



## Trends in PV Applications

Gaëtan Masson, IEA PVPS Task 1 Manager– Becquerel Institute

Key findings from the 2024 Trends Report Webinar

# Who am I

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Gaëtan Masson

Task 1 Manager since 2013

My PV story:

- In the PV industry since 2009
- Becquerel Institute – since 2014
- ESMC co-chairman (European Solar Manufacturing Association)
- EDORA Board member (Belgian RE Association)
- And more...

# THE TRENDS REPORT



Published for the first time in 1995

Comprehensive report about...

Trends in PV applications

Technology

Markets

Policies

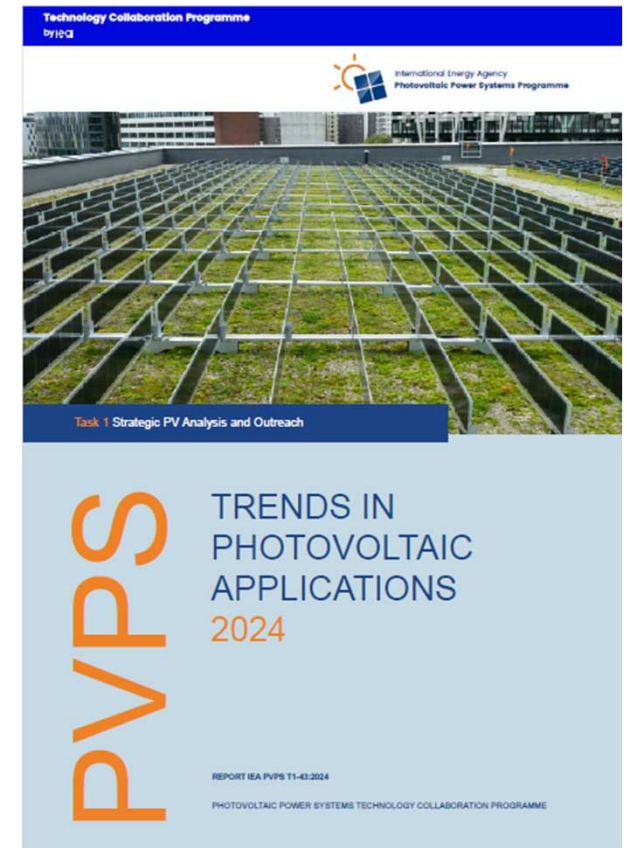
