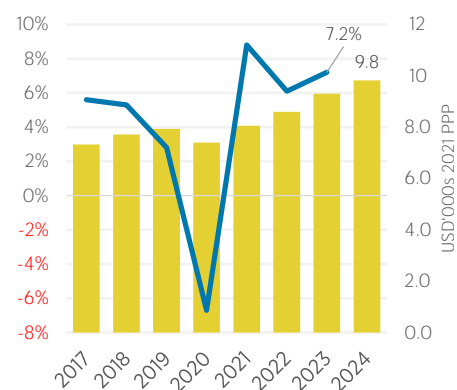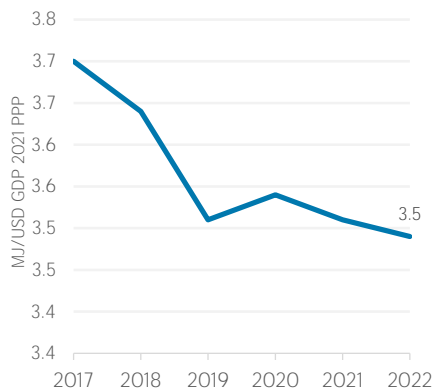# India

IRENA
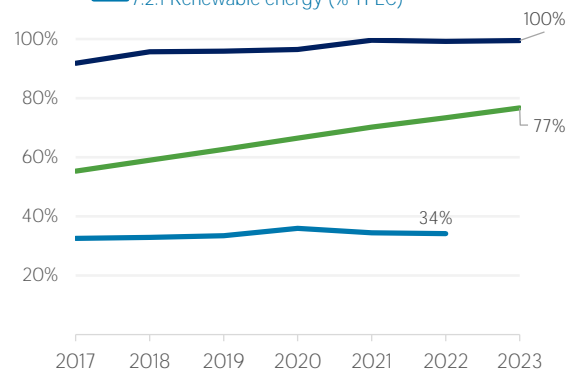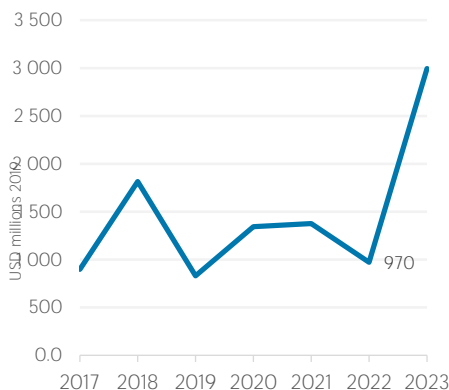International Renewable Energy Agency

COUNTRY INDICATORS AND SDGS

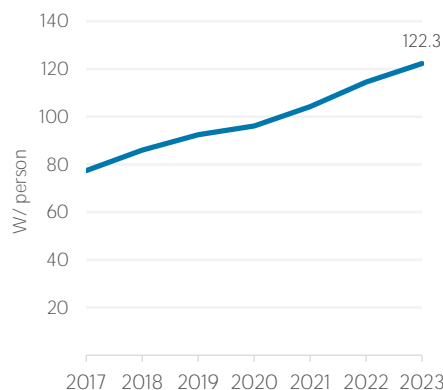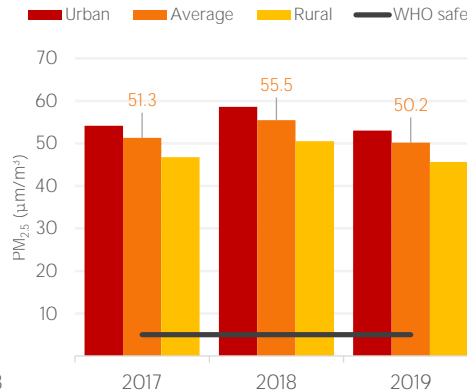**GDP per capita** — **8.1.1 Real GDP growth rate**

7.3.1 Energy intensity

— 7.1.1 Access to electricity (% population)
— 7.1.2 Access to clean cooking (% population)
— 7.2.1 Renewable energy (% TFEC)

