GECF

Gas Exporting
Countries Forum

Global Gas Outlook 2050

9th Edition

Launch event

10 March 2025 | Doha, Qatar

Agenda

Opening remarks

HE Eng. Mohamed Hamel
GECF Secretary General

Sheikh Dr Mishal bin Jabor Al-Thani
GECF Executive Board Member

Scene Setting
Amin Naderian, EEFD Head

Panel discussion on the key findings of the **Global Gas Outlook 2050**

Abubakar Jibrin Abbas

Mustafa Adel Amer

Galia Fazeliyanova

Masoumeh Moradzadeh

Dmitrii Gordeev

Sabna Ali

Moderator
Tarisse Austin, Public Relations Officer

The Global Gas Model (GGM) improvements

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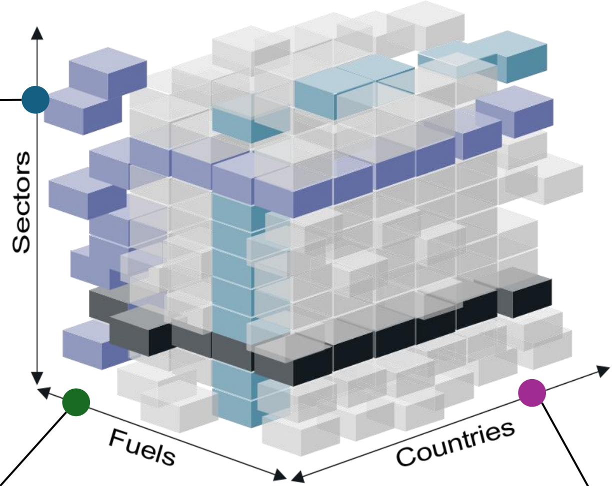
38 Sectors

- Residential
- Commercial
- Transport
- Industry
- Power
- Agriculture
- Hydrogen
- Heat
- Energy

35 Fuels

- Natural gas
- Coal
- Oil
- Biomass
- Solar
- Wind
- Geothermal
- Hydro
- Nuclear
- Hydrogen



Granularity

- Inclusion of Senegal as a new country
- Inclusion of pulp and paper as a sub-sector in the industrial sector

140 Countries

- Africa (19)
- Asia Pacific (31)
- Eurasia (14)
- Europe (39)
- Latin America (16)
- Middle East (18)
- North America (3)

Model structure

- Inclusion of renewable energy (e.g., wind and solar) intermittency in the cost of electricity generation.
- LPG production stemming from natural gas processing will be factored into the demand for natural gas
- New methodology to estimate global temperature change

Key drivers for GGO Reference Case Scenario (RCS)

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People and society

- Population rise stemming from developing countries
- Global ageing due to declining fertility and increased longevity
- Increased migration owing to economic betterment pursuit

Technology and innovation

- Time for technology adoption is set to speed up
- Industry 4.0 will profoundly change the energy supply chains and energy consumption behavior
- Technological competitiveness improvement is on the rise in the developing countries
- AI will be a powerful frontier technology resulting in a new human-machine interaction

Economic and business

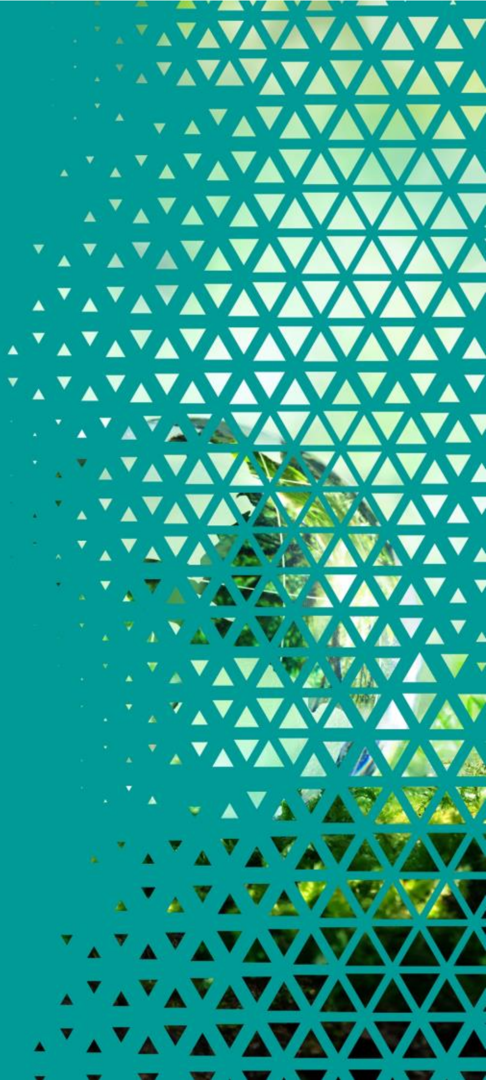
- The balance between labour displacement and job creation is exposed to shifts due to ICT
- Increased trade policy uncertainty and emerging regionalisation trend
- Global economic power is shifting to emerging countries
- Global economy will be burdened by increasing levels of debt

Environment and resources

- Emergency measures to revisit climate policies and targets
- Ongoing climate change concerns
- Beyond climate, other types of pollution will damage the environment and human health
- Significant demand for food, water and raw materials is expected in the long-term

Geopolitics and governance

- The evolving role of the Global South in shaping international policies and norms
- Formation of new alliances among Global South countries
- Strengthening multilateralism with a focus on inclusiveness and equity in international negotiations



Energy Policy Developments

Energy security and affordability remained the primary drivers of energy policy

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2022

- Growing focus on energy security and affordability
- A noticeable shift from market-driven mechanisms to a greater state role in energy markets
- Rise in policies supporting domestic energy production and supply diversification
- Climate change policies were overshadowed by the energy crisis

Short-term strategies

In response to energy crisis, governments implemented measures to mitigate the adverse effects of energy-related shocks on consumers and businesses

2023

Reevaluating long-term policies

As energy crisis tensions eased, the global community seized the opportunity for policy re-evaluation

- Continued focus on energy security through domestic capacity development and import diversification
- Shift from short-term crisis solutions to long-term goals
- Renewed emphasis on climate change policies
- Accelerated energy transition momentum

2024

Diminished social support for climate goals and intensified global competition for AI leadership are expected to slow the energy transitions

Shifting political dynamics

The global energy transitions have driven up energy prices and living costs, reducing societal support for climate policies, as reflected in the 2024 elections

Strong drivers have solidified natural gas's role in global energy systems

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Policy drivers

Energy security, rising power demand, and regional dynamics drive growth.

Regionally, it's crucial for grid stability in advanced economies, emissions reduction in coal-dependent countries, drought management in Latin America, desalination in the Middle East, clean cooking in Sub-Saharan Africa and reducing emissions in shipping and heavy-duty transport.

LNG production

Governments are actively advancing policies to support LNG production.

Governments are advancing policies to support LNG production through expanded exports and international partnerships.

LNG contracts

Rising renewables and variable demand drive the shift to flexible LNG contracts.

LNG markets are shifting toward flexible contracts, with buyers favoring shorter-term agreements that allow resale, while traditional suppliers prefer long-term contracts to secure financing.

Production

Countries intensified policy support for gas production.

Countries announced various plans to enhance natural gas production, driven by concerns about energy security and sustainability.

Power generation

Countries are securing natural gas's key role in power generation.

Regions are receiving policy support to boost investments in the infrastructure needed to increase the use of natural gas in power generation including new power plants, pipelines, and LNG terminals.

