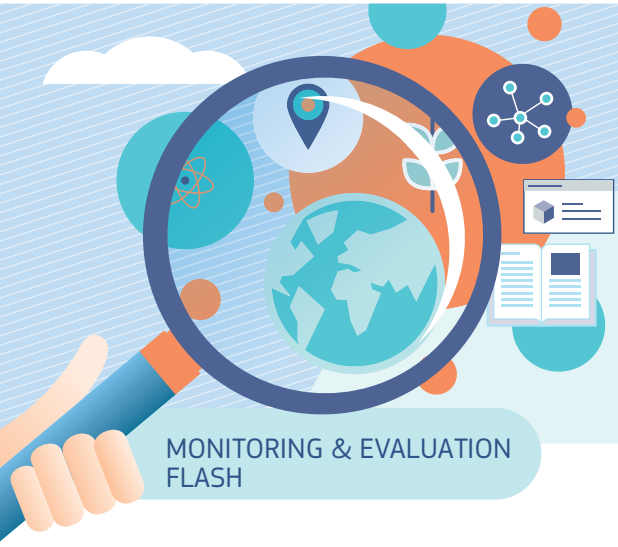


European Commission

MONITORING & EVALUATION FLASH

Tracking research and innovation performance in the clean energy sector: KEY FINDINGS

April 2023

This factsheet summarises the key findings of the report "Tracking Research and Innovation Performance in the Clean Energy Sector", which analysed the research and innovation (R&I) performance on clean energy technologies (CET) of European Union (EU) and Mission Innovation (MI) members using innovation-output indicators (scientific publications, patents, exports).

Innovation on CETs is essential to achieve climate neutrality and other energy sustainability goals (e.g. increasing energy security, reducing energy poverty) while minimising the costs of the energy transition. The faster innovation in the clean energy sector is driven by effective policies, the lower the short- and mid-term costs to society of climate change mitigation will be. The scale of R&I activities must be increased in order to accelerate clean energy innovation. Their effectiveness and efficiency also need to be improved, including through analytical work based on indicators, the use of which can greatly help to fine-tune R&I policies.

Between 2015 and 2020, scientific publications related to CETs increased by 50% at global level. The top-performing global players in 2020 were China, with 32% share of CET-related publications, the EU-27 (16%) and India (9%).

Between 2015 and 2018 high-value patents (inventions protected in more than one national jurisdiction) related to CETs increased by 16% globally, with Japan (24% share of CET-related high-value patents), the EU-27 (22%) and the United States (18%) as world leaders.

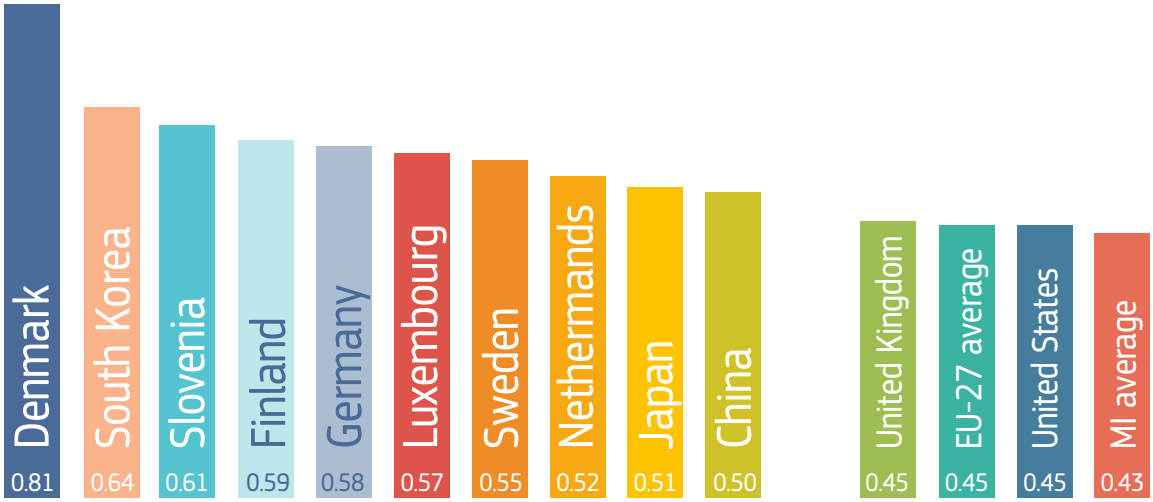
The value added of CET exports rose from USD 68 billion in 2015 to USD 70 billion in 2018, with the EU-27 as the top global player in terms of both absolute exports of CETs (33% of global export) and valued added content (38% of global value added).

Renewable energy technologies had the highest share (32%) of innovation outputs (average of shares in publications, high-value patents and export in 2018) followed by sustainable transport (31%), smart systems (20%), energy efficiency (13%), carbon capture and storage (2%) and nuclear (2%).

Innovation outputs in the clean energy sector are increasing

Between 2015 and 2020, there was an increase in R&I outputs related to CETs for most countries in the EU and MI member countries. In several countries, the increase in scientific publications and patents did not keep pace with the rise in underlying drivers such as population or gross domestic product (GDP). This resulted in a decline in R&I performance, as measured by "scaled indicators" such as the number of scientific publications per capita and number of inventions per unit of GDP.

Clean Energy Innovation Index, top 10 performing countries and global players in 2018



The overall R&I performance in the clean energy sector was assessed with a composite indicator (the 'Clean Energy Innovation Index' [CEII]), which combines seven different R&I output indicators. The CEII was computed for 38 countries from 2015 to 2018.

The analysis showed that in 2018, Denmark had the highest global performance (CEII of 0.81) in research and innovation in the clean energy sector, with the EU scoring (0.45) above the average of MI members (0.43). Seven out of the ten top country performers were EU members (Denmark, Slovenia, Finland, Germany, Luxembourg, Sweden and the Netherlands). Amongst global innovation players (China, the EU, Japan, South Korea, and the US) in the clean energy sector, only China reported increasing index values between 2015-2018; EU-27 had constant index values while all other players had decreasing values.

The analysis, narrowed down to qualitative R&I output indicators related to CETs, such as highly cited scientific publications and high-value patents per unit of GDP, suggests a radical shift in global R&I leadership in this sector. China significantly increased its global ranking across all qualitative indicators, while "mature" global innovation players (e.g. the EU, Japan, South Korea and the US) reported either negative or modest growth.

Methodology and dataset

This factsheet is based on the final report of the Clean Energy Innovation Index project, led by the Clean Planet Directorate of the European Commission's Directorate General for Research and Innovation. The project resulted in the publication of nine reports between 2020 and 2022. The methodology for the computation of the Clean Energy Innovation Index is described in the first and second methodological reports, respectively. The full dataset for EU and MI members is available in the Annex of the report.

Find out more on the report here:

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