Industry

Impact on the society including  
economics

Climate change

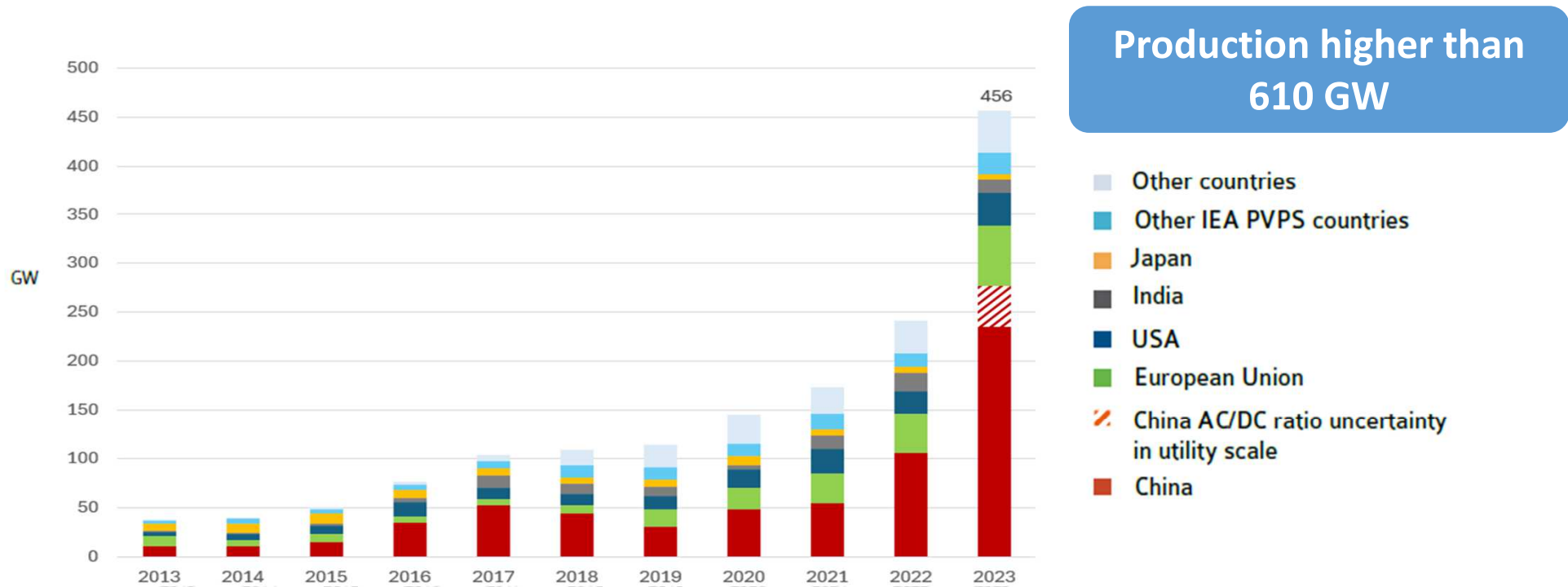
And more

**PVPS** 29<sup>th</sup> edition !



## Global PV Markets: how much was installed in 2023

FIGURE 2.3: EVOLUTION OF ANNUAL PV INSTALLATIONS IN MAJOR MARKETS



SOURCE IEA PVPS & OTHERS

## Some statistics

1,25 GW per  
day

52 MW installed  
every hour

Close to 1 MW  
every minute

Around 1 billion PV  
modules manufactured  
every year

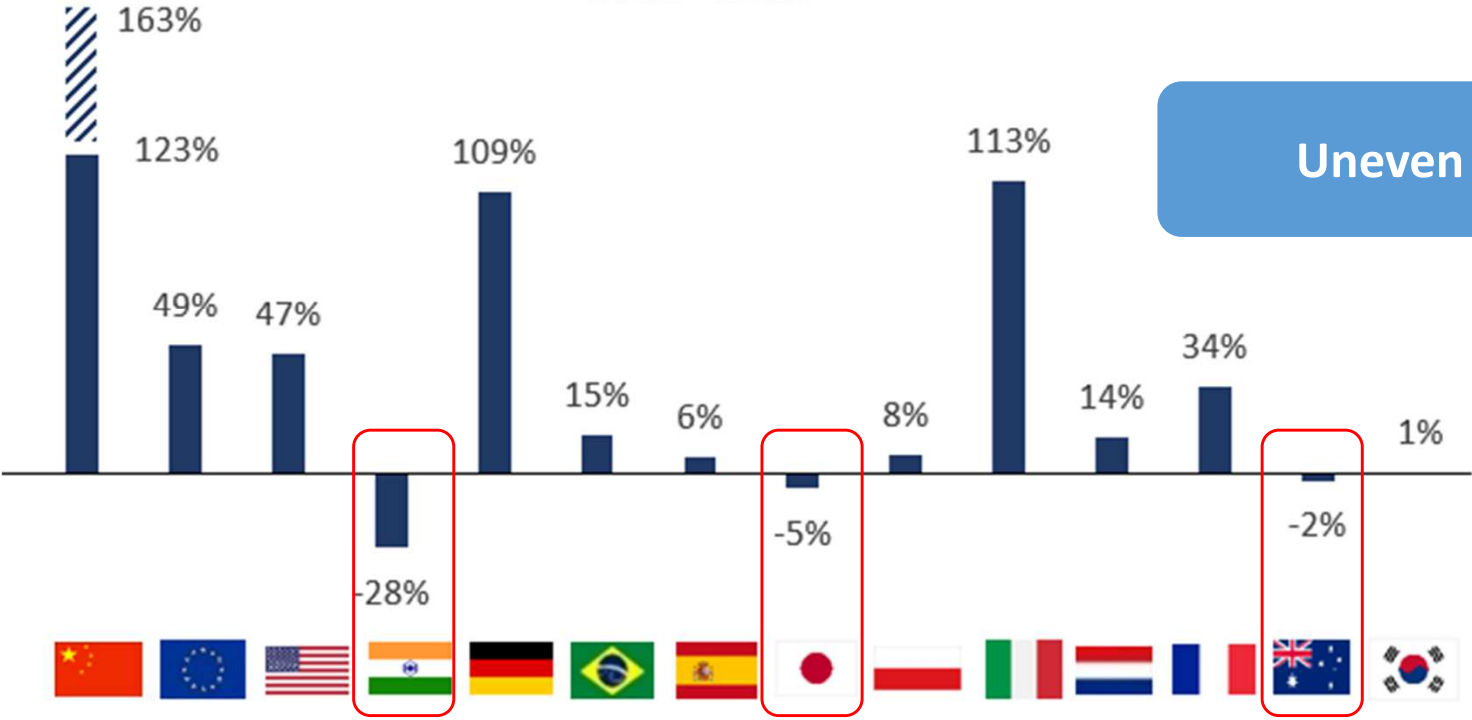
2000 modules  
every minute

43 km<sup>2</sup> of surface

# EVOLUTION OF ANNUAL PV IN MAJOR MARKETS



EVOLUTION OF NEW ANNUAL CAPACITY IN MAJOR MARKETS  