Methane emissions reduction

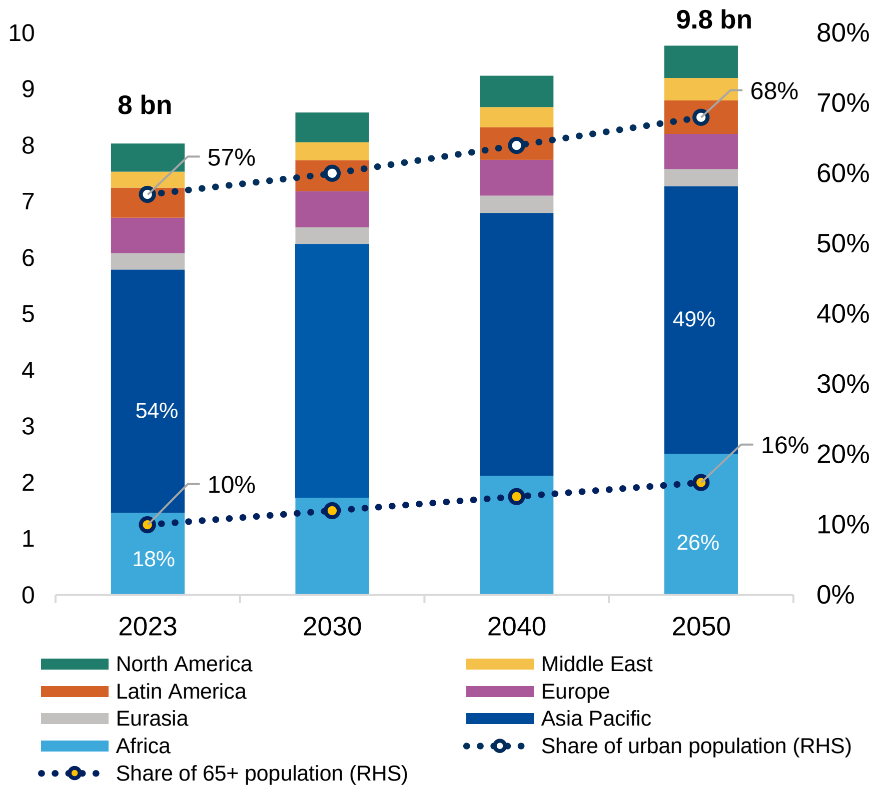
Countries are increasingly prioritising regulations on methane emissions.

Global efforts to address methane emissions have intensified.

Energy and Natural Gas Demand Outlook

Demographic diverging path: while Europe and North America stagnate, Africa and developing Asia surge, driving 80% of global population growth by mid-century

Global population outlook by region, 2023-2050
billions



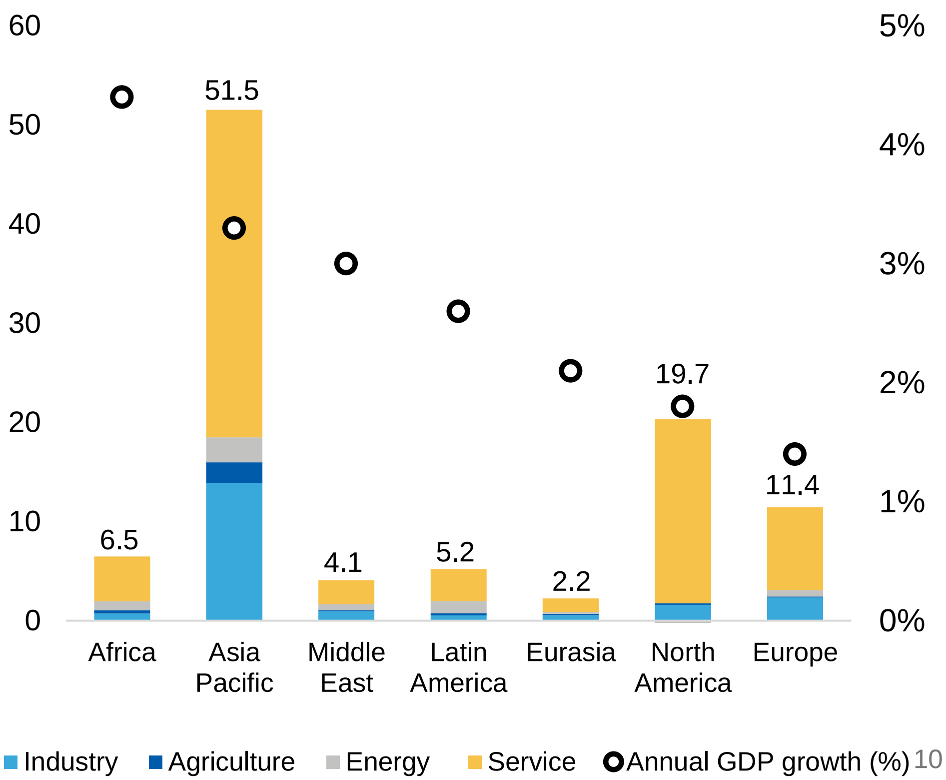
- **Global population** is set to grow by 21% by 2050, reaching 9.8 billion people
- More than 80% of the incremental population is anticipated to take place in **Africa and the developing Asia Pacific** regions
- **Urbanisation** will rise to 68% by 2050, driving new megacities in Africa and developing Asia and boosting demand for housing, services, and infrastructure
- The **ageing global population** will see those 65+ grow from 10% in 2023 to 16% by 2050, raising the old-age dependency ratio from 16% to 26% and heightening economic and social pressures

Source: GECF Secretariat based on GGM

Robust long-term growth in emerging regions such as Asia Pacific and Africa will be key in doubling the global GDP by mid-century

- The **size of the global economy** is projected to more than double, reaching USD 206 trillion
- More than half of the incremental economic output is anticipated to come from the **Asia Pacific region**
- The **service sector** will lead global economic growth, increasing its GDP share from 66% in 2023 to 68% by 2050
- Long-term growth is expected to be stronger in Africa (4.4%), Asia Pacific (3.3%), and the Middle East (3%) compared to North America (1.8%) and Europe (1.4%)

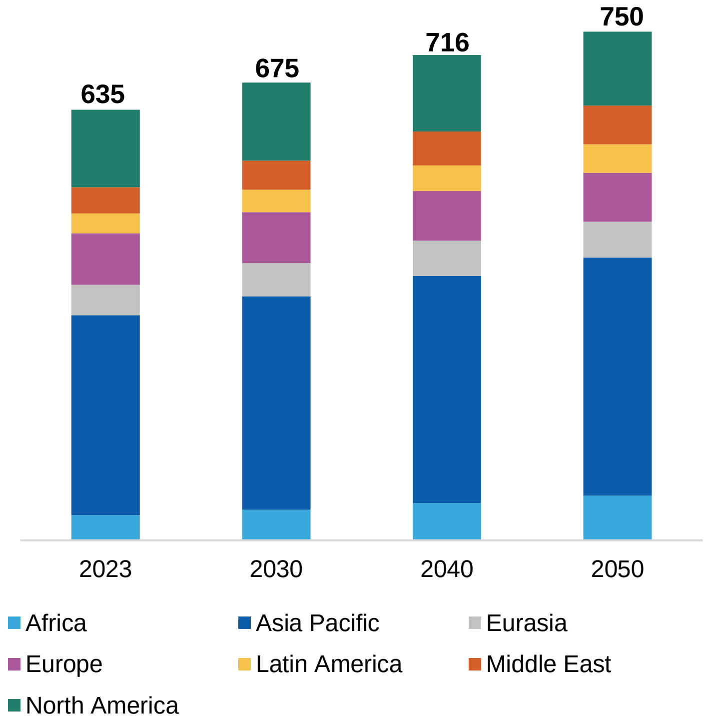
Regional GDP change outlook by sector, 2023-2050
(real trillion USD, base year=2023)



