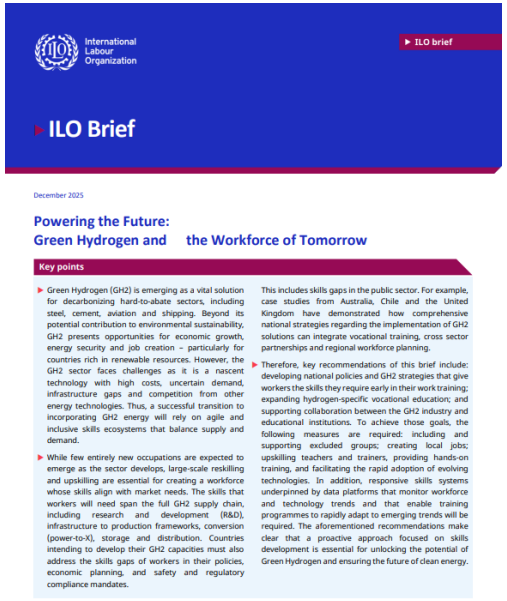
International Labour Organization

Powering the Future

Green hydrogen and the workforce of tomorrow

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ILO brief

ILO Brief

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Powering the Future: Green Hydrogen and the Workforce of Tomorrow

Key points

- Green Hydrogen (GH2) is emerging as a vital solution for decarbonizing hard-to-abate sectors, including steel, cement, aviation and shipping. Beyond its potential contribution to environmental sustainability, GH2 presents opportunities for economic growth, energy security and job creation – particularly for countries rich in renewable resources. However, the GH2 sector faces challenges as it is a nascent technology with high costs, uncertain demand, infrastructure gaps and competition from other energy technologies. Thus, a successful transition to incorporating GH2 energy will rely on agile and inclusive skills ecosystems that balance supply and demand.
- While few entirely new occupations are expected to emerge as the sector develops, large-scale reskilling and upskilling are essential for creating a workforce whose skills align with market needs. The skills that workers will need span the full GH2 supply chain, including research and development (R&D), infrastructure to production frameworks, conversion (power-to-X), storage and distribution. Countries intending to develop their GH2 capacities must also address the skills gaps of workers in their policies, economic planning, and safety and regulatory compliance mandates. This includes skills gaps in the public sector. For example, case studies from Australia, Chile and the United Kingdom have demonstrated how comprehensive national strategies regarding the implementation of GH2 solutions can integrate vocational training, cross sector partnerships and regional workforce planning.
- Therefore, key recommendations of this brief include: developing national policies and GH2 strategies that give workers the skills they require early in their work training; expanding hydrogen-specific vocational education; and supporting collaboration between the GH2 industry and educational institutions. To achieve those goals, the following measures are required: including and supporting excluded groups; creating local jobs; upskilling teachers and trainers, providing hands-on training, and facilitating the rapid adoption of evolving technologies. In addition, responsive skills systems underpinned by data platforms that monitor workforce and technology trends and that enable training programmes to rapidly adapt to emerging trends will be required. The aforementioned recommendations make clear that a proactive approach focused on skills development is essential for unlocking the potential of Green Hydrogen and ensuring the future of clean energy.

Three questions

1 What is the current state of GH2 sector?

2 Who is needed to build GH2 economy?

3 What should skills systems do?

Low-emissions/green hydrogen sectors are:

Growing fast

up 20%

Low-emissions hydrogen produced in 2025 reaching almost 1 million tonnes

Doubled

Installed electrolysis capacity in 2025 to more than 4 GW (with China accounting for ¾)

…but behind schedule

7%

Electrolysis capacity announced for 2023 that was delivered on schedule

Source: IEA (2026); Odenweller, A. and Ueckerdt, F. (2025),

Green hydrogen matters for hard-to-abate sectors, but faces challenges

Opportunities

- Decarbonizes sectors that are hard to electrify
- GH2 is considered where alternatives are not viable
- Growth, energy security and job creation
- Storable, and convertible through Power-to-X to derivatives with various end-uses

Challenges

- High production and transport costs
- Uncertain policy
- Limited manufacturing capacity
- Competition from other decarbonization solutions
- Demand forecasts being revised downward

Green hydrogen skills: a moving target

Train too early, too narrowly?



Train too late?

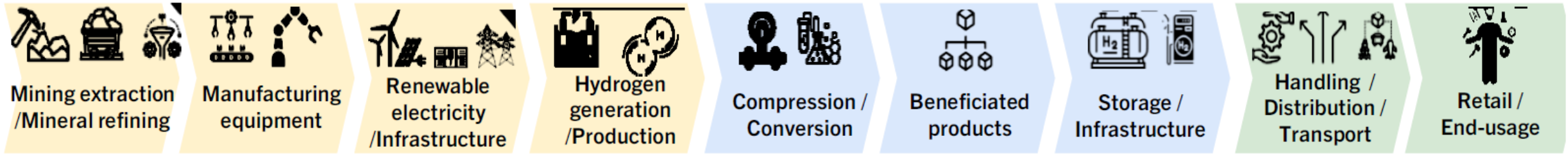
However,

There are also common occupations and skills required

But, this also means

There is competition for the same pool of workers

A value-chain perspective on occupational needs



Occupations

- Research scientists
- Design, chemical, mechanical and electrical engineers
- Water-treatment experts; health and safety officers
- Electrolysis, instrumentation and electrical technicians
- Welders, boilermakers, plant operators
- Hydrogen economists, policy analysts, finance managers