2022 - 2023

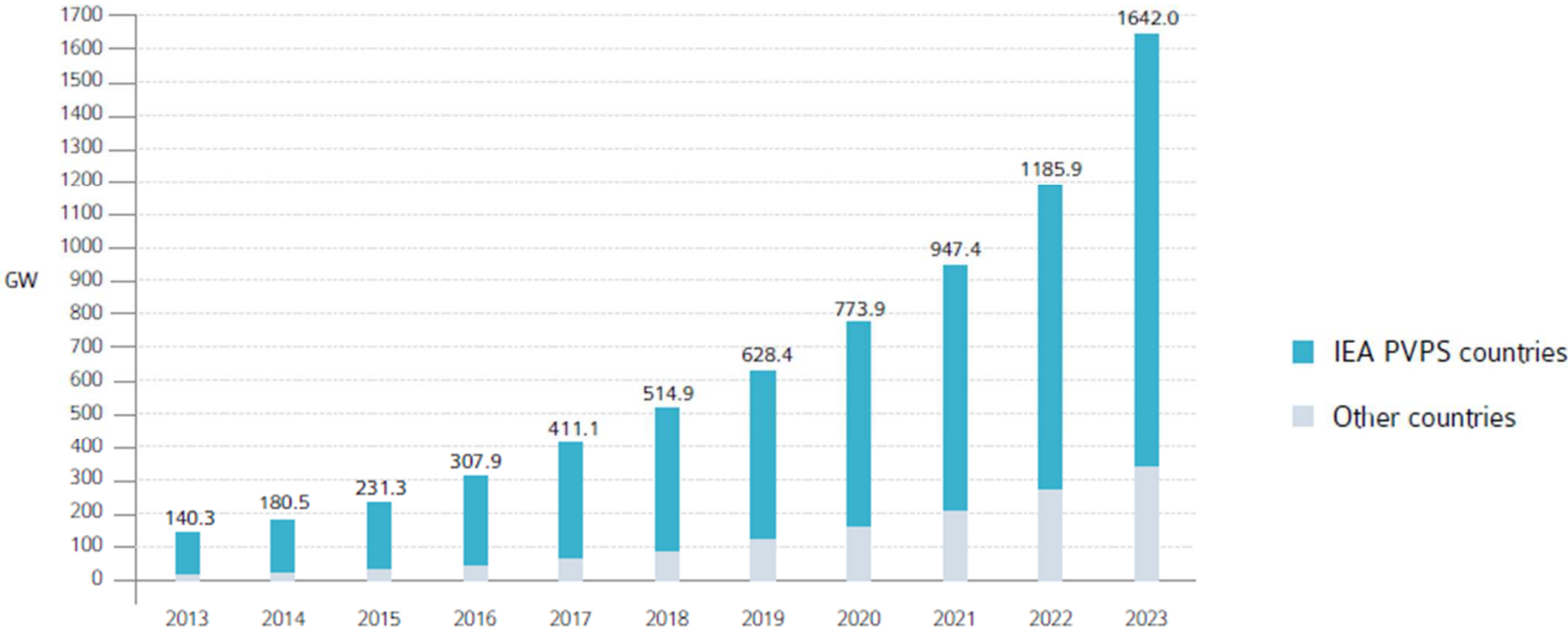


PVPS

# EVOLUTION OF CUMULATIVE PV INSTALLATIONS



FIGURE 2.1: EVOLUTION OF CUMULATIVE PV INSTALLATIONS



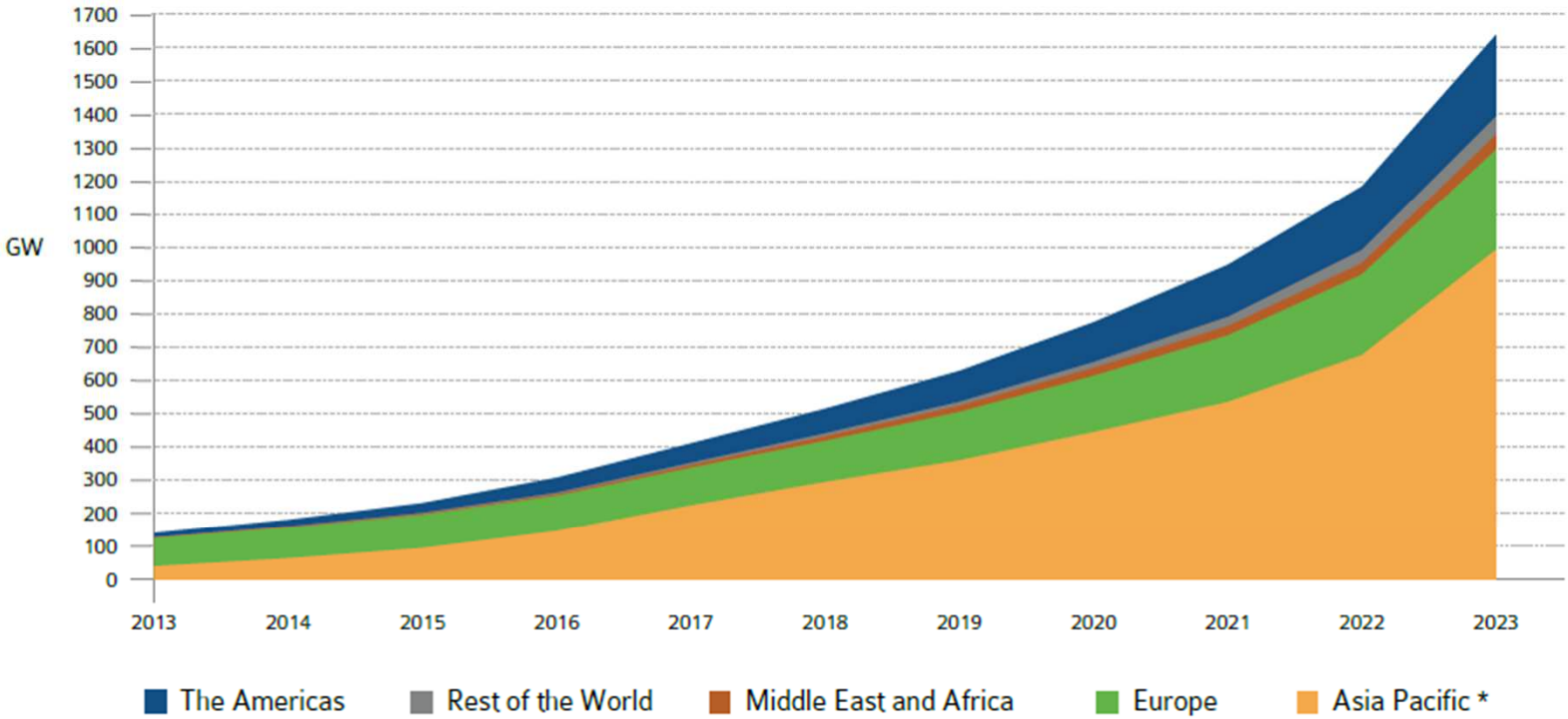
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SOURCE IEA PVPS & OTHERS

# EVOLUTION OF REGIONAL PV INSTALLATIONS



FIGURE 2.7: EVOLUTION OF REGIONAL PV INSTALLATIONS



\*includes 42 GW China AC/DC ratio uncertainty

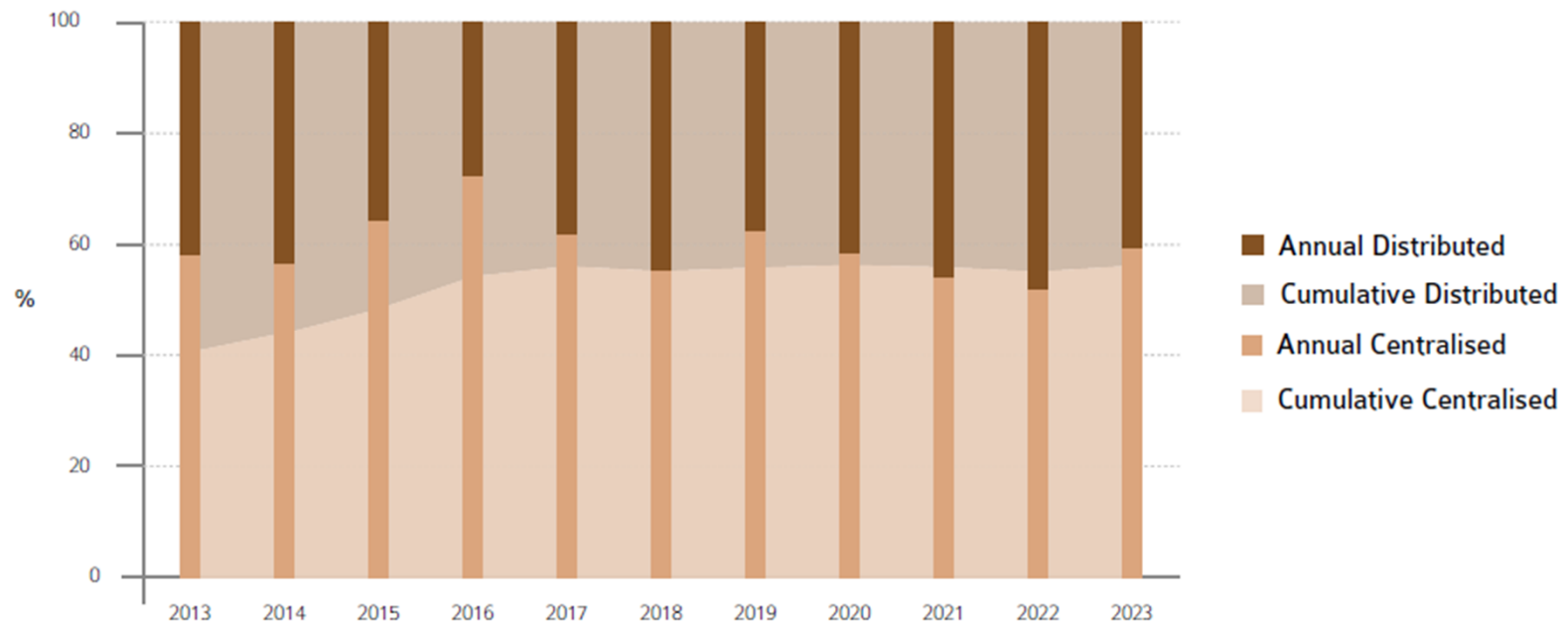
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# ANNUAL SHARE OF CENTRALISED AND DISTRIBUTED GRID-CONNECTED INSTALLATIONS 2013-2023