Source: GECF Secretariat based on GGM

Global primary energy demand is projected to rise by 18% by 2050

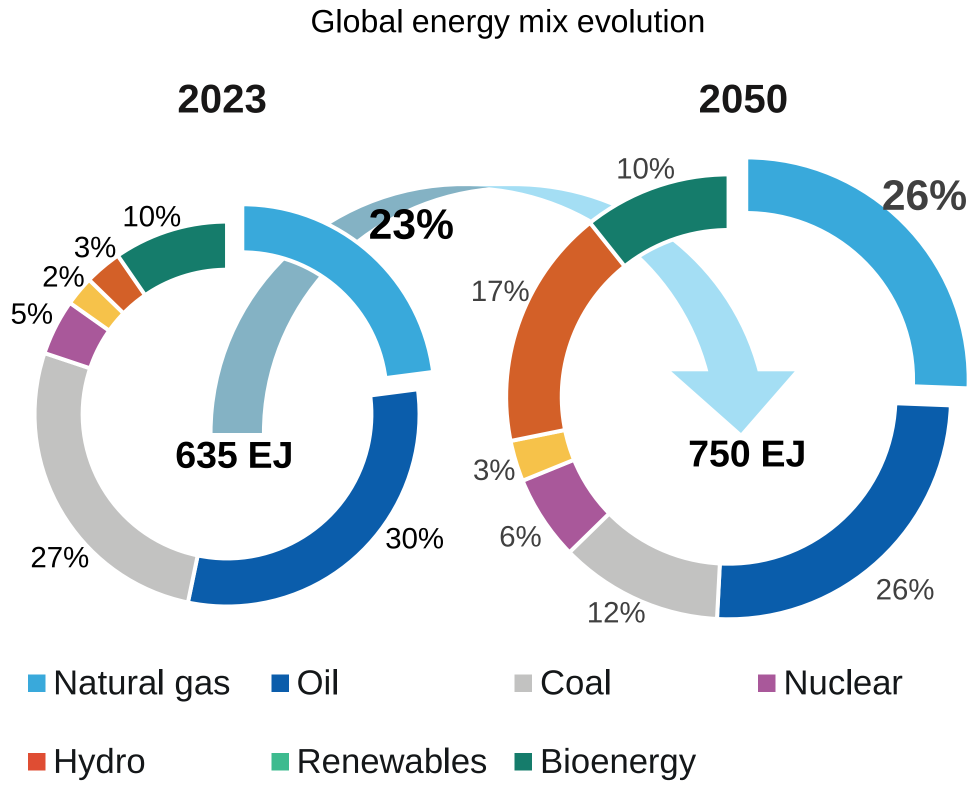
Primary energy demand trends by region (EJ)



Source: GECF Secretariat based on GGM

- **Primary energy demand** is forecast to grow at an average annual rate of 0.6%, rising from 635 EJ in 2023 to 750 EJ by 2050
- **Asia Pacific** is set to dominate global energy demand growth, contributing 54 EJ (equivalent to 49%), of the net total increase between 2023 and 2050
- **Africa** follows as the second-largest contributor, accounting for one-fourth of the global growth during the outlook period
- Energy demand in **Europe** is projected to continue its declining trend through the end of the outlook period, decreasing by approximately 4 EJ by 2050
- Primary energy demand in **North America** is expected to peak in the latter half of the 2030s, followed by a gradual decline

Natural gas is an essential element of the global primary energy mix: from 23% today to 26% in 2050



- **Hydrocarbons** are expected to remain dominant in the global primary energy mix, contributing 64% by 2050, down from nearly 80% in 2023
- **Natural gas**, which accounts for 23% of global primary energy demand, is forecast to rise to nearly 26% by 2050
- **Renewables** are the fastest growing energy, with their share projected to increase from 3% in 2023 to over 17% by mid-century
- **Oil** demand is anticipated to grow by 2030, before a prolonged plateau by 2050
- **Coal**'s share is anticipated to decrease significantly, from 27% to just 12% over the outlook period

Note: Bioenergy includes traditional and modern bioenergy.
Renewables include solar, wind, tidal, and geothermal energy.

Source: GECF Secretariat based on GGM

By 2050, natural gas demand surges 32%, with Asia Pacific leading the growth

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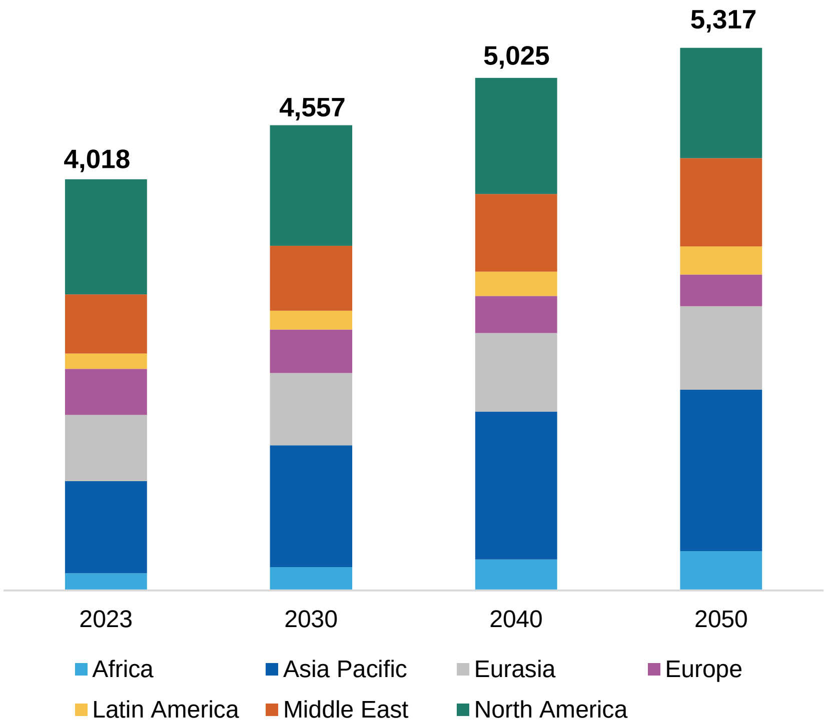
Global natural gas demand by region (bcm)

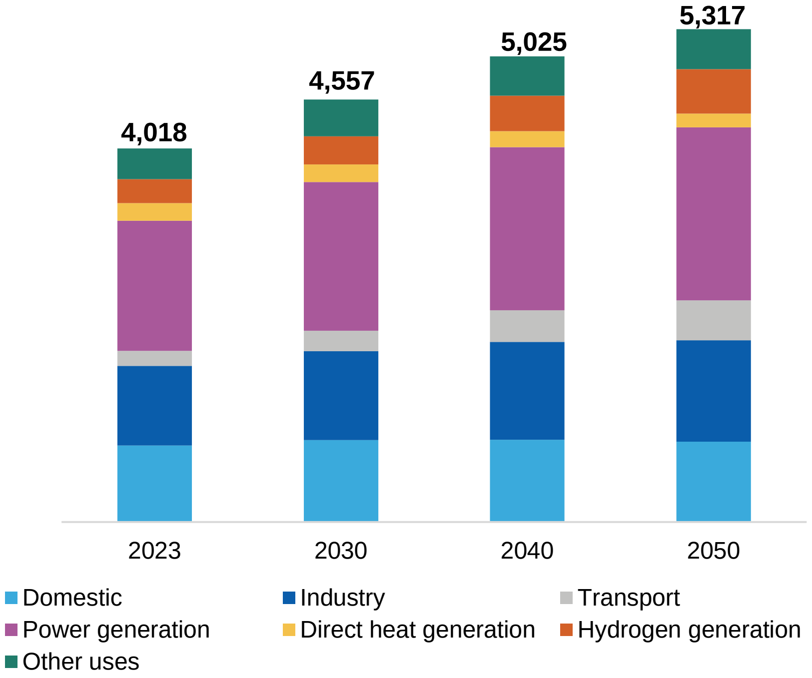


- **Global gas demand** is forecast to increase by 32%, reaching 5,317 bcm by 2050
- **Asia Pacific** region is forecast to add 710 bcm and account for 53% of the global net demand growth during the outlook period
- In **Africa**, natural gas demand is expected to grow at the fastest rate globally, 3.0% annually
- In **Europe**, natural gas demand is anticipated to decline from 463 bcm in 2023 to 309 bcm by 2050, due to energy policies and deindustrialisation
- **North American** demand is forecast to remain resilient, with Mexico leading growth

