iha
international hydropower association

2023 World Hydropower Outlook

Opportunities to advance net zero

Date: 7 June 2023

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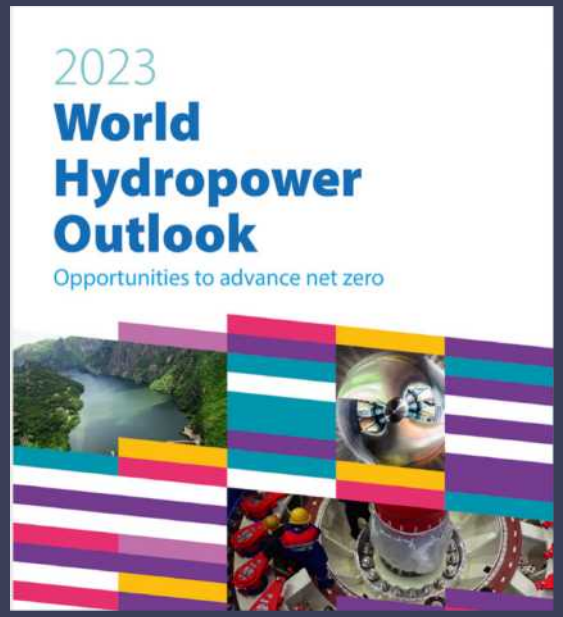
Programme



- Introduction to IHA
- Global summary
- The Hydropower Sustainability Standard
- The pipeline – are we on track for net zero?
- Hydropower potential
- Regional developments
  - Europe
  - Americas
- Climate resilience and drought
- World Hydropower Congress
- Next steps

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About the IHA

The International Hydropower Association (IHA) represents organisations and individuals committed to the responsible and sustainable development and operation of hydropower.

IHA's members share a common purpose: building a world where the world's energy and water needs are supported by sustainable hydropower

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Global summary

- 34 GW of new capacity added in 2022, first time since 2016 that we have seen more than 30 GW.
- Includes over 10 GW of pumped storage.
- Hydropower provides over 15% of the world's electricity.

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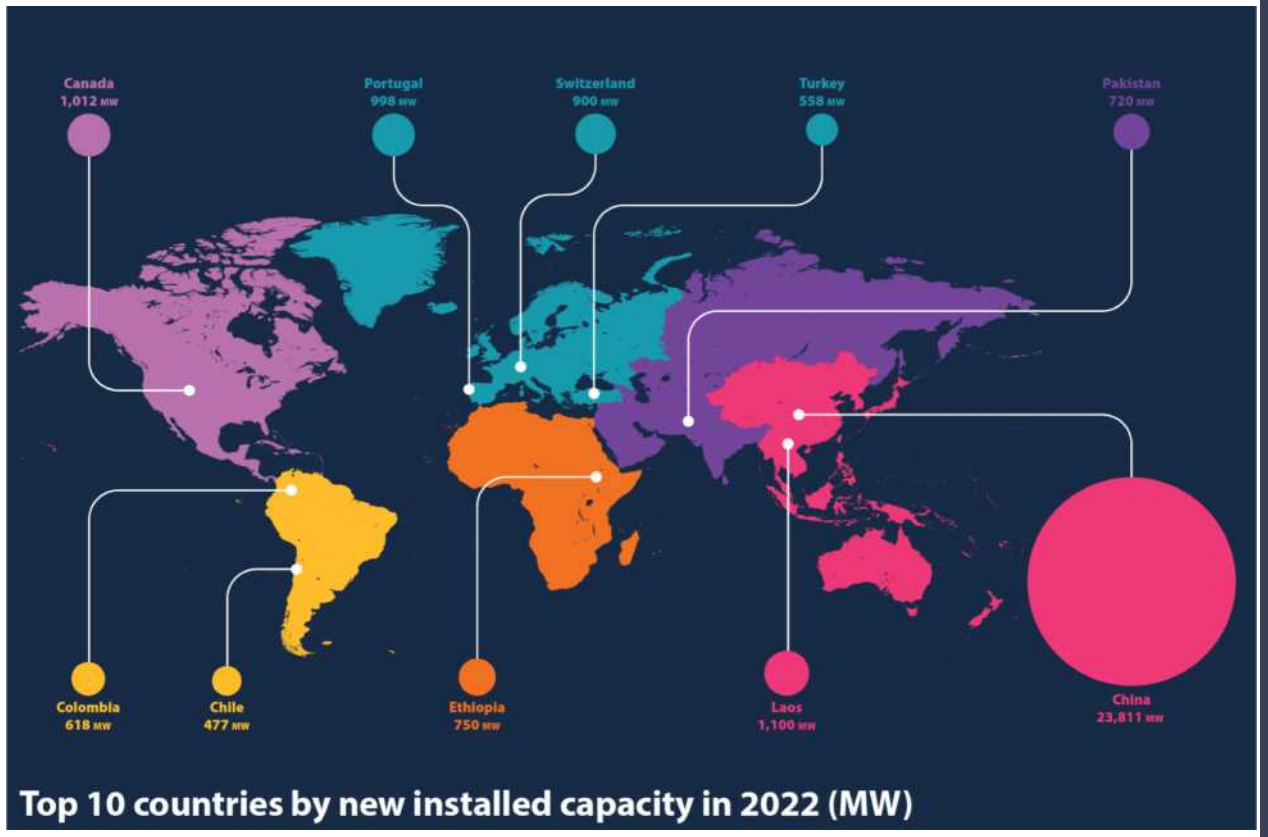
Global summary