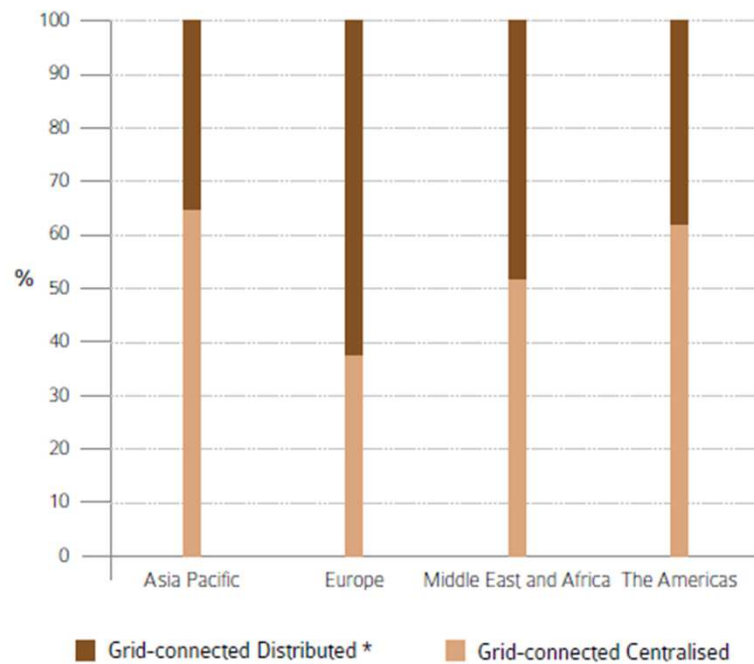
FIGURE 2.9: ANNUAL SHARE OF CENTRALIZED AND DISTRIBUTED GRID-CONNECTED INSTALLATIONS 2013-2023