Source: GECF Secretariat based on GGM

The power generation and industrial sectors are set to be the main areas of natural gas demand expansion

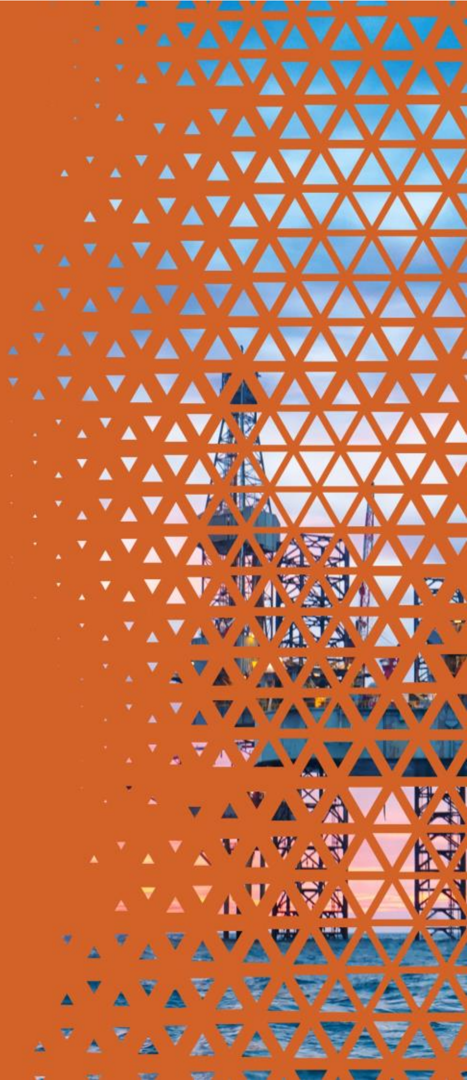
Global natural gas demand by sector (bcm)



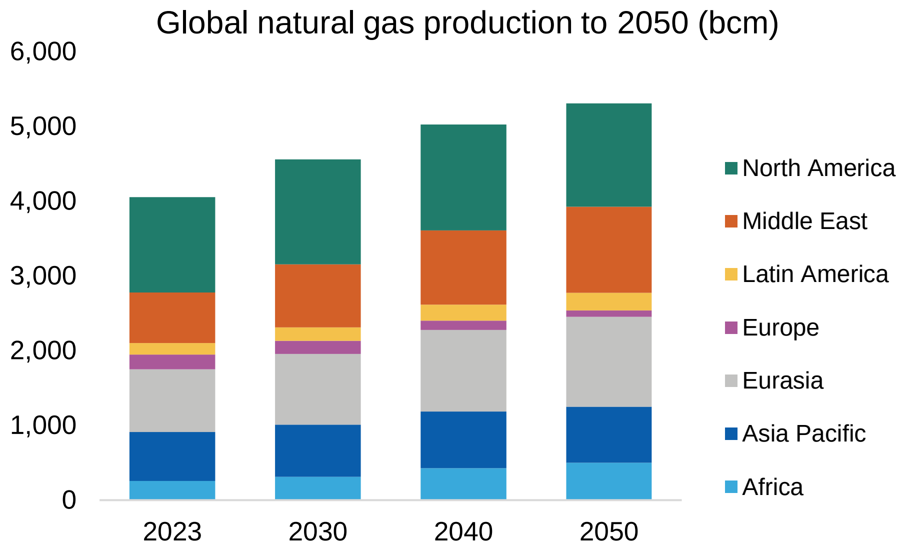
- **Power generation** remains the primary driver of demand growth, accounting for 35% of the total increase, adding around 475 bcm and reaching nearly 1,866 bcm by 2050
- The **transport sector** follows as the second-largest contributor, representing 21% of the net demand growth, adding 265 bcm at an average annual growth rate of 3.5% over
- Natural gas demand for **hydrogen production**, encompassing both blue and grey hydrogen, is projected to increase from 259 bcm in 2023 to 480 bcm by 2050

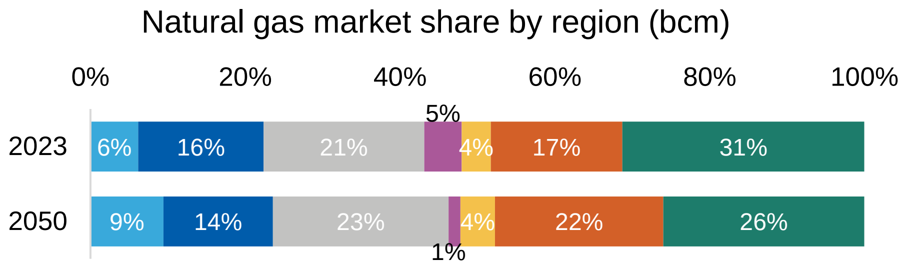
Note: 1) Industry includes natural gas directly used as fuel and feedstock, as well as input for refineries. 2) Transport encompasses road transport, marine bunkers, rail transport, and pipeline operations. 3) Other uses cover natural gas consumption for the energy industry's own use, along with distribution losses.

Natural Gas Supply Outlook



Natural gas production sustains growth to 2050, adding volume equivalent to North America's current production





Source: GECF Secretariat based on GGM

- Global natural gas production is projected to reach 5,317 bcm, with an average annual growth rate of 1%
- **North America** is expected to remain the world's largest natural gas producer reaching 1,382 bcm by 2050. However, its share in global gas production drops from 31% in 2023 to 26% in 2050
- **Eurasia** is projected to reach 1,208 bcm by mid-century, with its share rising from 21% in 2023 to 23% in 2050
- **The Middle East** is projected to experience significant growth, with production rising to 1,155 bcm by 2050 and its share increasing from 17% in 2023 to 22% in 2050

Middle East, Eurasia and Africa will be the main drivers behind natural gas production growth to 2050