Top 10 countries by new installed capacity in 2022 (MW)

- Around 35 countries added more than 1MW of capacity
- Major projects completed in 2022 include the final units at 16 GW Baihetan in China, plus big pumped storage in Europe (Nant-de-Drance, Gouvães) and Karot in Pakistan.

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Global summary

- China remains the world leader – going above 414 GW including nearly 45 GW of pumped storage
- 4 largest countries operate more than half of the world's fleet by capacity

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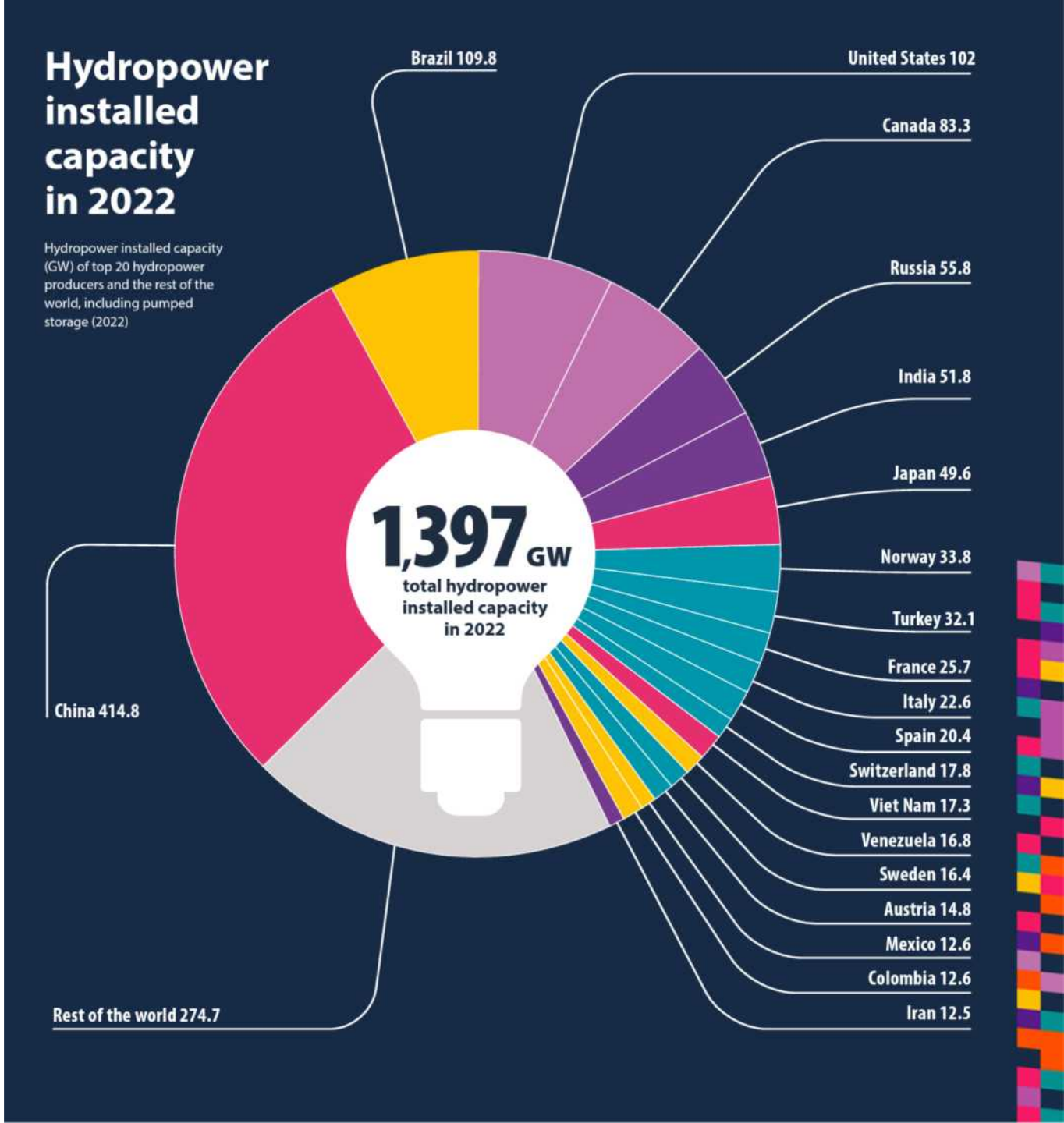
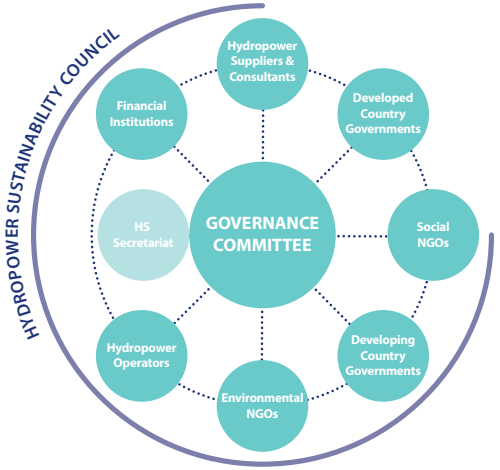