# ANNUAL GRID-CONNECTED CENTRALISED AND DISTRIBUTED PV INSTALLATIONS BY REGION IN 2023



FIGURE 2.12: ANNUAL GRID-CONNECTED CENTRALIZED AND DISTRIBUTED PV INSTALLATIONS BY REGION IN 2023



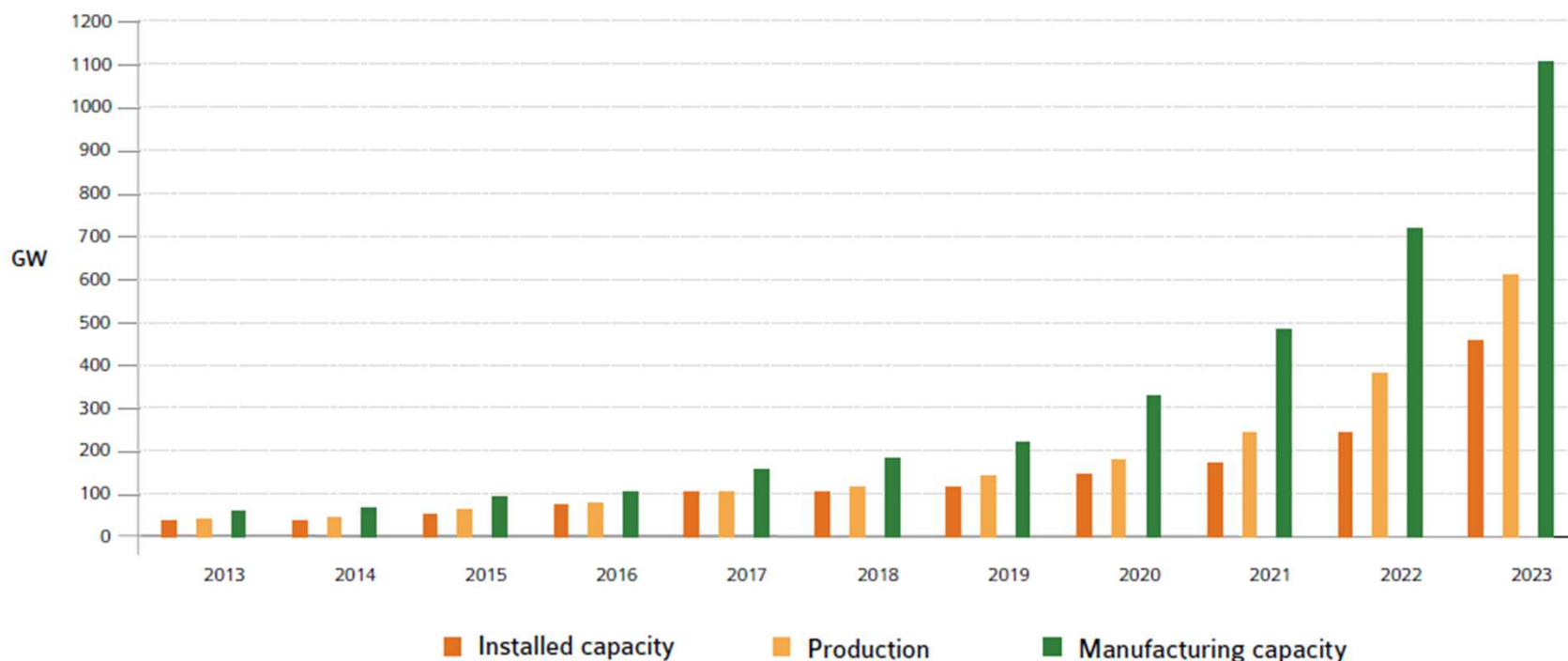
\*includes off-grid

SOURCE IEA PVPS & OTHERS

# YEARLY PV INSTALLATION, MODULE PV PRODUCTION AND MODULE PRODUCTION CAPACITY 2013-2023 (GW)



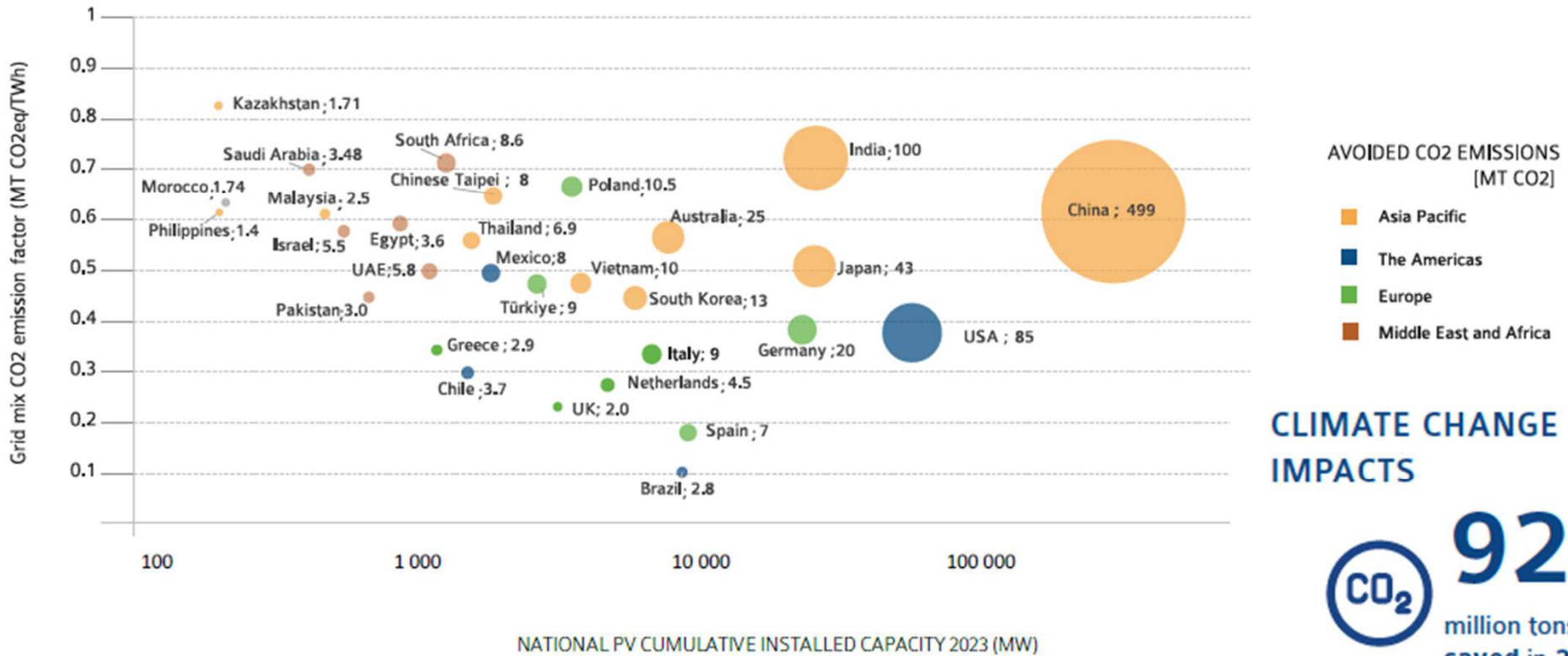
FIGURE 4.7: YEARLY PV INSTALLATION, PV PRODUCTION AND PRODUCTION CAPACITY 2013-2023 (GW)



# CO<sub>2</sub> EMISSIONS AVOIDED BY PV IN SELECTED MARKETS



FIGURE 5.1: CO<sub>2</sub> EMISSIONS AVOIDED BY PV



## CLIMATE CHANGE IMPACTS

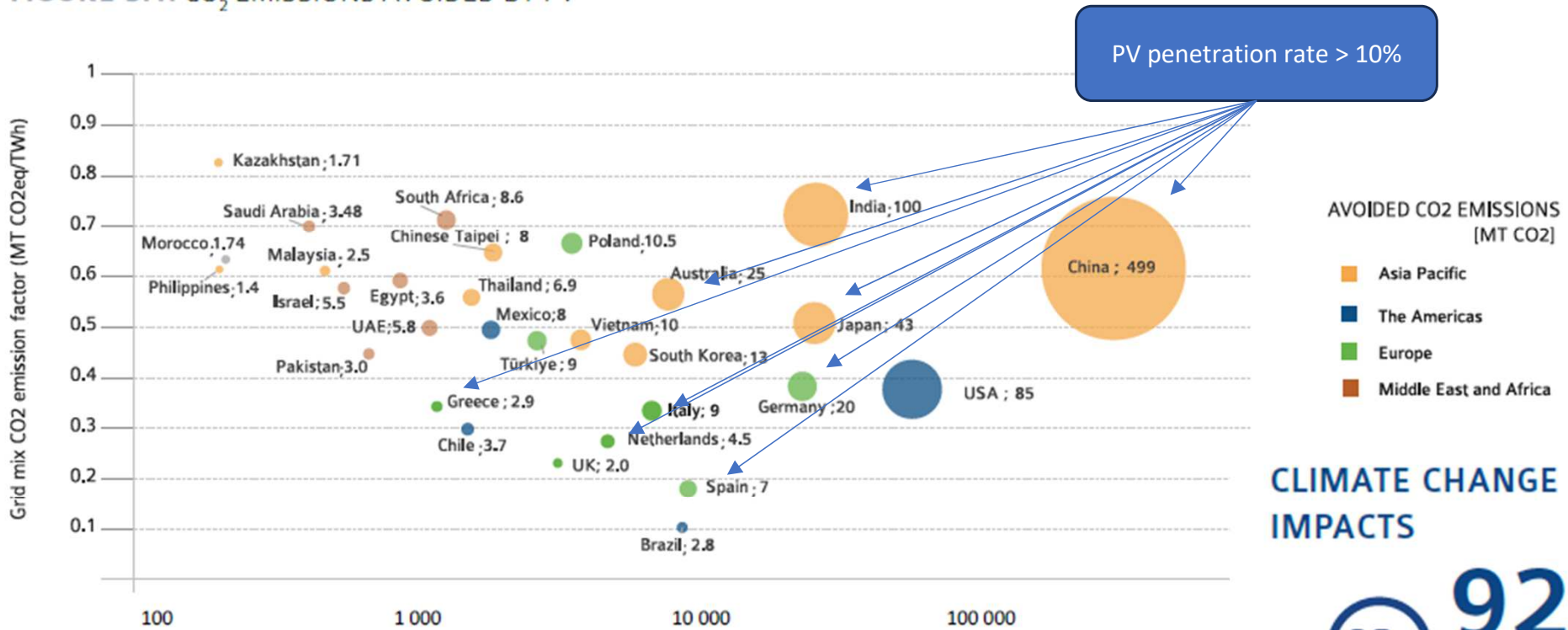
**923**  
million tons of CO<sub>2</sub> saved in 2023

\* method changed from 2022: now assuming PV replaces baseload generation

# CO<sub>2</sub> EMISSIONS AVOIDED BY PV IN SELECTED MARKETS



FIGURE 5.1: CO<sub>2</sub> EMISSIONS AVOIDED BY PV



## CLIMATE CHANGE IMPACTS

**923**  
million tons of CO<sub>2</sub> saved in 2023

\* method changed from 2022: now assuming PV replaces baseload generation

CO<sub>2</sub> emissions if PV replaces baseload power in all countries

# CO<sub>2</sub> EMISSIONS AVOIDED BY PV IN SELECTED MARKETS

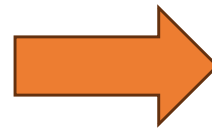


CLIMATE CHANGE  
IMPACTS



**1927**

million tons of CO<sub>2</sub>  
saved in 2023



CLIMATE CHANGE  
IMPACTS



**923**

million tons of CO<sub>2</sub>  
**saved in 2023**  
\* method changed from 2022;  
now assuming PV replaces  
baseload generation