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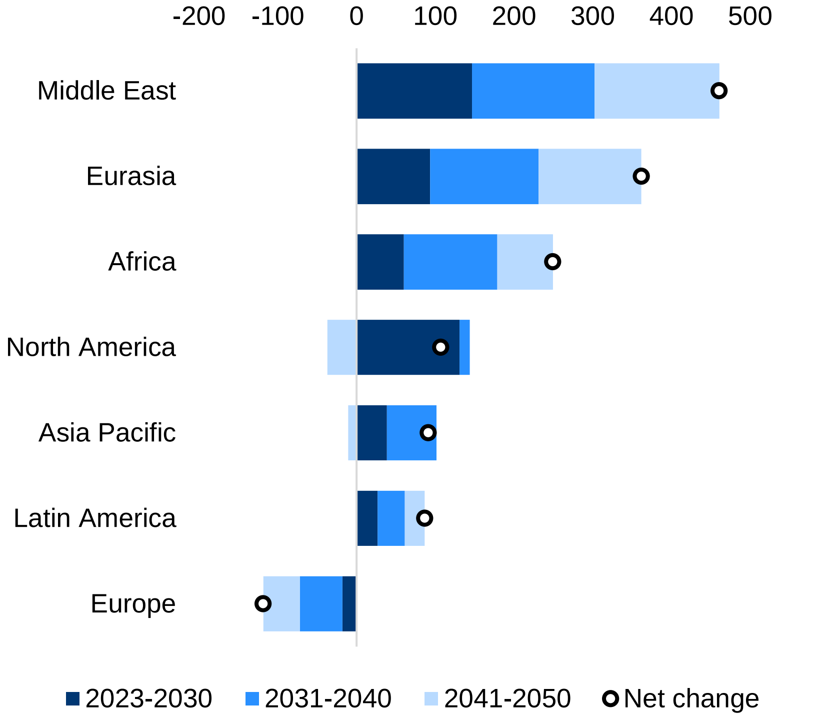
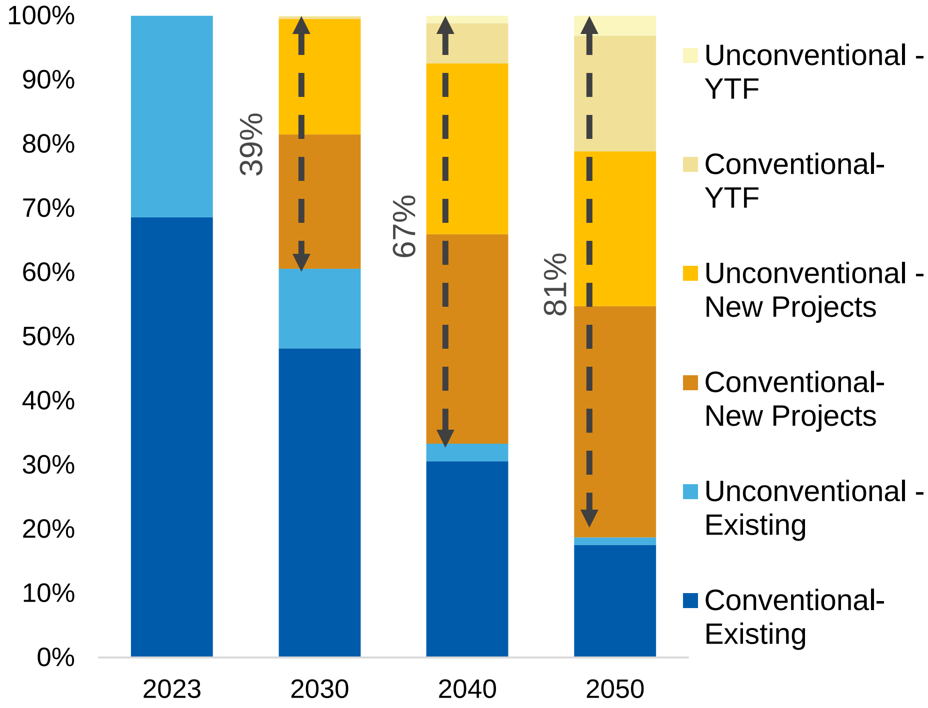
Global natural gas production growth by region from 2023 – 2050 (bcm)



- The **Middle East** will account for the largest incremental gas production growth in the forecast period, while **Africa** is the fastest growing region
- The **Middle East** leads with 461 bcm additional production, followed by **Eurasia** (362 bcm) and **Africa** (250 bcm), with **Africa** achieving the highest annual gas production growth rate of 2.5%
- Production from these three regions will steadily grow over the outlook period and will account for 54% of global gas production in 2050 compared to 44% in 2023
- During 2030s, **North America**'s gas production begins to slow, reflecting maturity in unconventional plays despite gains from new unconventional projects. During 2040s, **North America**'s gas production will decline
- Unconventional gas production in **North America** is expected to peak at 1,200 bcm in the late 2030s, before declining to 1,126 bcm by 2050

Source: GECF Secretariat based on GGM

New projects and yet-to-find (YTF) resources are expected to deliver 81% of global natural gas production by 2050



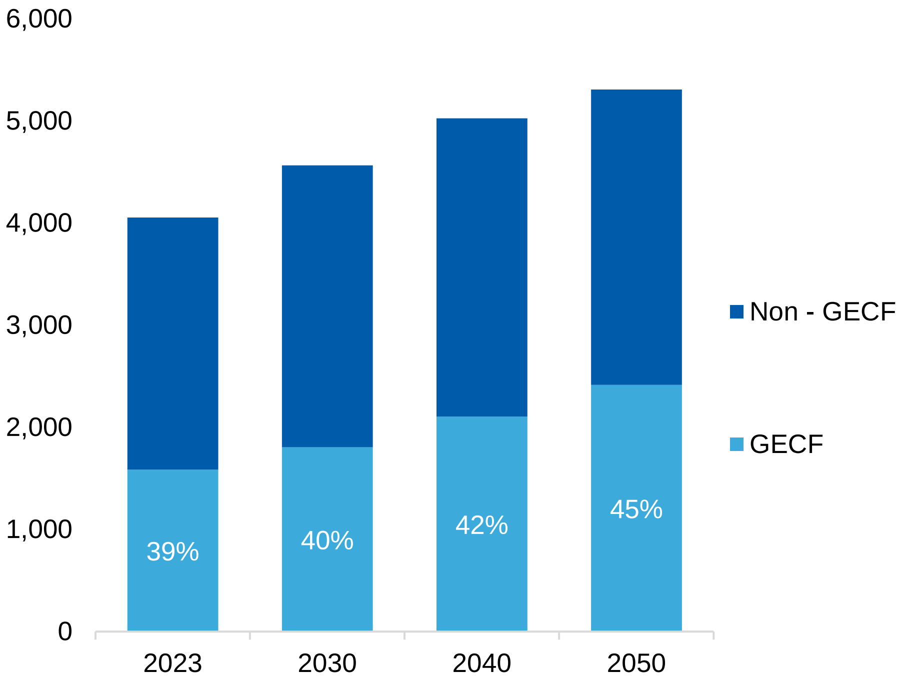
YTF: Yet to Find

- Today's producing assets face natural decline, **conventional fields** declining at 4% annually while unconventional assets deplete nearly three times faster at 11% annually
- By 2050, 81% of global gas will flow from fields not yet producing today
- Future gas security hinges on successfully developing 4,390 bcm of **new and undiscovered resources** by 2050, more than the current global gas production
- The future stability of gas markets and energy security depend on maintaining a robust exploration and development activities across diverse geographies, making **upstream investment** a strategic priority

Source: GECF Secretariat based on GGM

GECF members countries are set to expand their market share from 39% in 2023 to 45% in 2050

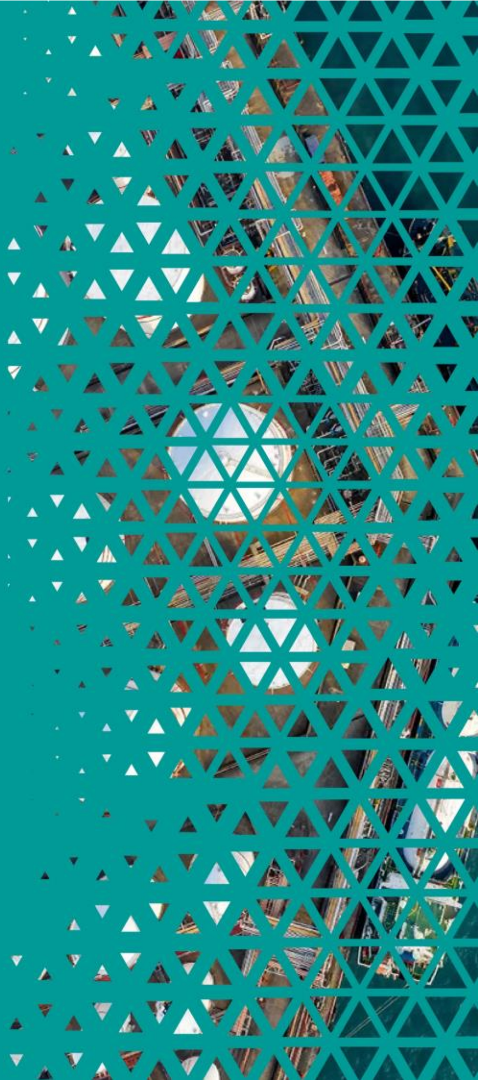
GECF member countries' contribution to global natural gas production, 2023-2050 (bcm)