Hydropower Sustainability Standard

Multistakeholder governance



Assess projects over 12 sustainability topics

Environmental

Social

Governance

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iha

Unlocking the sustainability potential of hydropower worldwide

Hydropower Sustainability Standard

Social responsibility

Continuous improvement

Enhanced project credibility

Access to financing and investment

Positive community relations

Align with industry and investor

Streamlined project development

Leadership and inspiration

Environmental protection

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Methodology applied over a decade and across +25 countries

hydrosustainability.org

Pipeline: are we on track for net zero?

Hydropower will play a critical enabling role in the electricity grids of the future

Huge increase in variable renewables wind and solar PV means flexibility will be at a premium

Hydropower *should* be the single largest source of flexibility

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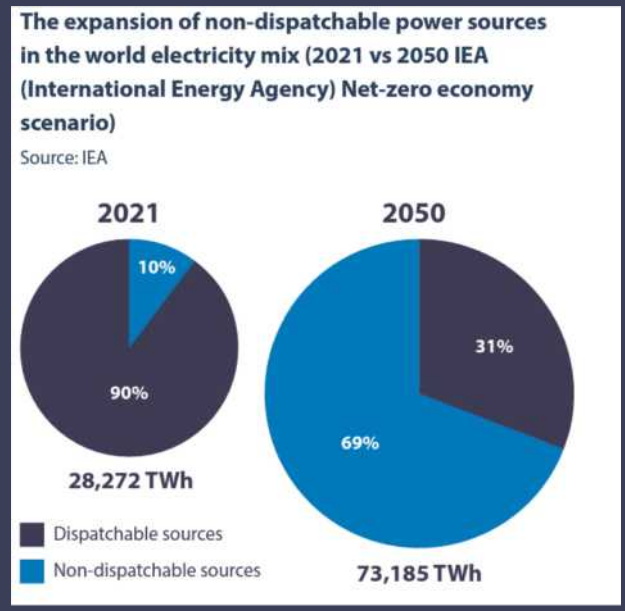