CO<sub>2</sub> emissions if PV  
replaces **peak power** in all  
countries

CO<sub>2</sub> emissions if PV  
replaces **baseload power**  
in all countries

# CO<sub>2</sub> EMISSIONS AVOIDED BY PV IN SELECTED MARKETS



- With high penetration rates PV is becoming a mainstay of electricity generation in many countries
- It is replacing baseload power, that may be the lowest CO<sub>2</sub> content of fossil energy mixes (as compared to peak power)
- It is reducing the CO<sub>2</sub> content of electricity generation
- Most countries still have low penetration rates so **the reality is somewhere between these number**: methodology will be updated again next year

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CO<sub>2</sub> emissions if PV replaces baseload power in all countries

CLIMATE CHANGE IMPACTS

**923**  
million tons of CO<sub>2</sub> saved in 2023  
\* method changed from 2022: now assuming PV replaces baseload generation



CLIMATE CHANGE IMPACTS

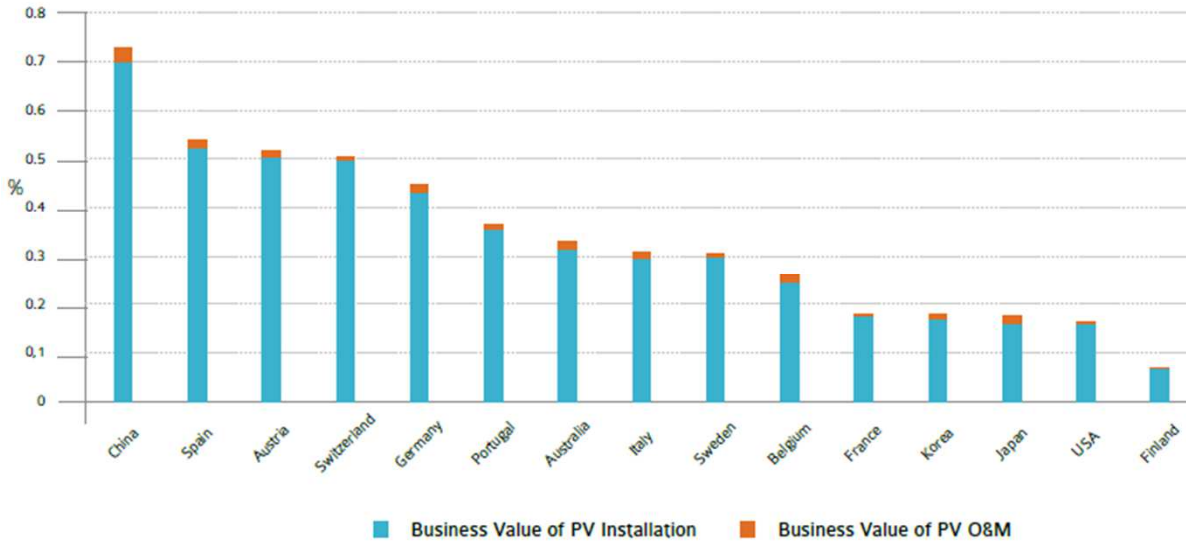
**1927**  
million tons of CO<sub>2</sub> saved in 2023

CO<sub>2</sub> emissions if PV replaces peak power in all countries  
- If using methodology and energy mixes from Trends 2023

# BUSINESS VALUE OF THE PV MARKET IN 2023



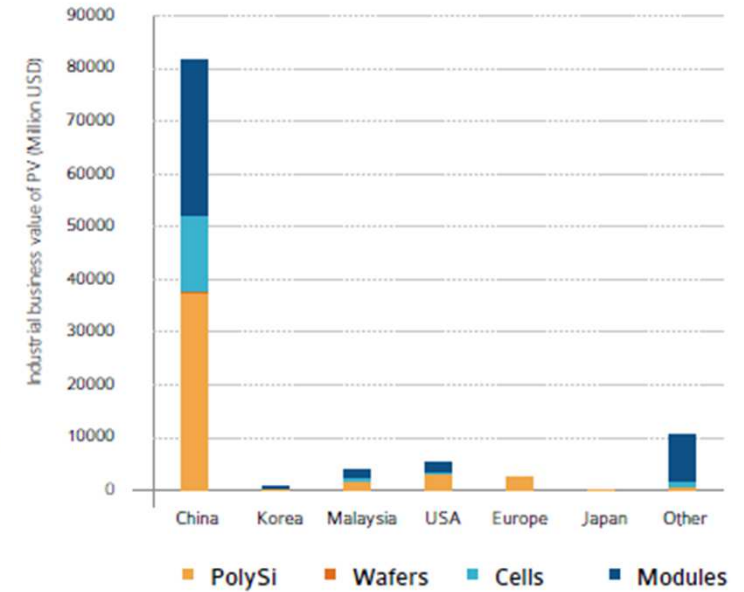
FIGURE 5.3: BUSINESS VALUE OF THE PV MARKET IN 2023 COMPARED TO GDP IN% IN 2023