- Natural gas production from **GECF member countries** is expected to rise from 1,600 bcm in 2023 to 2,400 bcm in 2050, accounting for 45% of global production, up from 39% in 2023
- The average annual growth rate of natural gas production from **GECF member countries** is forecast at 1.5%, significantly outpacing the 0.6% growth rate for non-GECF countries
- The **GECF member countries** are projected to account for 80% of the global growth in conventional gas production

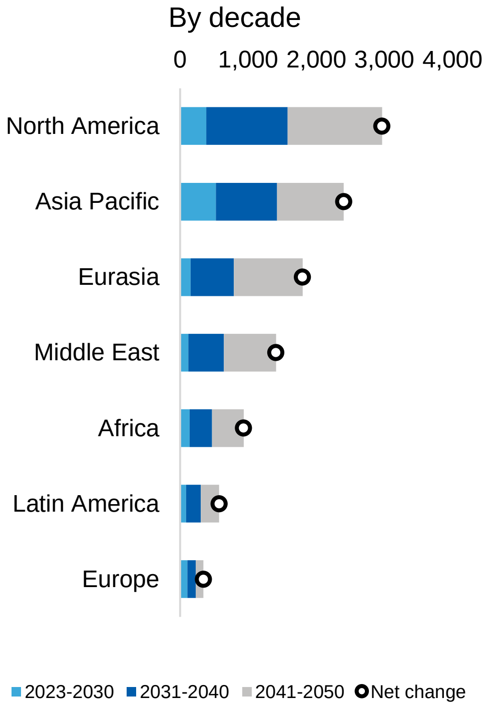
Source: GECF Secretariat based on GGM

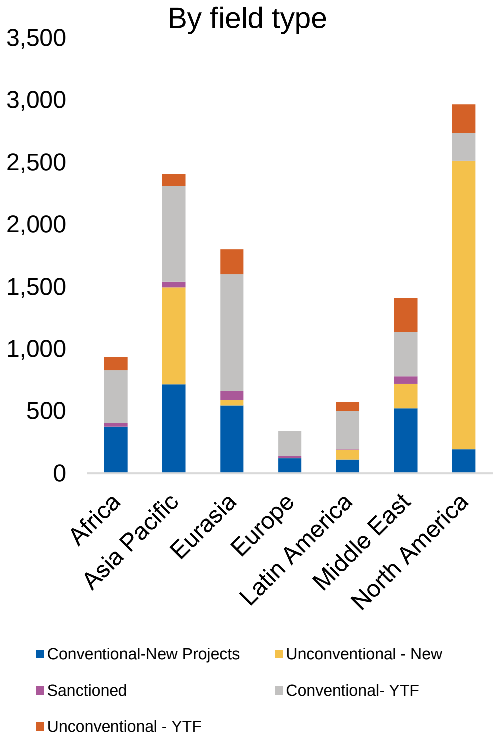
Upstream Natural Gas Investment Outlook



Natural gas cumulative investment is projected to reach USD 11.1 trillion by 2050

Regional natural gas Capex requirement 2024-2050 (real USD billion, base year =2023)

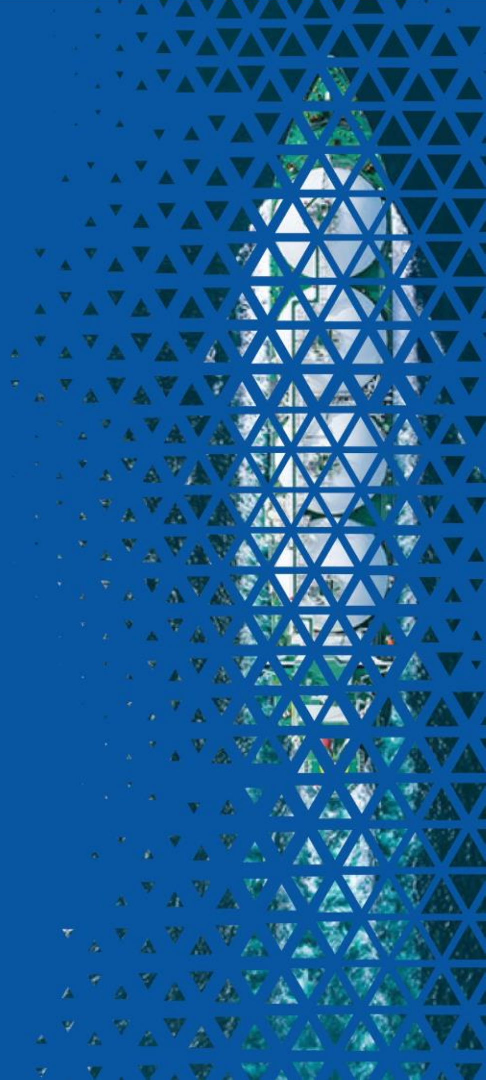




- Over the 2024–2050 outlook period, **cumulative required investment in the upstream sector** is estimated at **USD 10.4 trillion**, averaging approximately USD 385 billion per year
- By 2050, the globally required gas investments are shifting towards capital-intensive projects, especially in unconventional and deepwater gas fields
- The long-term supply cost curve is shifting upward, as the depletion of mature fields forces greater dependence on capital-intensive gas resources
- While North America and Asia Pacific will lead global upstream gas investments, Eurasia, the Middle East, Africa and Latin America, will play key roles

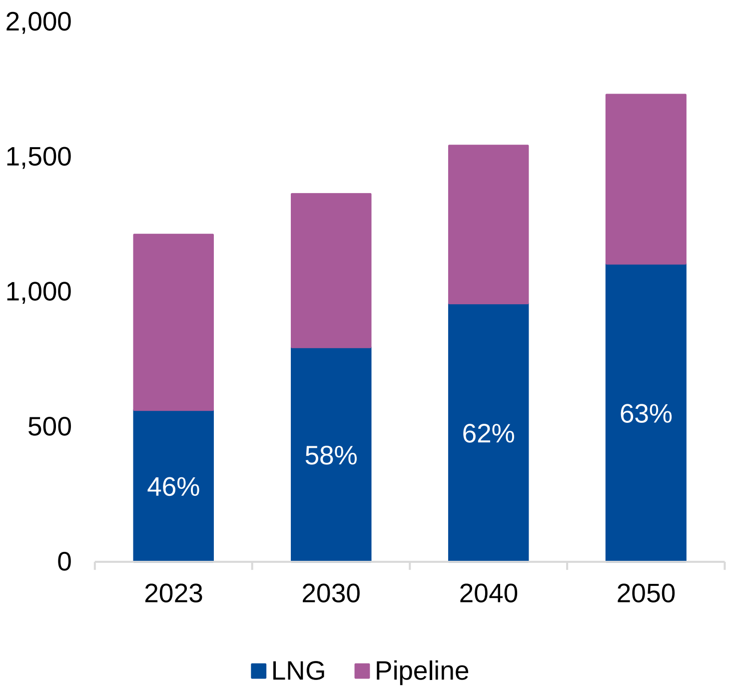
Source: GECF Secretariat based on GGM

Natural Gas Trade and Midstream Investment Outlook



LNG is set to dominate global natural gas trade, nearly doubling by 2050

Global natural gas trade outlook by flow type, 2023-2050 (bcm)