7.a.1 Public flows to renewables
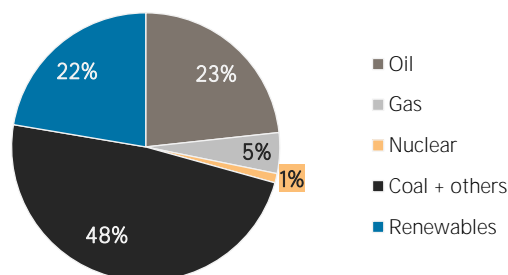

7.b.1 Per capita renewable capacity

11.6.2 Air particulate matter (PM$_{2.5}$)

■ Urban ■ Average ■ Rural — WHO safe

TOTAL ENERGY SUPPLY (TES)

Total Energy Supply (TES)	2017	2022
Non-renewable (TJ)	29 264 243	34 220 086
Renewable (TJ)	8 391 334	9 846 479
Total (TJ)	37 655 577	44 066 565
Renewable share (%)	22	22

Growth in TES	2017-22	2021-22
Non-renewable (%)	+16.9	+11.5
Renewable (%)	+17.3	+5.0
Total (%)	+17.0	+10.0

Primary energy trade	2017	2022
Imports (TJ)	17 906 076	19 283 088
Exports (TJ)	3 254 042	2 712 951
Net trade (TJ)	-14 652 034	-16 570 137
Imports (% of supply)	48	44
Exports (% of production)	14	10
Energy self-sufficiency (%)	61	62

Total energy supply in 2022

■ Oil
■ Gas
■ Nuclear
■ Coal + others
■ Renewables

Renewable energy supply in 2022

■ Hydro/marine
■ Wind
■ Solar
■ Bioenergy
■ Geothermal

RENEWABLE ENERGY CONSUMPTION (TFEC)

Renewable TFEC trend

- ■ Electricity
- ■ Commercial heat
- ■ Bioenergy

Petajoules (PJ)

Year	Value
2017	9 139
2018	9 633
2019	9 927
2020	10 194
2021	10 594
2022	11 189

Renewable energy consumption in 2022

- ■ Geothermal
- ■ Solar direct

12%
88%

- ■ Industry
- ■ Transport
- ■ Households
- ■ Other

31%
1%
43%
25%
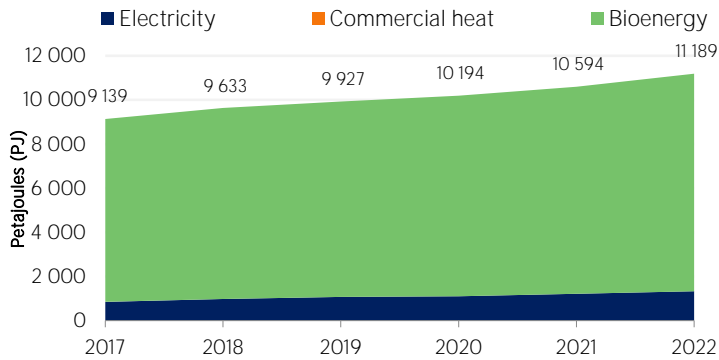
Consumption by sector	2017	2022
Industry (TJ)	2 686 460	3 436 823
Transport (TJ)	10 815	155 084
Households (TJ)	4 388 472	4 832 572
Other (TJ)	2 052 856	2 764 820
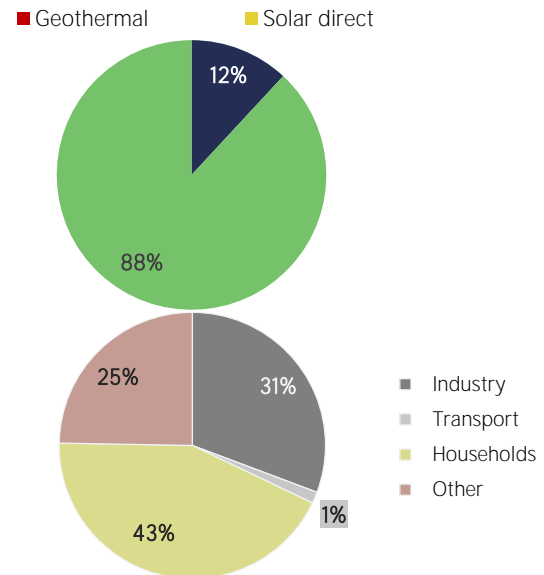
ELECTRICITY CAPACITY

