



IEA Technology Collaboration Programme

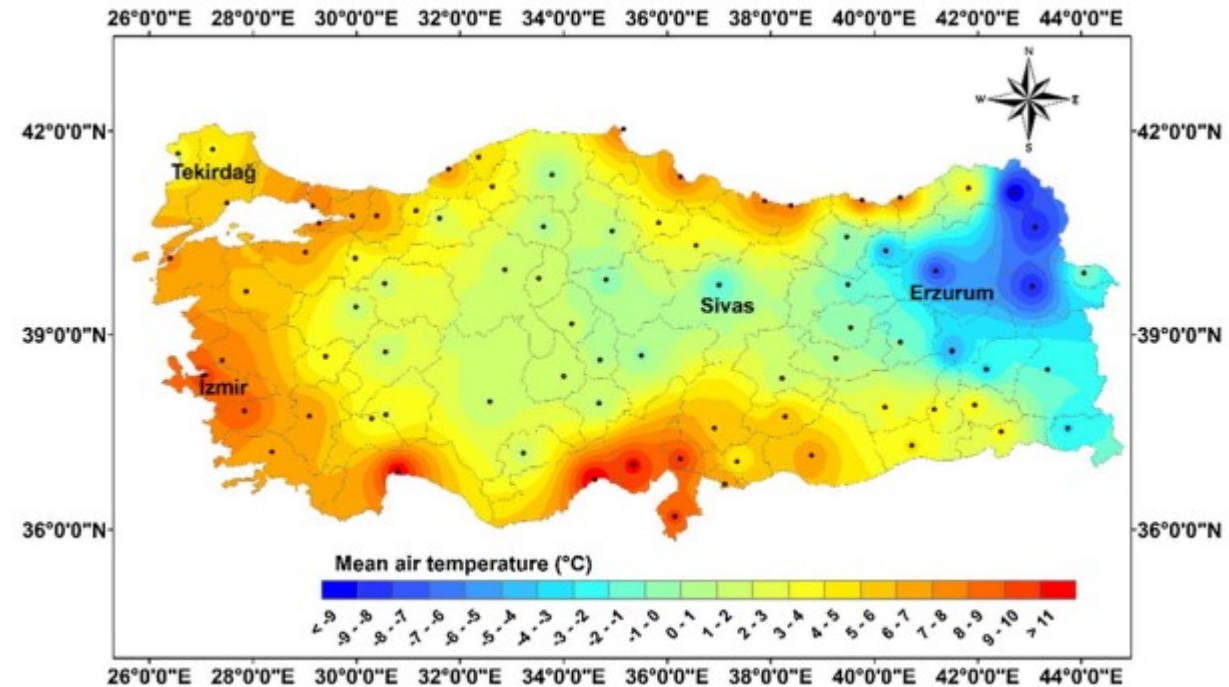
COUNTRY REPORT

Türkiye

Prof. Dr. Halime Ö. Paksoy
Cukurova University

XC98 13-14 November, 2024, Richland WA, USA

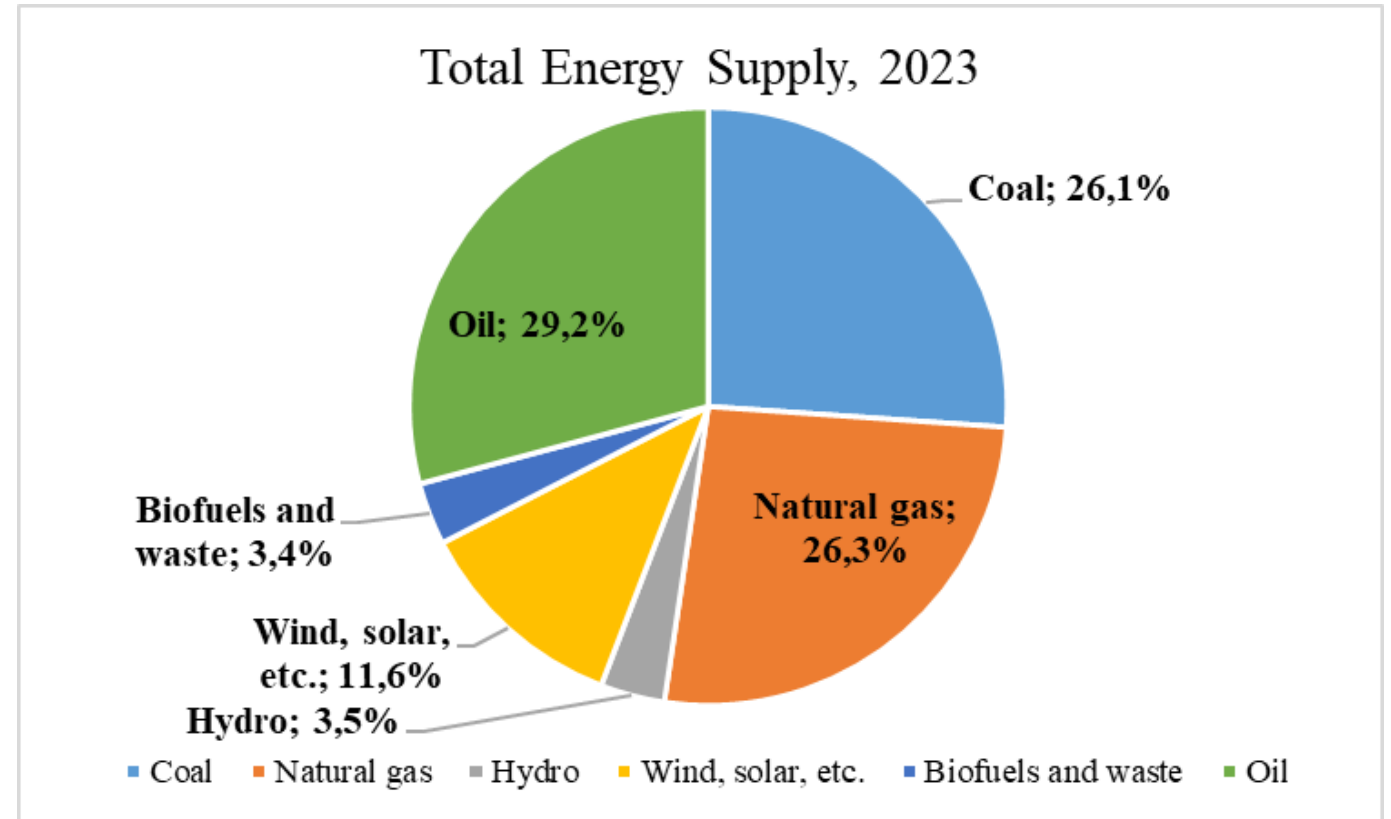
- **Population: 85.3 million in 2023**
- **Growth rate: 5.5 per thousand**
 - Population living in cities: 93%
- **Total area: 783,562 m²**
- **Climate Change**
 - Highest monthly average temperature in June (25.4 °C) in 53 years
 - Min: 1.6 °C in Erzurum, Max: 47.8 °C in Urfa
 - Lowest average precipitation in 23 years



Mean air temperature distribution for the winter season
Source: Bilgili et al 2023; <https://doi.org/10.1007/s00704-023-04543-9>