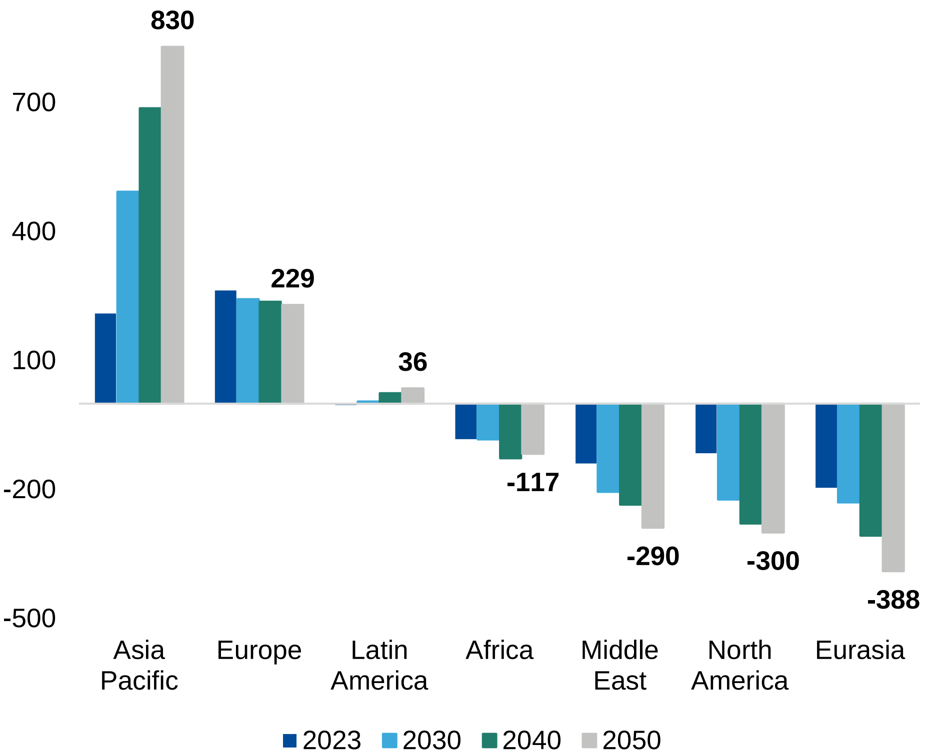
- **Global natural gas trade** to expand by 44%, reaching 1,743 bcm by 2050 or one-third of global gas demand
- **LNG** to dominate international trade, with volumes doubling to 800 Mt, making up 63% of traded gas by 2050
- **Pipeline** trade declines (2023-2030), but overall gas trade sees positive growth from 2030 onward
- Fastest **LNG growth** expected from 2023 to 2030, with trade expanding by 170 Mt
- **LNG exports** are projected to reach 577 Mt by 2030 and 695 Mt by 2040

Source: GECF Secretariat based on GGM

Rising Asia Pacific gas demand and falling output will be offset by expanding exports from North America, the Middle East, Eurasia, and Africa, reshaping global flows

- **Asia Pacific**'s LNG demand surge - net imports to rise 619 bcm by 2050, driving global LNG trade and increasing reliance on North America, the Middle East, Eurasia and Africa
- **Europe**'s declining gas imports – net imports to drop 36 bcm by 2050 due to ramping up decarbonisation
- **North America**'s net exports to hit 300 bcm by 2050 while the Middle East reaches 290 bcm, driven by LNG expansion in the United States, Qatar, UAE, and Oman
- **Eurasia**'s net exports to reach 388 bcm by 2050, driven by Russia's pivot to Asia, while Africa's exports peak in 2040 before declining to 117 bcm, as domestic demand rises for power, industry, and petrochemicals

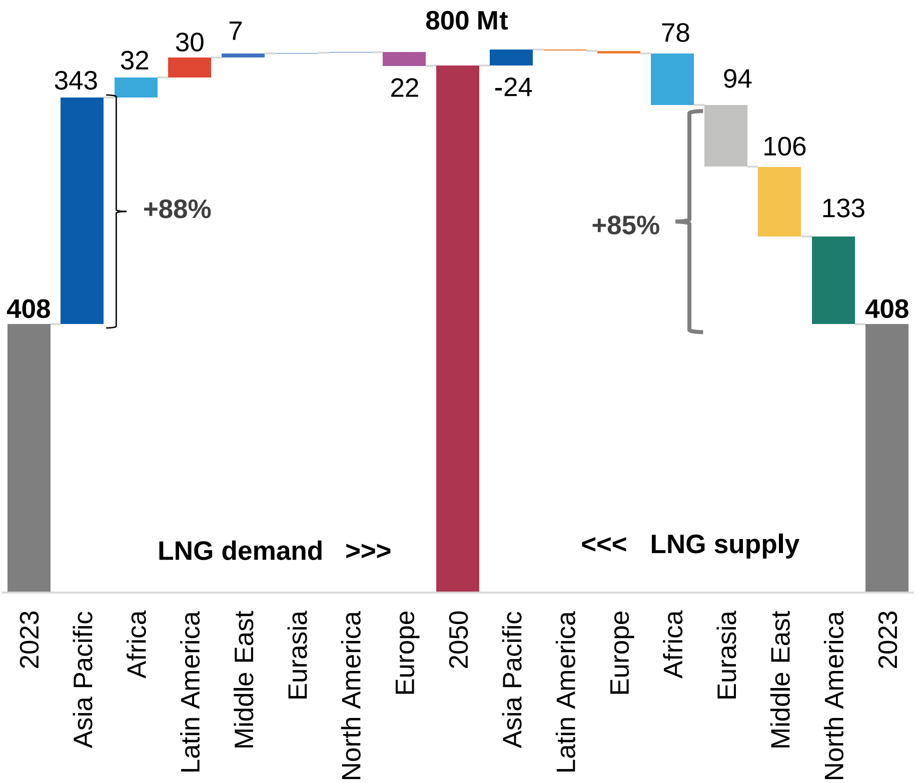
Natural gas balance (net imports) outlook by region, 2023-2050 (bcm)



Source: GECF Secretariat based on GGM

Asia Pacific demand drives LNG growth, supported by North American & Middle Eastern supply

Change in regional LNG balance, 2023-2050 (Mt LNG)



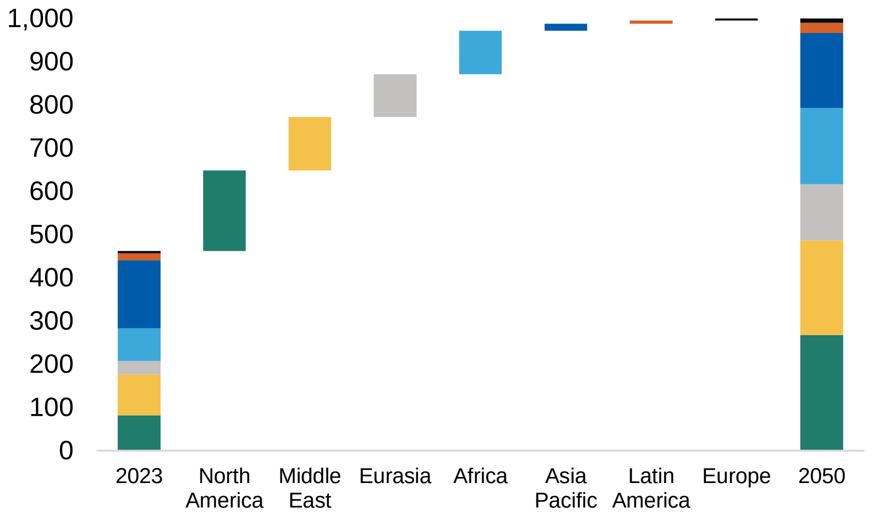
- The strongest **LNG demand growth** comes from Asia Pacific, adding almost 90% by 2050, followed by Africa and Latin America highlighting the region's reliance on LNG for energy security and economic expansion
- **Europe**'s LNG demand will decline by 22 bcm amid decarbonisation and energy transitions
- **North America** and **the Middle East** will together contribute over 60% of global LNG supply by 2050, with Qatar's expansion driving Middle Eastern growth
- **Eurasia**'s LNG exports will see significant growth as Russia shifts towards Asian markets, while Africa's supply will expand with key projects in Mozambique, Mauritania, and Senegal