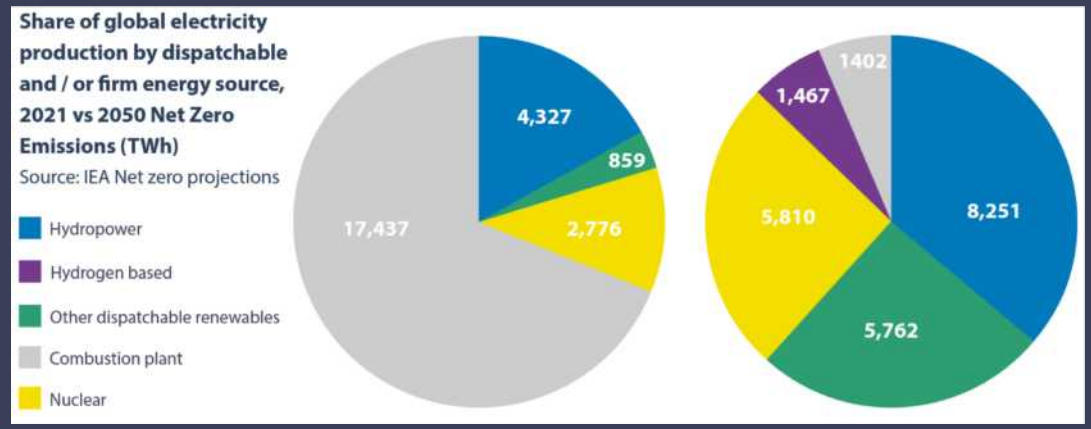

Pipeline: are we on track for net zero?

- IEA and IRENA both estimate that we need to be building over 45 GW of hydropower a year to reach 2,500 – 3,000 GW by 2050

- Over 500 GW of projects in the pipeline, with many in Asia and Africa, but

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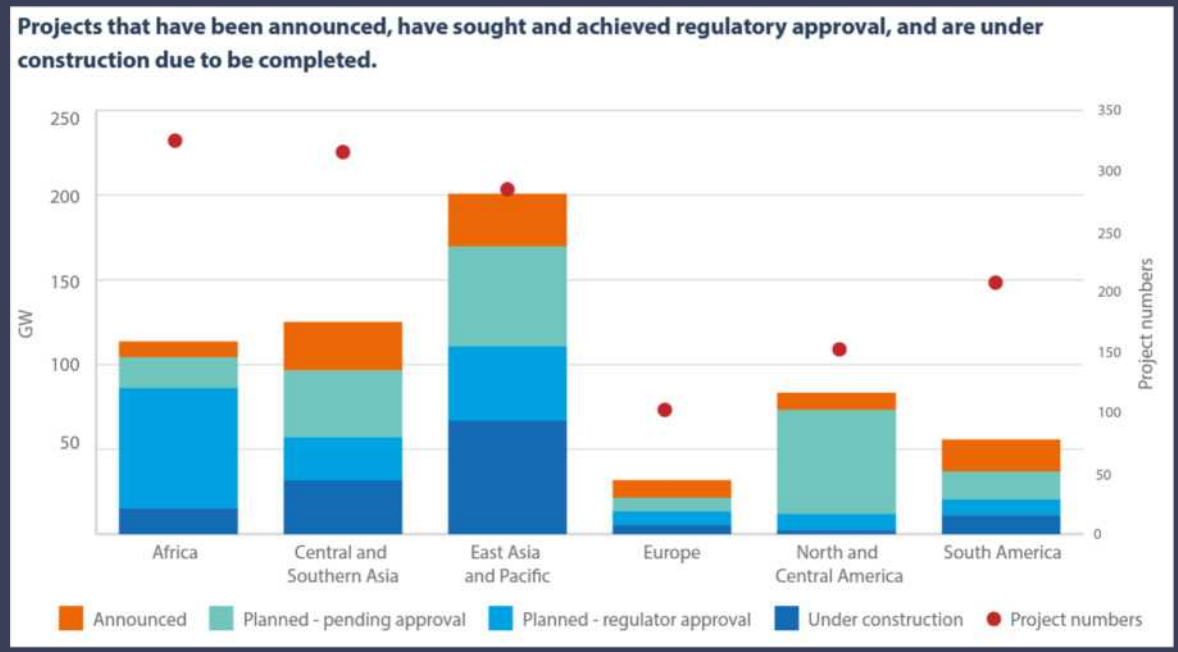

Pipeline: are we on track for net zero?