Primary Energy Supply in 2023

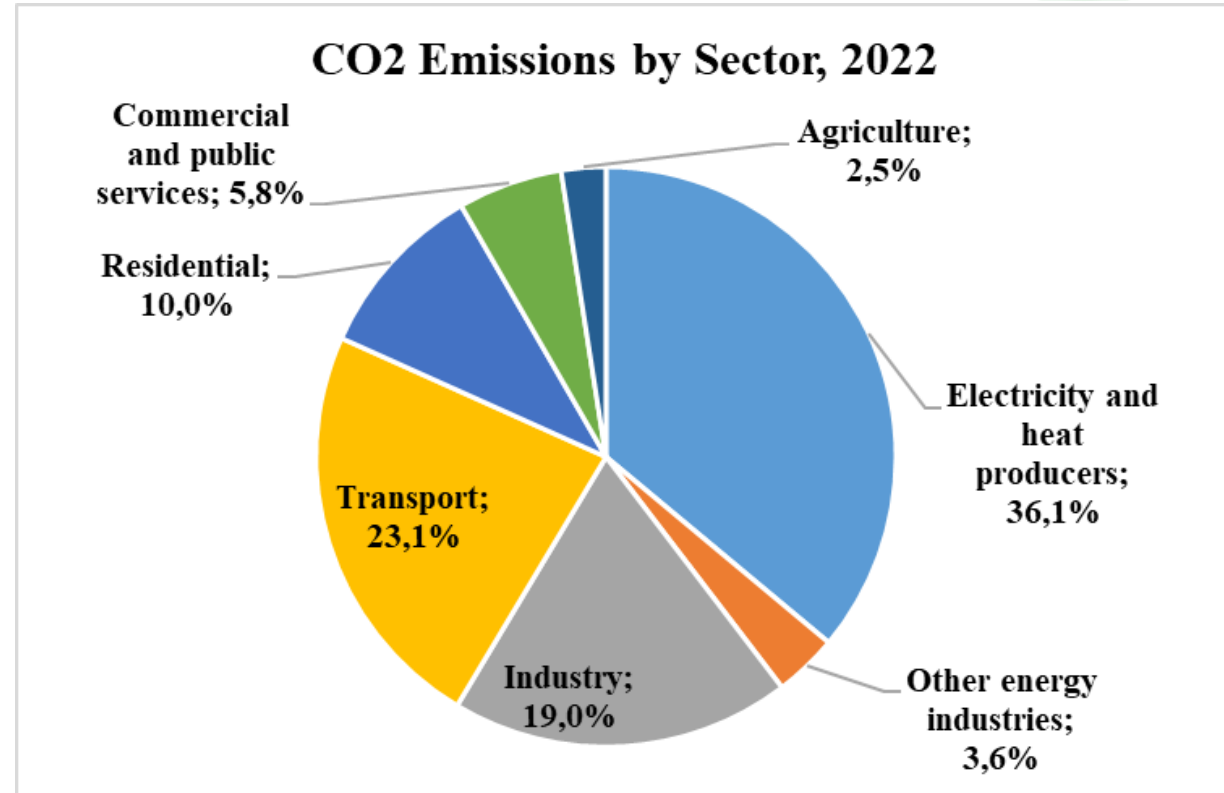
- **Total primary energy supply : 6,604,388 TJ**
 - 81.6 % from fossil fuels
- **Heavy dependence on imports:**
 - Net energy imports: 71.7%



Source: <https://www.iea.org/countries/turkiye>

CO₂ Emissions from Energy Related Activities

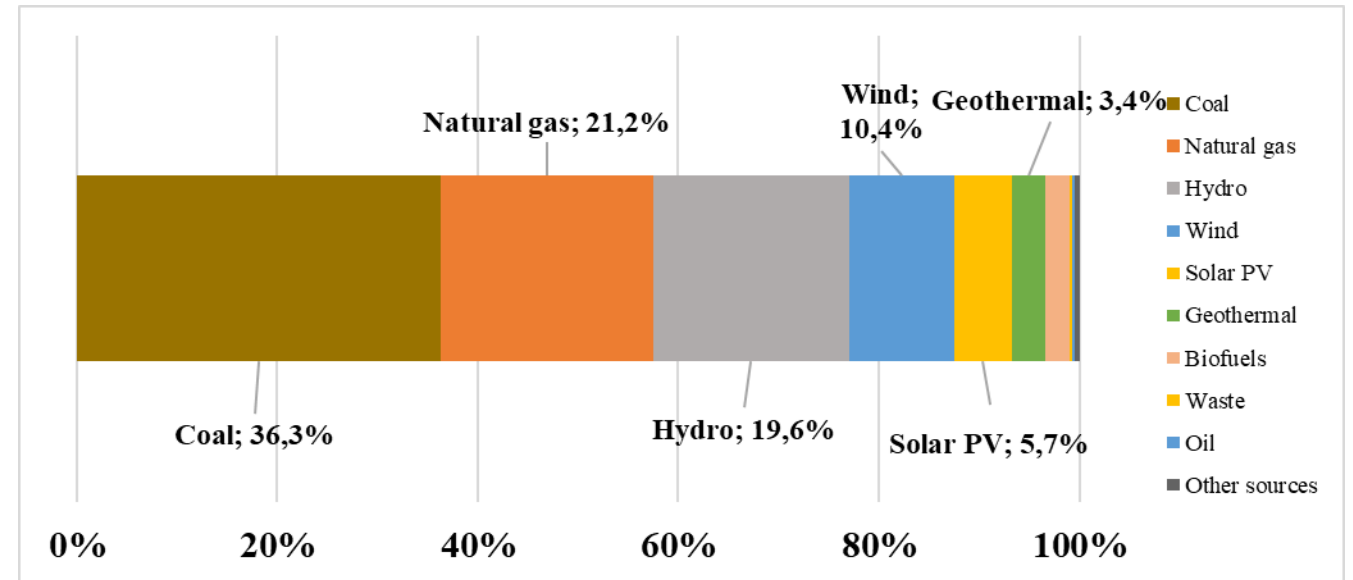
- **390 Mt CO₂ emissions in 2022**
 - ↑ 94% change since 2000
- **1.14% of global emissions**
- **CO₂ emissions from power generation: 36 %**
- **Largest sources of CO₂ emissions :
Coal 43% and Oil 32%**



