENERGY EFFICIENCY FACTOR

The ENERGY EFFICIENCY FACTOR value is derived from subtracting final energy intensity (total final consumption per unit GDP [kgoe/2005 Constant USD]) from 1. A higher value represents greater efficiency.

**Data source:** ESCAP Statistical Database based on data from IEA and NAMAD

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**Selected Energy Use and Intensity Reduction Targets (continued)**

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<tr>
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LIMITING GLOBAL WARMING

The 6°C Scenario (6DS) is largely an extension of current trends and is broadly consistent with the Current Policies Scenario*. By 2050, energy use almost doubles (compared with 2009) and total Green House Gas (GHG) emissions rise even more. In the absence of efforts to stabilise atmospheric concentrations of GHGs, average global temperature rise is projected to be at least 6°C in the long term.

The 4°C Scenario (4DS) takes into account recent pledges made by countries to limit emissions and step up efforts to improve energy efficiency. It is broadly consistent with the New Policies Scenario.

The 2°C Scenario (2DS) describes an energy system consistent with an emissions trajectory that recent climate science research indicates would give an 80% chance of limiting average global temperature increase to 2°C. It is broadly consistent with the 450 Scenario. It sets the target of cutting energy-related CO₂ emissions by more than half in 2050 (compared with 2009) and ensuring that they

*See the References and Notes section for a further explanation of the various scenarios.

Source: IEA, Energy Technology Perspectives 2012
Cumulative Installed Wind Power Capacity in Top Ten Countries, 1990-2012

Data source: EPI from Worldwatch, CREIA, DOE, GWEC, EWEA

Asia-Pacific Installed Renewable Energy Capacity Including Hydro (GW), 2009/2010

491.9 GW

Data source: REN21

Renewable Energy Policies, Selected Countries

RPS = Renewable Portfolio Standard

Source: REN21 Renewables 2012 Global Status Report
Asia-Pacific Renewable Energy Production, by Subregion
(excluding Hydro and Solid Biomass)

Source: IEA

Renewables** as % of Total Energy Production

Data source: IEA

** Includes: hydro, geothermal, solar PV, solar thermal, wind, municipal waste (renewable), solid biomass, charcoal, landfill gas, sludge gas, other biogases, biogasoline, biodiesel, and other liquid biofuels.

*** Solid biomass includes a multitude of woody materials such as firewood, wood chips, bark, sawdust, shavings, chips, sulphite lyes, and animal waste.
Asia-Pacific Electricity Production from Renewables (excluding Hydro)

- Biofuels and Waste: 17%
- Solar: 4%
- Wind: 47%
- Solid Biomass: 15%
- Geothermal: 2%
- Hydro: 14%
- Fossil fuels and nuclear: 84%

Data source: IEA

Potential Employment Creation through Off-Grid Renewable Electricity

- Solar: 30
- Small Hydro: 4
- Biomass: 15
- Wind: 22

Source: IRENA, 2012

Average Employment over Life of Power Plants (Estimated jobs per megawatt of average capacity)

<table>
<thead>
<tr>
<th>Energy Source</th>
<th>Manufacturing, Construction, Installation</th>
<th>Operations &amp; Maintenance/Fuel Processing</th>
<th>Total</th>
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<tbody>
<tr>
<td>Solar PV</td>
<td>5.76–6.21</td>
<td>1.20–4.80</td>
<td>6.96–11.01</td>
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<tr>
<td>Wind Power</td>
<td>0.43–2.51</td>
<td>0.27</td>
<td>0.70–2.78</td>
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<tr>
<td>Biomass</td>
<td>0.4</td>
<td>0.38–2.44</td>
<td>0.78–2.84</td>
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<tr>
<td>Coal-Fired</td>
<td>0.27</td>
<td>0.74</td>
<td>1.81</td>
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<tr>
<td>Natural Gas-Fired</td>
<td>0.25</td>
<td>0.7</td>
<td>0.95</td>
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</table>

Source: UNEP, 2008

Renewable Energy Employment 2009/10

- China: 1,600
- India: 1,400
- USA: 1,200

Source: ILO, 2012
Global CO₂ Emissions 2009

30.1 billion tonnes

Data source: ESCAP Statistical Database based on data from MDG Indicators database

Total CO₂ Emissions by Asia-Pacific Subregion

Global Per Capita CO₂ Emissions

Per Capita CO₂ Emissions by Asia-Pacific Subregion

Data source: ESCAP Statistical Database based on data from MDG Indicators database
Median Lifecycle GHG Emissions from Electricity Generation Technologies

Asia-Pacific Electricity Production by Resource

WHO Air Quality Particulate Matter (PM10) Level Targets

PM10 levels in Selected Asia-Pacific Cities*

Outdoor Air Pollution Attributable DALYs per 100,000 Capita, 2004

CSP = Concentrating solar power

Source: Adapted from IPCC SRRES, 2011

Data source: IEA

Data source: WHO Global Health Observatory

Data source: WHO Urban Outdoor Air Pollution Database

*Data ranges from 2003-2010

The disability-adjusted life year (DALY) is a measure of overall disease burden, expressed as the number of years lost due to ill-health, disability or early death.

This chart indicates annual mean concentration of particulate matter of less than 10 microns of diameter (PM10) (µg/m³) in cities.

These particles are able to penetrate deeply into the respiratory tract and therefore constitute a risk for health by increasing mortality from respiratory infections and diseases, lung cancer, and selected cardiovascular diseases.
Asia-Pacific Diesel and Gasoline Pump Prices, 2012

Yellow and blue lines indicate the retail prices of diesel and gasoline in the United States. These cost-covering retail prices include industry margins, VAT and include approximately US 10 cents for two road funds (federal and state). This fuel price, being without other specific fuel taxes, may be considered as the international minimum benchmark for a non-subsidised road transport policy.