Occupations

- Engineers and technicians for compression, conversion and storage
- Hydrogen storage experts (cryogenic, pressurized)
- Industrial process engineers;
- Research scientists
- Market analysts; compliance specialists; quality inspectors
- Plant operators, welders and boilermakers

Occupations

- Fuel cell engineers; chemists
- Hydrogen health and safety specialists; compliance auditors
- Specialized hazardous-goods truck drivers; materials-handling technicians
- Recycling and material-recovery technicians
- Hydrogen economists; policy and market analysts

Source: Deutsche Gesellschaft für Internationale Zusammenarbeit (2024); ILO (2025)

Few "entirely new" occupations. The gap is GH2-specific skills and practiacal expereince

The core workforce exists today

- Engineers
- Electrical technicians
- Welders and boilermakers
- Plant operators
- Health and safety officers
- Quality inspectors
- Value chain segments and project phase change the “occupational mix”

Hydrogen/GH2-specific skills need to be added

- Electrolyser operation and maintenance
- Cryogenic and pressurized hydrogen storage
- Hydrogen safety protocols
- Certification and carbon life-cycle assessment
- Recycling of electrolysers and fuel cells

Practical experience is lacking

- Large-scale GH2 projects remain limited and concentrated

Overlooked skills gap: supporting functions and public sector

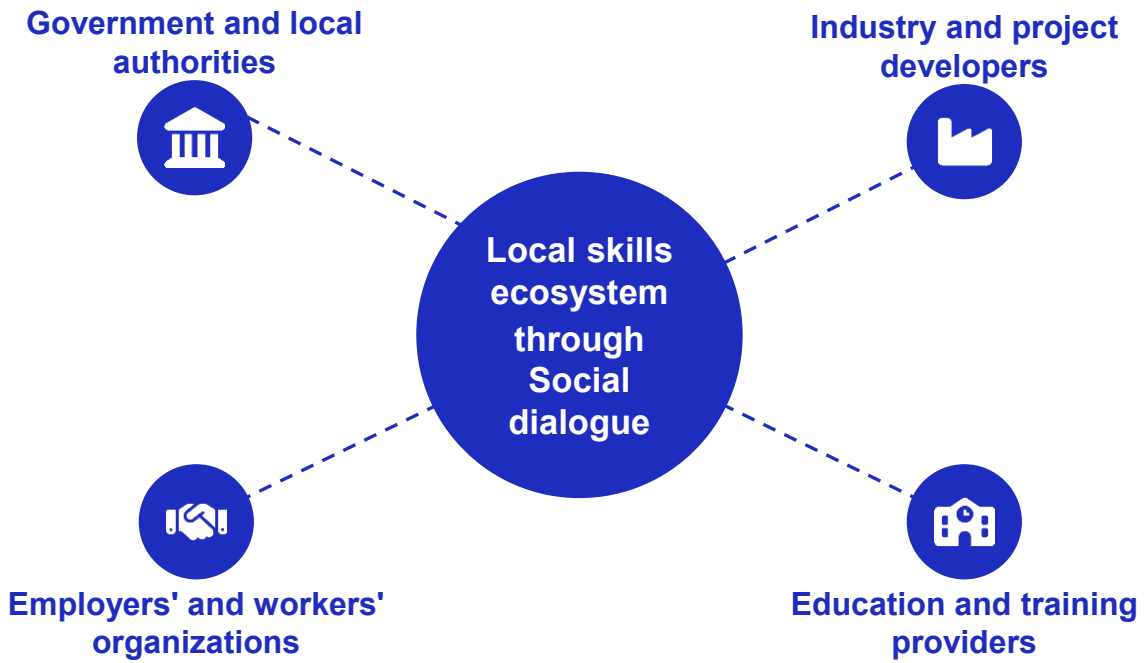
Supporting roles

- Hydrogen economists and policy analysts
- Finance managers and procurement
- Environmental, regulatory and ESG compliance specialists
- Market analysts
- HR and workforce advisors
- Climate science and social and environmental impact assessment

Public sector

- Develop regulations
- Issue permits
- Assess environmental impacts
- Policy implementation and promote investor confidence

Local skills ecosystem through social dialogue to address skills gaps



Actions needed (examples):

- Accredited, hydrogen-specific qualifications
- Hydrogen competencies embedded in existing curricula
- Hands-on, work-based learning
- Upskilled teachers and trainers
- Stronger partnerships between industry and TVET providers

Countries embedding skills in national and regional hydrogen strategies (examples)

Australia

National Hydrogen Strategy 2024; Regional roadmaps (e.g. Queensland)

- Regional skills initiatives for local hydrogen hubs
- Curricula and workplace placements co-designed with industry
- Accredited, hydrogen-specific TVET courses

Chile

National Green Hydrogen Strategy 2020

- A local workforce of technicians and specialists
- Identify skills gaps together with Government, industry, academia and technical centres

United Kingdom

UK Hydrogen Strategy 2021; Hydrogen Sector Development Action Plan 2022

- Invest in regional hubs
- Implement an energy apprenticeship
- Develop energy skills forecasts
- Provide incentives for project
- Create a skills accreditation framework

Respective roles of stakeholders

Governments

- Embed skills planning in national hydrogen strategies
- Invest in regulatory and permitting capacity
- Facilitate maping of skills needs by region

Industry and social partners

- Co-design training that reflects industry needs
- Provide the hands-on experience
- Work with certification bodies to recognize skills developed through targeted programmes
- Monitor the data on projects and workers, and communicate with training providers

Training institutions

- Deliver practical and inclusive training;
- Prioritize vulnerable groups such as displaced fossil-fuel workers
- Upskill trainers

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Thank you very much for your kind attention.

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