Ref: <https://www.iea.org/countries/turkiye/emissions>

Power Generation in 2023

- **Total power generation: 326,296 GWh**
 - 57 % from fossil fuels
- **Share of electricity in final consumption: 22%**
- **Largest electricity consumer is industry: 46%**



Source: <https://www.iea.org/countries/turkiye/energy-mix>

Renewable Power Generation Capacity in 2024

- **Total installed capacity: 114.52 GW**
- **Total capacity from Renewables (Wind+Solar+ Hydro+Geo): 64.75 MW**
- **Share of renewables in installed capacity: 57%**

Source	Capacity, GW	Share, %
Coal	21.74	19%
NG	25.41	22%
Hydro	31.73	28%
Wind	12.5	11%
Solar	18.84	16%
Geothermal	1.68	1%
Others	2.62	2%
	114.52	100%
TOTAL RES	64.75	57%

Thermal Energy Storage Landscape



ÖZBEK MÜHENDİSLİK



New Legislation on Electrical Storage

5 July 2022

- Electricity production licenses for solar and wind farms should include electrical storage.
- The current licensed solar and wind plants can increase their license capacity by adding ESS.



Renewable Power Licensing

- **Applications to licensing can take 2-3 years**
- **Share of wind power**
 - Total applications: 47%
 - Accepted applications: 56%
- **Share of solar power :**
 - Total applications: 53%
 - Accepted applications: 44 %

	Solar +Wind (MW)	Solar/Wind + Storage (MWh)
Total Applications MW	253.446	316.808
Pre-Licence	23.337	24.996
Under evaluation for pre-licence	9.690	9.846
Total Licenced	33.027	34.842

Local Li-ion Cell Producers

Kontrolmatik
Technologies

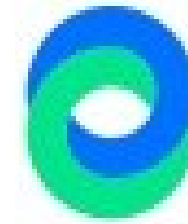


Pomega

550 MWh (Will be 2,25GWh/year in
2026) cell (LFP) production in Ankara
(Started in 2023)



Togg



siro™

15GWh/year in 2026 under construction



aspilsan®

Teknolojinin Enerjisi

220 MWh in Kayseri, started in 2021
Cylindrical cells (NMC)





Locals: Battery Containers/Systems Suppliers



Local System Integrators



Global Partnerships

 ALARKO +	 Gotion
 aksa JENERATÖR +	 EVE ENERGY VERY ENDURE
 KONTEK maxxen +	 HTHIUM
 Togg  siro +	 FARASIS
 OTTOMOTIVE AUTOMOTIVE ENGINEERING +	 SVOLT

Kontrolmatik Technologies 

 Pomega

 **aspilsan**
Teknolojinin Enerjisi

RDD Information

■ Energy Storage Topic/Priorities

- Electricity
 - Hydrogen, fuel cells
 - Battery technologies
- Material
 - Innovative materials for solar thermal energy storage
 - High temperature energy storage materials
 - Green hydrogen