- IEA and IRENA both estimate that we need to be building over 45 GW of hydropower a year to reach 2,500 – 3,000 GW by 2050
- Over 500 GW of projects in the pipeline, with many in Asia and Africa, but
- Our analysis suggests a huge gap, even if *everything* in the current pipeline is built, there is still a 700+ GW gap

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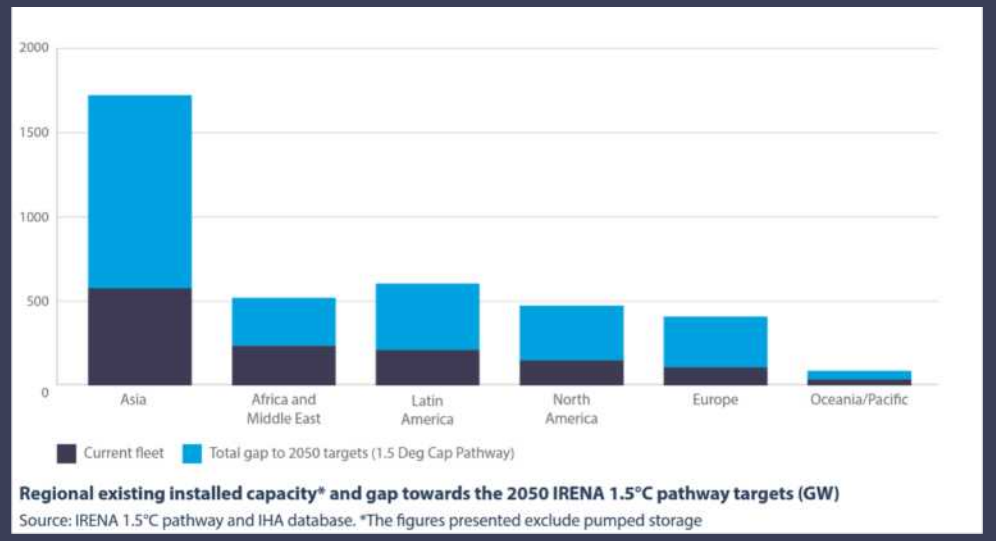
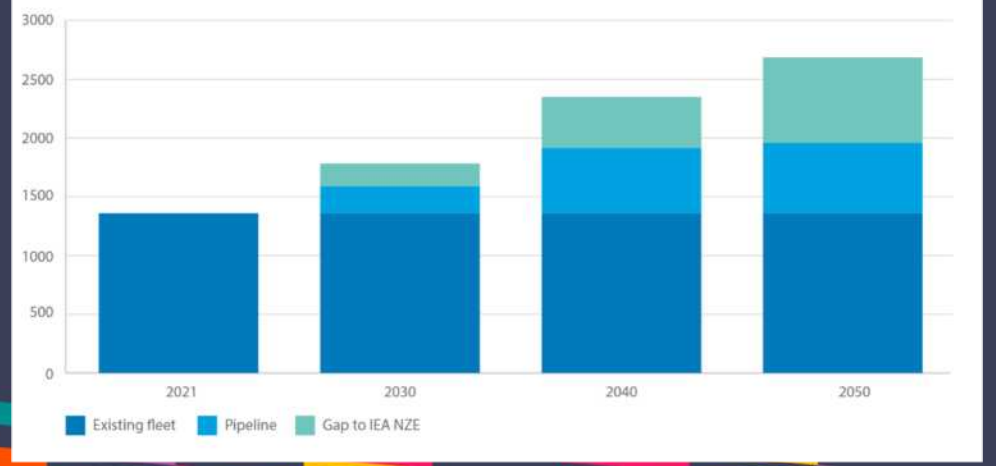


Regional existing installed capacity* and gap towards the 2050 IRENA 1.5°C pathway targets (GW)

Source: IRENA 1.5°C pathway and IHA database. *The figures presented exclude pumped storage

Hydropower development based on the current global hydropower projects pipeline and gap to the IEA NZE scenario projections (GW)

Source: IHA database and IEA NZE scenario projections



Potential:

- Academic studies suggest that there is sufficient economically viable hydropower to meet the net zero challenge. Major untapped resource in most regions.
- Off-river pumped storage provides huge additional potential
- Modernisation is an easy win, upgrading existing plants with latest technology can increase capacity, improve efficiency and provide resilience.
- Retrofitting unpowered dams could provide a further boost - only 21 per cent of single purpose and 16 per cent of multipurpose reservoirs are used for hydropower.