Installed capacity trend

- ■ Fossil fuels
- ■ Nuclear
- ■ Other Non-RE
- ■ Hydro/marine
- ■ Wind
- ■ Solar
- ■ Bioenergy
- ■ Geothermal
- — Renewable share

Gigawatts (GW) / Renewable share (%)

Year	Value
2017	388
2018	420
2019	443
2020	451
2021	465
2022	482
2023	500
2024	534

38%
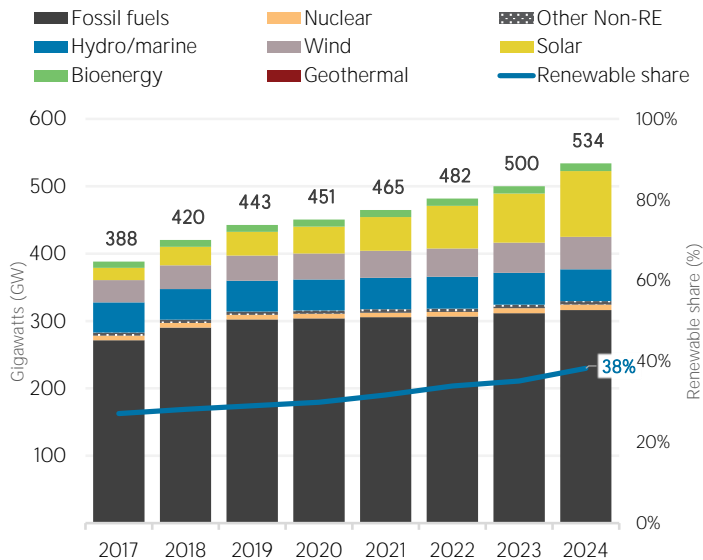
Renewable capacity in 2024

- ■ Hydro/marine
- ■ Solar
- ■ Wind
- ■ Bioenergy
- ■ Geothermal

23%
48%
24%
5%

Net capacity change (GW)

- ■ Fossil fuels
- ■ Renewable

Year	Fossil fuels	Renewable
2019	12	10
2020	1.6	6.3
2021	1.6	13
2022	1.0	16
2023	5.0	13
2024	4.5	29
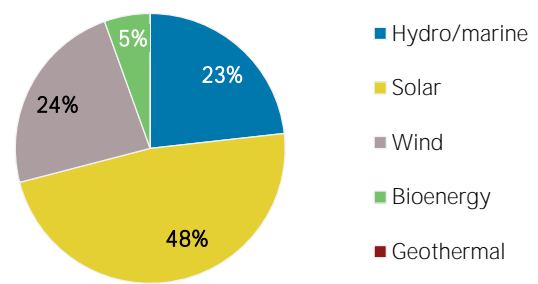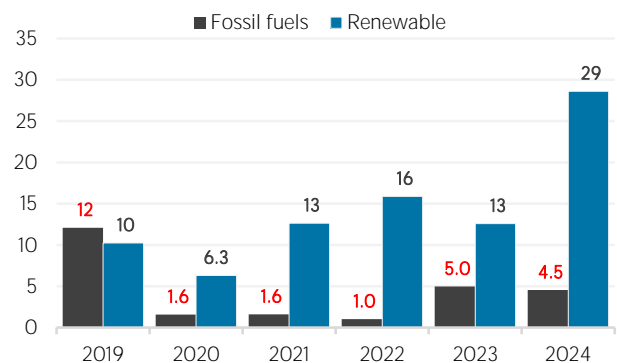
Net capacity change in 2024 (MW)