SOURCE IEA PVPS & OTHERS

# 400 Bn USD

FIGURE 5.5A: ABSOLUTE PV INDUSTRIAL BUSINESS VALUE IN 2023



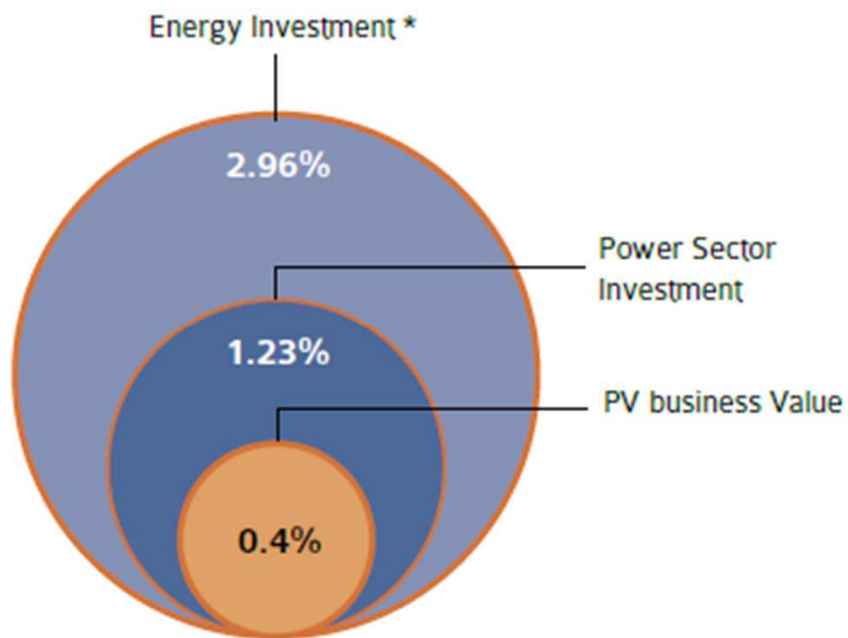
SOURCE IEA PVPS & OTHERS



# CONTRIBUTION TO GLOBAL GDP OF PV IN 2023



**FIGURE 5.4:** CONTRIBUTION TO GLOBAL GDP OF PV BUSINESS VALUE AND ENERGY SECTOR INVESTMENTS



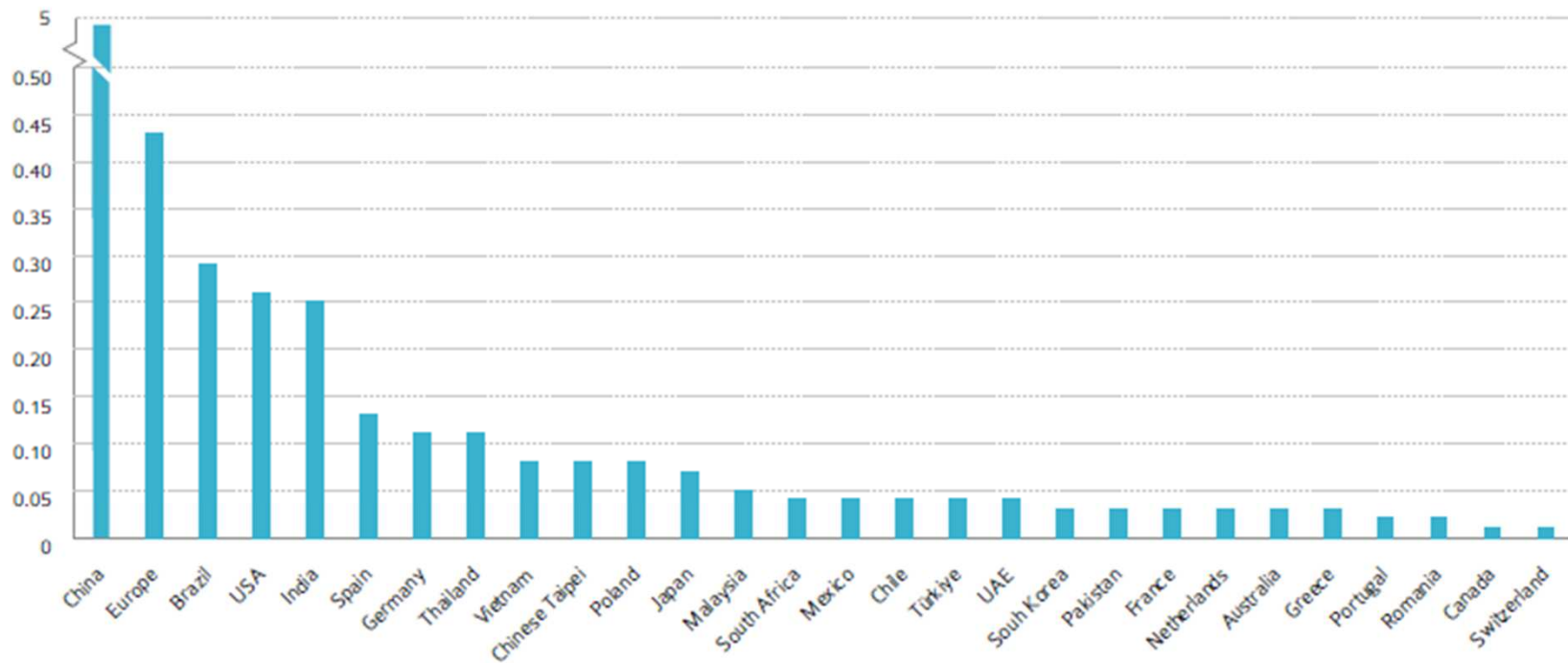
\*Investment in the power sector, fuel supply and end-use & efficiency

SOURCE IEA PVPS & OTHERS

# GLOBAL EMPLOYMENT IN PV PER COUNTRY



FIGURE 5.6: GLOBAL EMPLOYMENT IN PV PER COUNTRY



# INDICATIVE MODULE PRICES IN REPORTING COUNTRIES



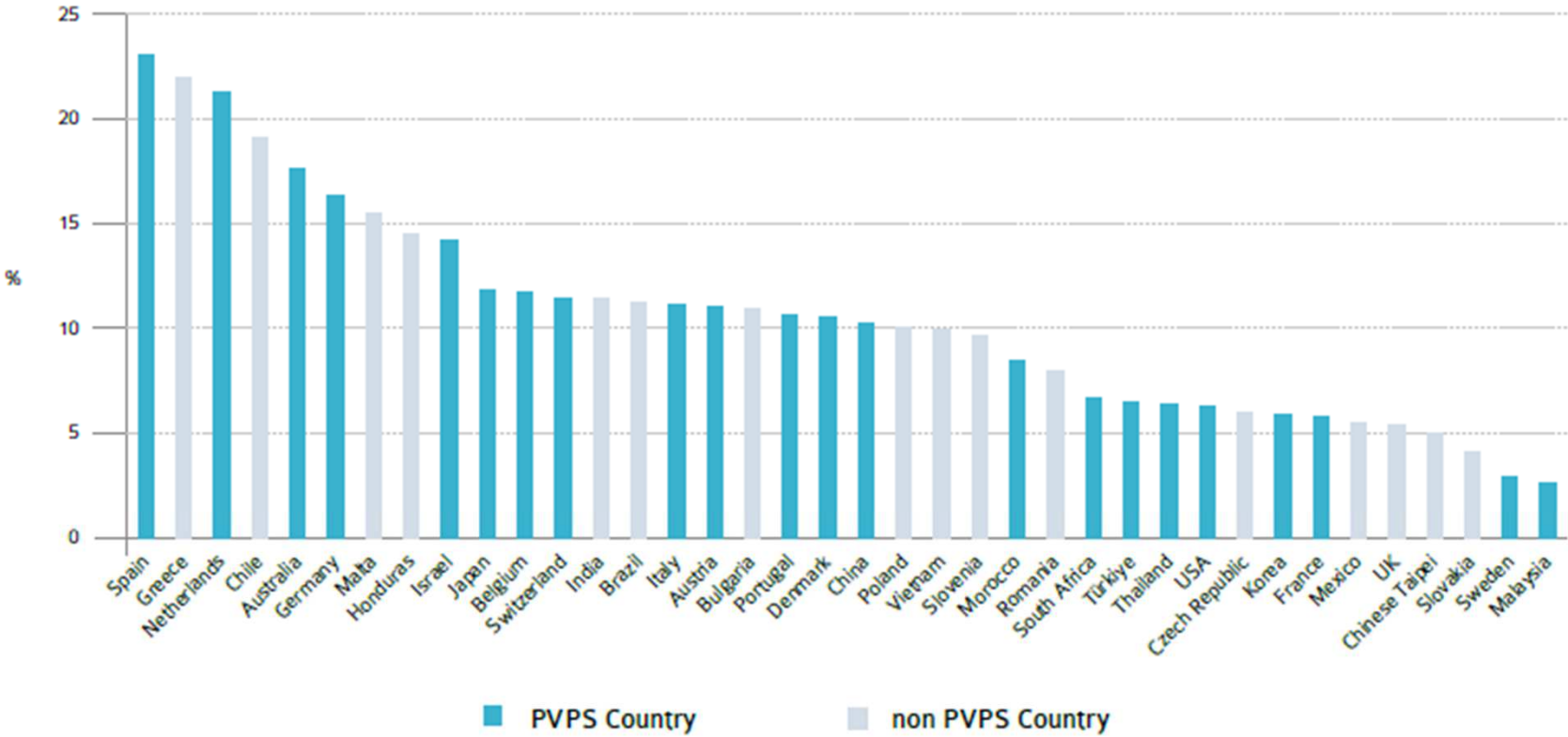
FIGURE 6.3: INDICATIVE MODULE PRICES IN SELECTED REPORTING COUNTRIES