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Over 100 GW – untapped potential in the Democratic Republic of the Congo

Up to 23,000 TWh – global off-river pumped storage potential

630 GW – the size of the hydropower fleet over 30 years old

12GW – estimate for additional generation capacity in retro-fitting non-powered dams in the USA

Action needed

To unlock this potential IHA urges governments and policy makers to take these important steps:

1. Incentivise sustainable hydropower development through financial and market mechanisms that reward flexibility.

2. Accelerate the development of renewables through streamlined permitting and licensing.

3. Embed hydropower sustainability practices in government regulation.

Regional updates

- Europe
- North and central America
- South America

Europe
Highlights

- Total installed capacity: 258 GW
- Europe saw the most additions outside of China (nearly 3 GW including Turkey).
- Big pumped storage additions in Switzerland (900 MW Nant-de-Drance) and Portugal (880 MW Gouvães)
- Renewed interest in the role of pumped storage and conventional hydropower in providing flexibility
- XFLEX Hydro, demonstrating the latest hydropower technology, nears completion
- ETIP Hydropower launches

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Rank	Country/Territory	Installed capacity (MW)*
1	Norway	33,807
2	Turkey	32,130
3	France	25,669
4	Italy	22,635
5	Spain	20,425
6	Switzerland	17,756
7	Sweden	16,391
8	Austria	14,836
9	Germany	11,471
10	Portugal	8,252
11	Ukraine	6,317
12	Romania	6,229
13	United Kingdom	4,723
14	Greece	3,421
15	Finland	3,246
16	Serbia	3,166
17	Bulgaria	2,916
18	Slovakia	2,476
19	Poland	2,376
20	Czechia	2,290
21	Bosnia and Herzegovina	2,230
22	Albania	2,203
23	Croatia	2,155

Rank	Country/Territory	Installed capacity (MW)*
24	Iceland	2,086
25	Latvia	1,588
26	Belgium	1,493
27	Luxembourg	1,332
28	Slovenia	1,307
29	Lithuania	1,028
30	Montenegro	649
31	Macedonia	644
32	Ireland	508
33	Belarus	96
34	Kosovo	92
35	Greenland	91
36	Moldova	64
37	Hungary	58
38	Andorra	45
39	Faroe Islands	39
40	Netherlands	38
41	Liechtenstein	35
42	Denmark	7
43	Estonia	4

*including pumped storage

North and Central America

Highlights

- Installed Capacity: 206 GW
- Added Capacity in 2022: 1046 MW
  - Canada: Full commissioning of Keeyask (695 MW) and Romaine-4 (245 MW)
  - US: Pumped storage additions
- Policy announcements
  - US: Inflation Reduction Act (IRA): Tax credits for upgrades at existing hydropower facilities, new pumped storage facilities, retrofits of non-powered dams with hydropower generation, etc.
  - Canada 2023 budget: Tax credits for non-emitting electricity generation systems including hydropower and pumped storage (new and refurbishment)
- Key issues
  - Modernisation: CFE (Mexico) has recovered 261 MW
  - Pumped storage development

South America
Highlights

- Installed Capacity: 180 GW
- Added Capacity 2022: 1525 MW
  - Colombia (including first 2 units of Ituango)
  - Brazil
  - Chile
- Countries where hydropower provides approx. 50 per cent of energy or more:
  - Paraguay
  - Colombia
  - Ecuador
  - Brazil
  - Peru
  - Venezuela
- 2022 saw increased rainfall and hydro generation compared with drought conditions in previous years

Climate Resilience and Drought

- Extreme drought in some parts of the world
- Can not be generalized across the sector
- As the climate gets more volatile, we will need more, not less, water infrastructure
- Hydropower provides water storage
  - Example: Hydro-Tasmania


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congress
Powering
Sustainable
Growth
BALI 2023
31 October to 2 November
worldhydropowercongress.org

A legacy of action

world hydropower congress

Indonesia in 2023 will mark the 9th World Hydropower Congress, following previous events in regions across the world:

Building on the ground-breaking moments of 2021

The 2021 World Hydropower Congress produced four remarkable moments for hydropower history:

1 The Hydropower Sustainability Standard, drawn together by IHA, but designed by a multi-stakeholder group of industry, governments and NGOs. The Standard outlines sustainability expectations for hydropower around the world, ensuring projects provide net benefits to communities and environments they interact with.