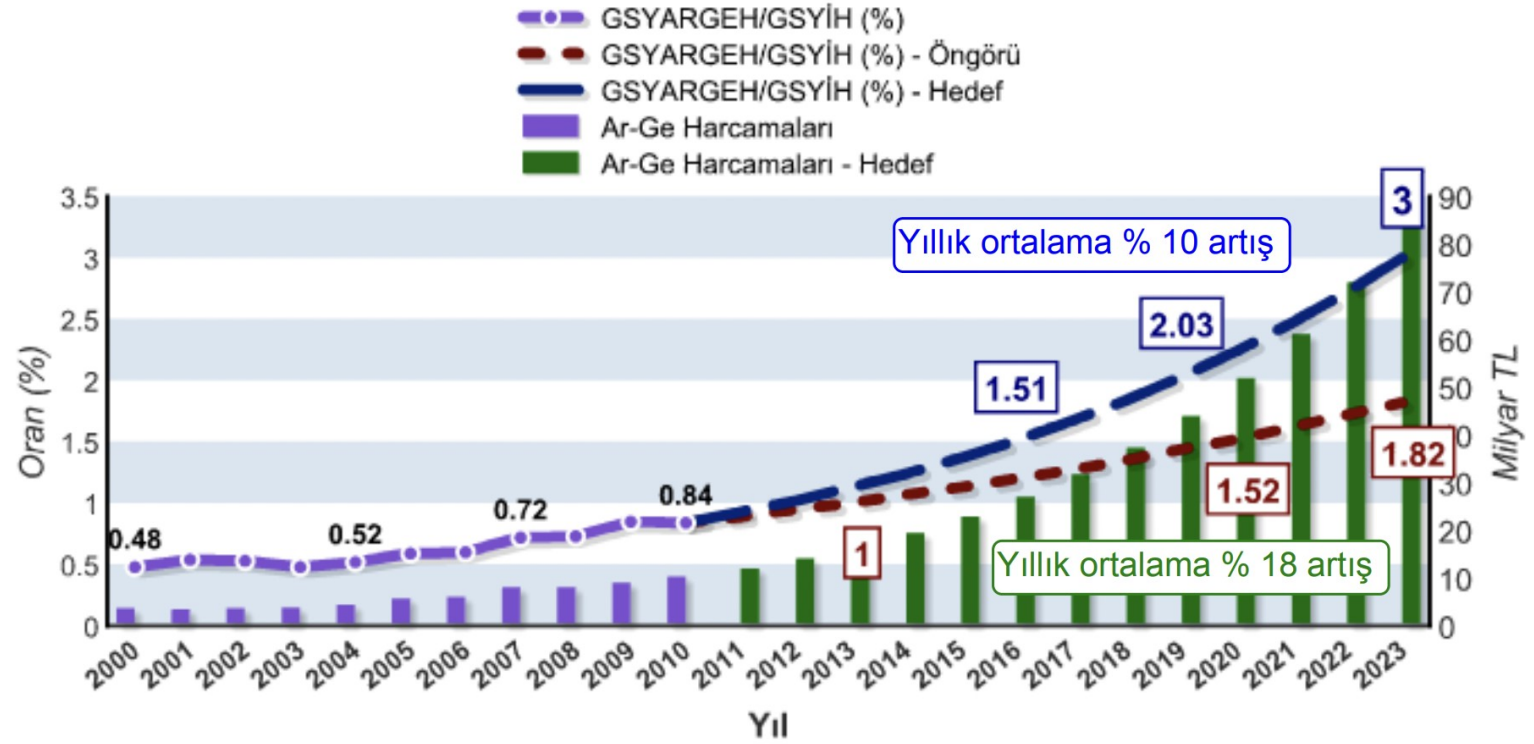
■ Dedicated Programmes and Funding

- **TUGEP:** Dedicated support for projects that apply R&D to practical applications in the areas of energy and mining, including hydrogen and CCUS.
- **SAYEM Industrial Innovation Networks:** Dedicated to private sector firms for funding to form networks with other firms, end-users, technology development zones, and universities. The goal is the co-creation of high value-added products and technologies to meet “green deal” objectives.
- **Turkish Scientific Research Council – TÜBİTAK:** Several programmes
- **Higher Education Council – YÖK:**
 - 100/2000 Young researchers grants for several topics including energy storage

R-D Expenditures

- **Total in 2023: 378 billion TL***
 - Industry: 65.1% , Academia: 30%, Government: 4.9%
- **Share in GDP in 2023: 1.42%**
- **Increased 13 folds since 2002**
 - From 1.2 billion USD to 16.1 billion USD