# PV CONTRIBUTION TO ELECTRICITY DEMAND 2023



FIGURE 7.1: PV CONTRIBUTION TO ELECTRICITY DEMAND 2023



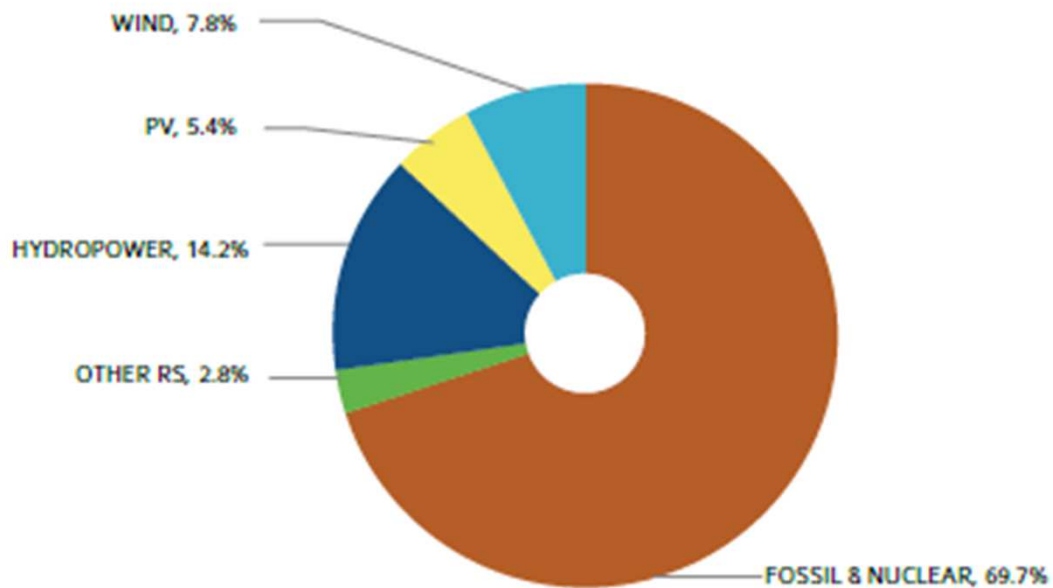
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SOURCE IEA PVPS & OTHERS

# SHARE OF RENEWABLE IN THE GLOBAL ELECTRICITY PRODUCTION IN 2023



FIGURE 7.2: SHARE OF RENEWABLE IN THE GLOBAL ELECTRICITY PRODUCTION IN 2023



## PV PENETRATION IN 2023



8.3%

of  
Electricity demand



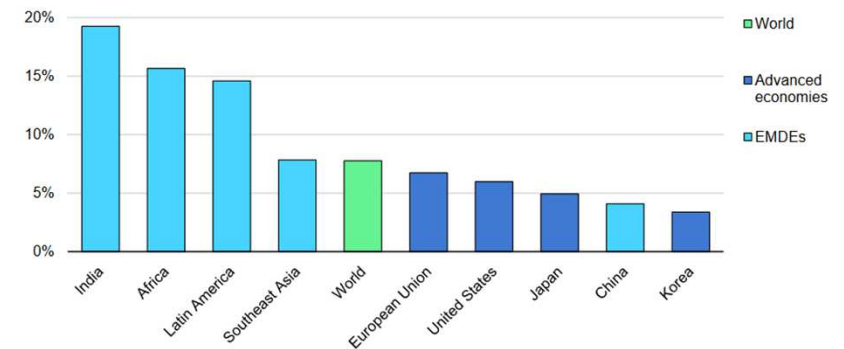
5.4%

of  
Electricity production

- PV is mostly generated close to consumption and has little transport and transformation losses
- Electricity production is higher than demand to cover these losses

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Technical grid losses as a share of total electricity generation by country/region, 2022



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# INFOGRAPHIC



## TRENDS IN PHOTOVOLTAIC APPLICATIONS // 2024

PHOTOVOLTAIC POWER SYSTEMS PROGRAMME [WWW.IEA-PVPS.ORG](http://WWW.IEA-PVPS.ORG)



TOTAL BUSINESS VALUE IN PV SECTOR IN 2023

**\$400** BILLION USD



**TOP 5**  
PV MARKETS IN 2023

	CHINA	277 GW
	EU	59.8 GW
	USA	33.9 GW
	INDIA	13.0 GW
	BRAZIL	12.4 GW

PV CONTRIBUTION TO  
ELECTRICITY DEMAND

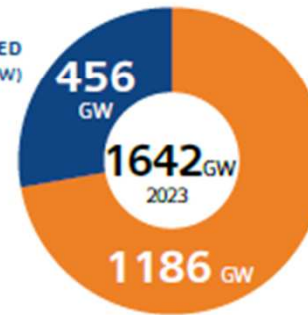


**8.3%**

Share of PV in the  
global electricity  
demand in 2023

ANNUAL INSTALLED  
CAPACITY IN 2023 (GW)

GLOBAL PV  
CAPACITY  
END OF 2023



GLOBAL PV CAPACITY  
END OF 2022 (GW)

1186 GW

## CONCLUSIONS

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- A growing market in 2023... but the market outside of China is < 50%
- China's market has increased significantly in 2023 to absorb overproduction
- PV penetration has reached 8.3% of the electricity consumption
- PV is becoming a central part of the global economy with 400Bn USD turnover
- Significant contribution to CO2 emission reduction
- Extremely low prices won't last since they endanger the whole PV industry
- The road to 1 TW per year is open



[www.iea-pvps.org](http://www.iea-pvps.org)

**Thank you for your attention**



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