Non-renewable	Hydro and marine
+ 5 256	+ 174

Solar	Wind
+ 24 525	+ 3 427

Bioenergy	Geothermal
+ 485	0
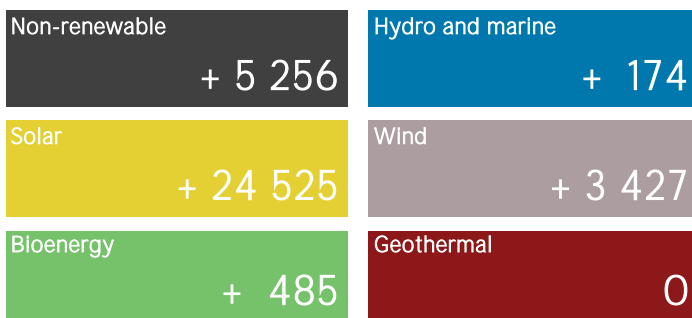
Capacity utilisation in 2023 (%)

Fossil fuels	53%
Nuclear	74%
Hydro/Marine	39%
Solar	18%
Wind	20%
Bioenergy	27%
Geothermal	
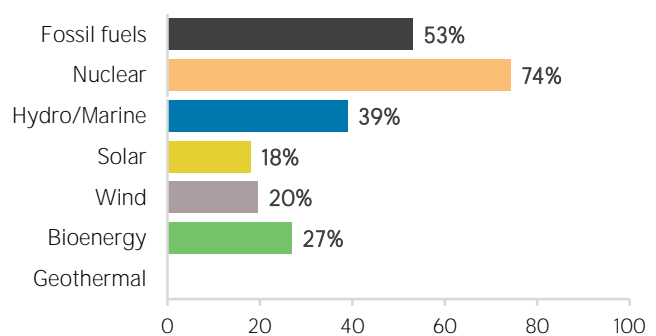
ELECTRICITY GENERATION

Generation in 2023	GWh	%
Non-renewable	1 493 334	80
Renewable	369 970	20
Hydro and marine	161 465	9
Solar	108 494	6
Wind	74 708	4
Bioenergy	25 303	1
Geothermal	0	0
Total	1 863 304	100

Per capita electricity generation (kWh)
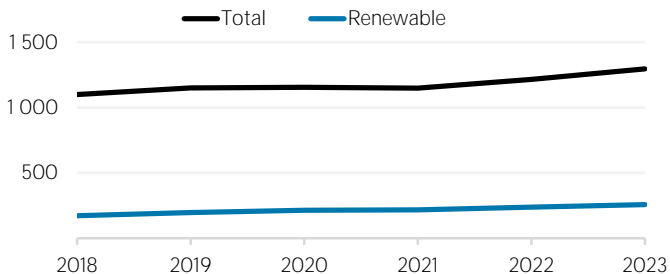
Electricity generation trend
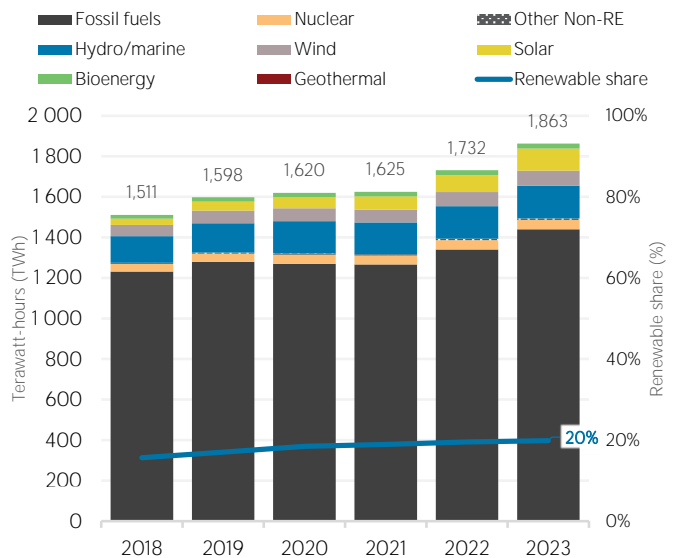