Trends in RDD Expenditures*

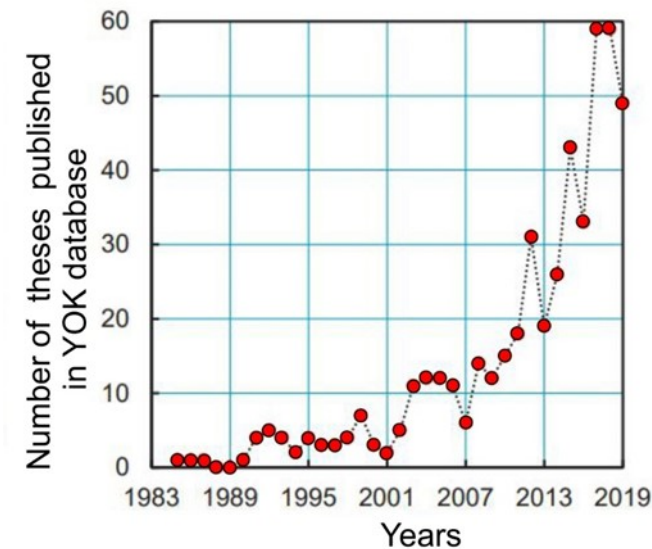
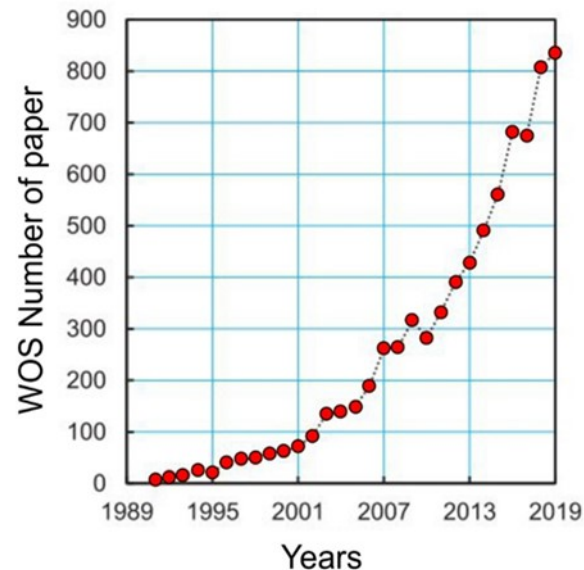


*<https://www.tubitak.gov.tr>

■ Trends

Science, Technology and Innovation Policy Board (BTYPK), at its September 2019 meeting has the following priority subjects:

- advanced functional materials and materials for energy technologies
 - energy storage
- Roadmaps for these subjects established
 - Papers and thesis on energy storage



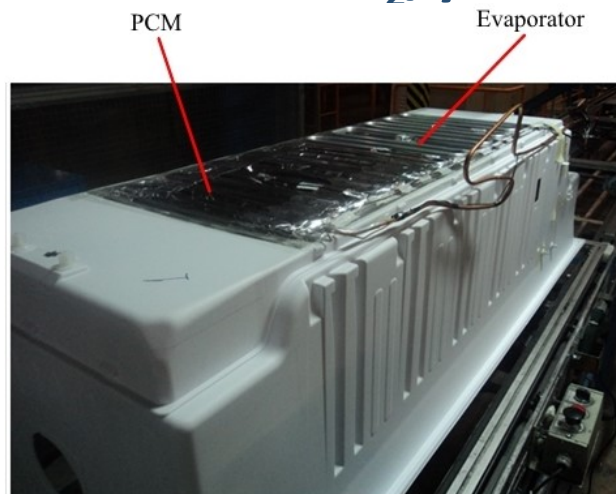
Top 3 cases/projects

- **PCMs in Refrigerators by Arçelik - CU**

- Started in 2006 with PCM development
- First prototype in 2012
- South Africa and Pakistan Markets in 2019

- **Total number sales : >160K**

- **4860 ton CO₂/year**



- **Prefabricated panels with microencapsulated PCMs (mPCM) by KAMBETON - CU**

- mPCM production in 2012
- Prefabricated panel production in 2015

- **22 kg CO₂/yıl-m²**



- **Latent heat storage for heating and cooling of refugee shelters**

- **2 X 1000 kg PCM**

- Coco oil (T_m:22 – 30°C)
- Paraffin (T_m:50 – 55°C)

- **Night-time radiation for cooling**





IEA Technology Collaboration Programme

The Energy Storage TCP Thank you

Country reports are an informative contribution of the ExCo delegates of the ES TCP member countries.

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