Household Electricity Tariffs for Selected ESCAP Member States, September 2010

Data source: World Bank statistical database based on data from GIZ

Data source: GIZ “Power in G-20 and N-11 Countries – At What Cost?” 2010

* New investment volume adjusts for re-invested equity. Total values include estimates for undisclosed deals.

Note: WTE = waste to energy

Data source: Bloomberg New Energy Finance, UNEP


Data source: Bloomberg New Energy Finance, UNEP

Total Clean Energy** Investment for Selected ESCAP Member States, 2012

** Clean energy includes: all biomass, geothermal, and wind generation projects of more than 1 MW; all hydro projects between 1 and 50 MW; all marine energy projects; all biofuels projects with a capacity of 1 million litres or more a year; and all solar projects, excluding those less than 1 MW in size. Efficiency & low carbon technology investment is comprised of financial investment in technology companies covering energy efficiency, smart grid, energy storage, advanced transportation, carbon capture and storage, and general clean energy services companies. Investment in efficiency and low-carbon technology projects by governments and public financing institutions was excluded.


Distribution of Clean Energy** Investment for Selected ESCAP Member States, 2006-2012

Global Net Energy Imports

Asia-Pacific Subregional Net Energy Imports

Asia-Pacific Top 5 Importers and Exporters by Energy Resource, 2010 (ktoe)

Data source: ESCAP Statistical Database based on data from IEA

Note: “Coal” is comprised of coal and peat. “Renewables” includes hydro.

Data source: IEA
Global Cross Border New Investment in Clean Energy, 2011*  
*New build asset finance for renewable energy projects only. Investment volumes show cross-border investments only. Domestic investments are excluded.

Asia-Pacific** Cumulative Gross Capacity Additions by Source under the New Policies Scenario*** 2012-2035

- **Non-Renewable**: $372 billion
- **Renewable**: $1,038 billion

- **South-South**: 9% (3%)
- **South-North**: 18% (9%)
- **North-South**: 18% (3%)
- **North-North**: 70%

Source: Bloomberg New Energy Finance White Paper

North-South Clean Energy Investment Flows: An $8bn Step to a $100bn Goal

- **Public Funds**: 13%
- **Private Funds**: 87%

$44.3 billion

Asia-Pacific** Needed Investment in Electricity-Supply Infrastructure under the New Policies Scenario*** 2012-2035 ($2011 billion)

- **Non-Renewable**: $2,049 billion
- **Renewable**: $2,728 billion

- **Transmission**: 948 billion
- **Distribution**: 2,899 billion
- **Plant Infrastructure**: 4,777 billion

$8,624 (billion)

** excludes the following ESCAP member States: Armenia, Azerbaijan, Bhutan, Georgia, Iran IR, Kazakhstan, Kyrgyzstan, Marshall Islands, Micronesia, Nauru, Palau, Tajikistan, Turkey, Turkmenistan, Tuvalu, Uzbekistan.

*** New Policies Scenario: A scenario in the IEA World Energy Outlook which takes account of broad policy commitments and plans that have been announced by countries, including national pledges to reduce greenhouse gas emissions and plans to phase out fossil energy subsidies, even if the measures to implement these commitments have yet to be identified or announced.

**** Includes geothermal, concentrating solar power and marine.

Data source: IEA WEO 2012
Energy Self-Sufficiency
in Asia and the Pacific

Data source: ESCAP Statistical database based on data from IEA and IRENA

Major Oil Trade Movements, 2011

Oil trade movements are represented in million tonnes

Major Gas Trade Movements, 2011

Gas trade movements are in billion cubic metres

*Data was unavailable for Afghanistan, Maldives, Timor-Leste and Tuvalu.
Note: Energy self-sufficiency values for this chart were derived by subtracting the ratio of production over TPES from one.

Source: Adapted from BP Statistical Review of World Energy 2012
Coal-generated electricity cost by transport options**

Asia-Pacific Proved Fossil Fuel Reserves at end of 2011

Coal - generated electricity cost by transport options**

Asia-Pacific Renewable Energy Resources

Note: Proportions represented are independent of each other and therefore are not directly comparable.

Note: Pie charts were generated using million tonnes of equivalent for the three fossil fuel resource types. Size of chart is approximate representation of total fossil fuel resources.

Note: The information on resources should be taken as an indication only. It refers to a general trend of available resources, and does not pre-judge the feasibility of individual projects. The thresholds are indicative, and do not refer to any technological choice. The IRENA analysis is based on literature.

Nuclear Renewable Energy Technical Potential

Energy Connectivity

Energy Connectivity

Energy Connectivity

Energy Connectivity

Energy Connectivity

Energy Connectivity
### Energy Connectivity

#### Smart Grid Technology, Maturity Levels, Development Trends and Action Areas

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<th>Development Trend</th>
<th>Generation</th>
<th>Transmission</th>
<th>Distribution</th>
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<th>Service</th>
<th>Residential</th>
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<td>Supporting cyber security</td>
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<td><strong>Information and communication technology (ICT) integration</strong></td>
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<td><strong>Renewable and distributed generation integration</strong></td>
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<td><strong>Advanced metering infrastructure (AMI)</strong></td>
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<td><strong>Electric vehicle charging infrastructure</strong></td>
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<td><strong>Customer-side systems (CS)</strong></td>
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<td><strong>Determine policy to use Smart Grids to leverage investments</strong></td>
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<td><strong>Promote real-time energy usage info and pricing</strong></td>
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*Battery storage technologies are less mature than other distributed energy technologies*

**High Temperature Superconducting technology is still in the developing stage of maturity**

Source: adapted from OECD/IEA 2011 Technology Roadmap: Smart Grids