LATEST POLICIES, PROGRAMMES AND LEGISLATION

1 National Critical Mineral Mission **2025**

2 2023 Extension of the Ujjwala Scheme **2023**

3 Approved Models and Manufacturers of Solar Photovoltaic Modules **2023**

4 Basic customs duty exemption for lithium-ion cell manufacturing material imports **2023**

5 Carbon Credit Trading Scheme, 2023 **2023**

ENERGY AND EMISSIONS
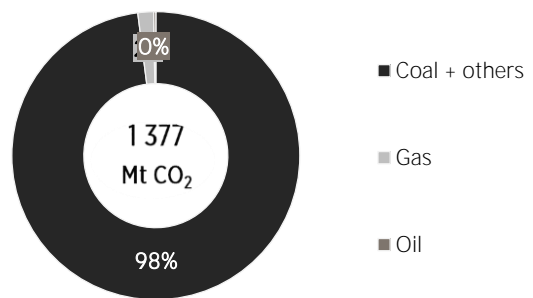
CO_2 emissions by sector

Elec. & heat generation CO_2 emissions in
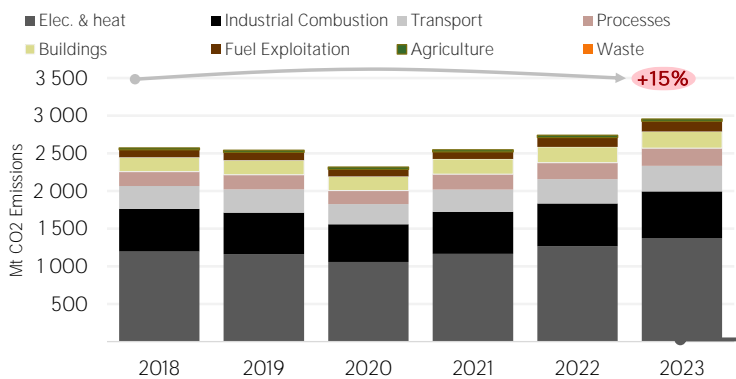
Avoided emissions from renewable elec. & heat
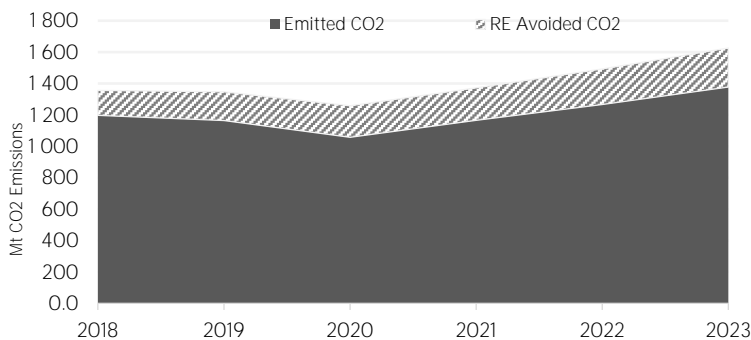
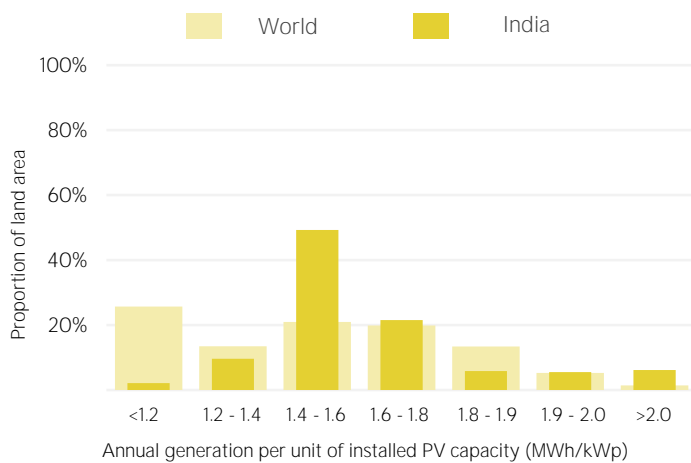*Avoided emissions based on fossil fuel mix used for power*