2 The San José Declaration on Sustainable Hydropower, a historic document that outlined an ambitious set of recommendations to guide the future of hydropower development. Endorsed by COP26 President Alok Sharma, the Declaration was taken to COP26 in Glasgow in November 2021.

3 The report of the International Forum on Pumped Storage Hydropower. Launched by IHA, the forum brought together 13 governments (including the US, China and India), 70 organisations, several multilateral development banks and financial organisations.

4 A no-go commitment to hydropower development in World Heritage Sites by IHA members and a duty of care commitment in Protected Areas. These commitments were reissued in 2022 alongside the publication of new guidance by UNESCO.

Indonesia - ideal host

- **HE President Joko Widodo's strong ambitions for renewables-based industrial growth**.
- Indonesia is an **attractive destination to invest in renewables** due to its:
  - **potential of hydropower - in Indonesia, potential is ? GW**, though only 6 GW has been developed.
  - **political stability.**
  - **geopolitical balance.**
  - **newly enacted regulation** for the acceleration of the development of renewable energy projects.
  - **the Indonesia Just Energy Transition Partnership** between Indonesia and international partners.
  - development of world's largest **Green Industrial Park**.

2023 World Hydropower Congress

world hydropower congress

Date

Congress: **31 October-2 November**

Venue

Bali Nusa Dua Convention Center (BNDCC)

Programme

Theme: Powering Sustainable Growth

Three days of high-level panel debates and open exchanges (policy, finance, sustainability and innovation), networking events and showcase area.

Participants

1,200+ policy-makers, industry, financiers, academics, civil society, and media from over 120 countries.

Key

Plenaries	Parallel sessions	Workshops	Networking event

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Congress programme

31 Oct		1 Nov		2 Nov	
MORNING SESSIONS					
		Diversity, equity and inclusivity in hydropower	The future of hydropower in emerging economies	Assessing GHG emissions from reservoirs	
Welcome address and opening plenary: Powering Sustainable growth		Clean energy for all		IHA General Assembly	
ASEAN high level dialogue	Breaking down the barriers to hydropower development: Streamlining licensing and permitting	Pump it up: challenges and opportunities for pumped storage hydropower	How hydropower is classified	Hydropower modernisation: the next generation of hydropower development	Floating solar: challenges and opportunities with hydropower
How hydropower can contribute to flexible, stable and low-carbon grids	Digitalisation in Hydropower	Multi-purpose benefits of hydropower	Integrating hydropower sustainability into river basin planning	Measuring up: the case for standards in sustainability claims	Jobs and skills: challenges and opportunities in the hydropower workforce
LUNCHTIME SESSION					
Women in Hydropower: networking event		Networking event		Networking event	
Launch of the Hydropower Sustainability Alliance		(Hydro)powering net-zero		Stakeholder Forum	
AFTERNOON SESSIONS					
XFLEX HYDRO - lessons from Europe on integrating hydropower	Hydropower's role in decarbonising hard-to-abate industries	Powering the clean energy transition in Indonesia	Hydropower in an interconnected world	Closing Ceremony	
Water management and clean energy nexus	Financial opportunities with the Hydropower Sustainability Standard	Financial mechanisms to enable project development	Introducing 'The Renewables'		
Powering the clean energy transition in Asia and Ocenia	Powering the clean energy transition in Africa	Communicating hydropower: lessons in advocacy	De-risking investments in hydropower		
Powering the clean energy transition in Europe	Powering the clean energy transition in the Americas	Using the Climate Resilience Guide			
The future of hydropower: Young energy professionals event		Hydropower awards ceremony: Gala dinner			

Other Congress activities:

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Side events on 30 October:

IHA Board meeting, Multilateral Development Banks roundtable, IEA session, IRENA Hydropower Collaborative Framework, Global Renewable Alliance, Planning for Climate Commission, and INAHA session.

Tour to Cirata on 3 November:

Training on 6-8 November:

How to get in touch

e: congress@hydropower.org

w: worldhydropowercongress.org

Thank you

- www.hydropower.org/publications/2023-world-hydropower-outlook
- And watch out for forthcoming projects on:
  - Climate Resilience
  - Understanding the barriers to project development
  - Hydropower's role in water management
- See also upcoming publications with:
  - World Bank and GWNET on women's employment opportunities in the hydropower sector
  - African Development Bank and modernisation of the African hydropower fleet