CO_2 emission factor for elec. & heat generation
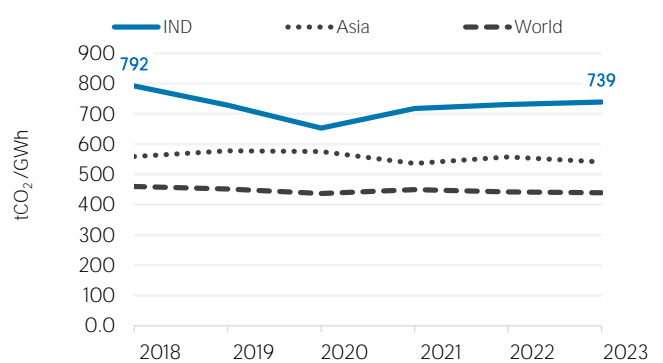
Calculated by dividing power sector emissions by elec. + heat gen.

Distribution of solar potential
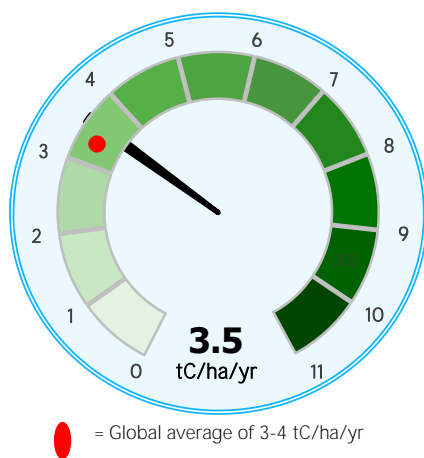
World India

100%
80%
60%
40%
20%

Proportion of land area

<1.2 1.2 - 1.4 1.4 - 1.6 1.6 - 1.8 1.8 - 1.9 1.9 - 2.0 >2.0

Annual generation per unit of installed PV capacity (MWh/kWp)

Distribution of wind potential

World India

100%
80%
60%
40%
20%
0%

Proportion of land area

<260 260-420 420-560 560-670 670-820 820-1060 >1060

Wind power density at 100m height (W/m²)
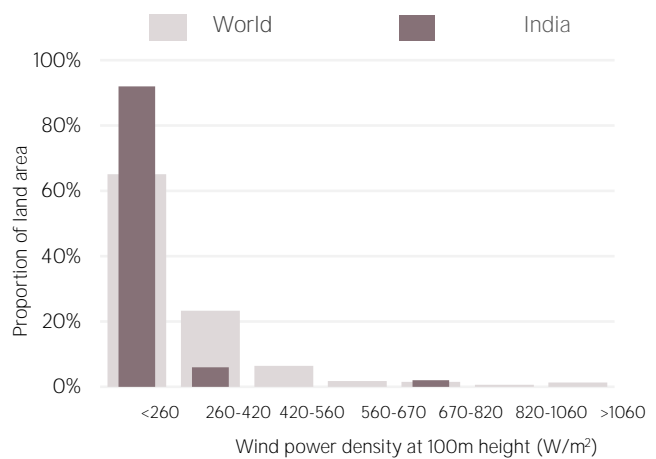
Biomass potential: net primary production

3.5
tC/ha/yr

= Global average of 3-4 tC/ha/yr

Indicators of renewable resource potential

Solar PV: Solar resource potential has been divided into seven classes, each representing a range of annual PV output per unit of capacity (kWh/kWp/yr). The bar chart shows the proportion of a country's land area in each of these classes and the global distribution of land area across the classes (for comparison).

Onshore wind: Potential wind power density (W/m²) is shown in the seven classes used by NREL, measured at a height of 100m. The bar chart shows the distribution of the country's land area in each of these classes compared to the global distribution of wind resources. Areas in the third class or above are considered to be a good wind resource.

Biomass: Net primary production (NPP) is the amount of carbon fixed by plants and accumulated as biomass each year. It is a basic measure of biomass productivity. The chart shows the average NPP in the country (tC/ha/yr), compared to the global average NPP of 3-4 tonnes of carbon

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