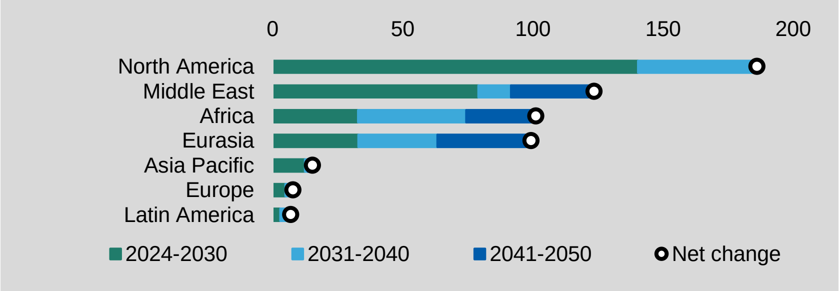
Source: GECF Secretariat based on GGM

North's America's LNG liquefaction boom and Asia's surging regasification are transforming the global LNG landscape

- **Global LNG liquefaction capacity** is projected to surpass **1,000 Mtpa**, exceeding the expected demand of 800 Mt, ensuring a well-supplied market with an 80% utilisation rate
- By 2050, the **Middle East** and **North America** will account for almost **50%** of total LNG liquefaction capacity, while Eurasian LNG capacity is anticipated to reach 130 Mtpa, and Africa is expected to add 100 Mtpa in LNG liquefaction capacity by mid-century
- **Global regasification capacity** could surpass **1,800 Mtpa** by 2050, with utilization projected to remain below 50%
- By 2050, **Asia Pacific** and **Europe** will collectively account for **84%** of total LNG regasification capacity

Global LNG liquefaction capacity outlook, 2023-2050 (Mtpa LNG)

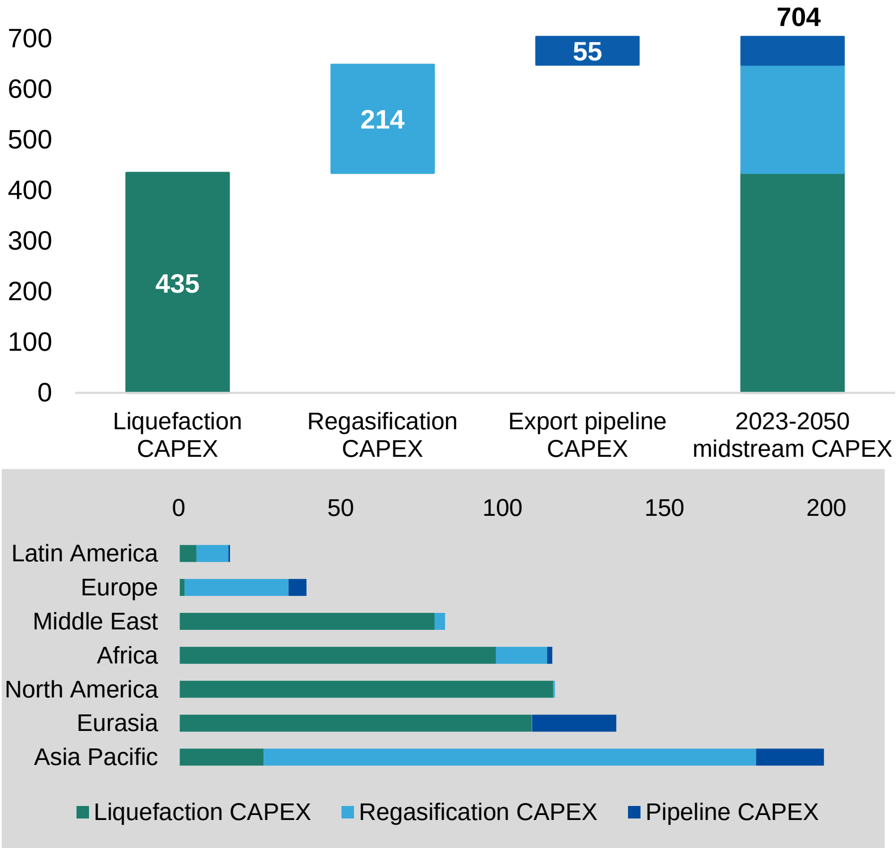




Source: GECF Secretariat based on GGM

Over USD 700 billion gas midstream investment required to fuel global gas trade by 2050

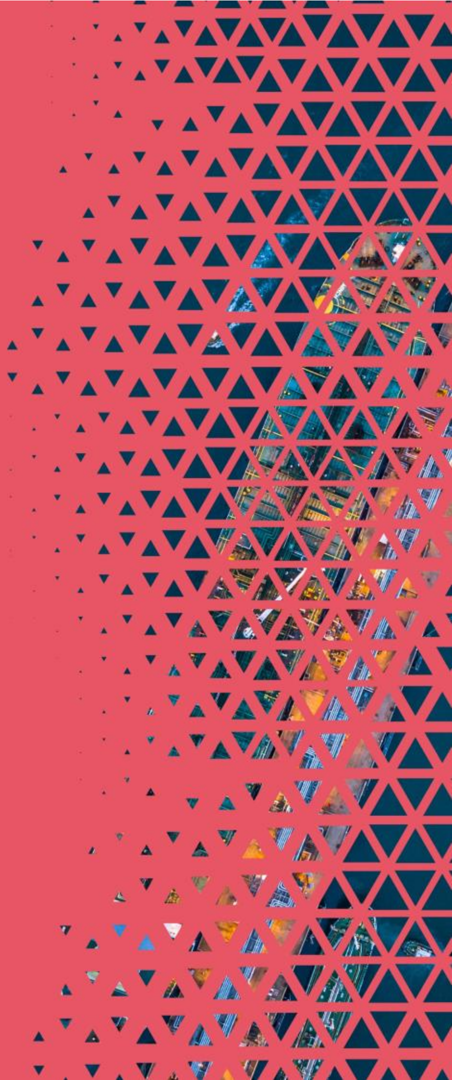
Global gas midstream Capex outlook, 2023-2050 (Real USD billion)



- Between 2023 and 2050, cumulative midstream gas investments needed to support global natural gas demand are expected to total **USD 704 billion**
- **Liquefaction will dominate midstream CAPEX**, making up over 60% of total investments, significantly surpassing regasification and export pipeline spending
- **Asia Pacific dominates regasification CAPEX**, driving 28% of midstream investment amid rising LNG demand
- **Cross-border pipeline** investments are the smallest midstream segment, driven by infrastructure expansion in Eurasia and developing Asia, particularly China

Source: GECF Secretariat based on GGM

Sustainable Energy Scenario



Sustainable Energy Scenario (SES) building blocks

Economic empowerment

- Achieving **universal economic empowerment** at the average national level by 2050, emphasising energy poverty eradication
- Average global **GDP growth rate of 2.9%** in the SES compared to 2.5% in the RCS
- Improved global **energy consumption per capita** equality

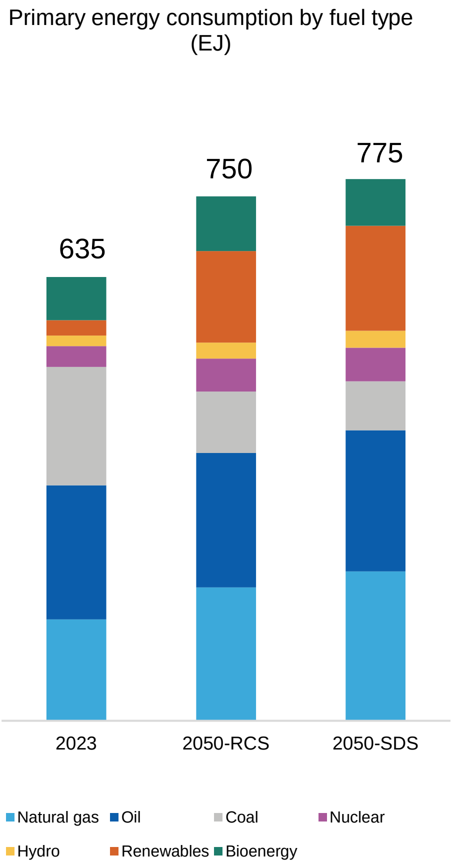
Substitution among energy sources within sectors

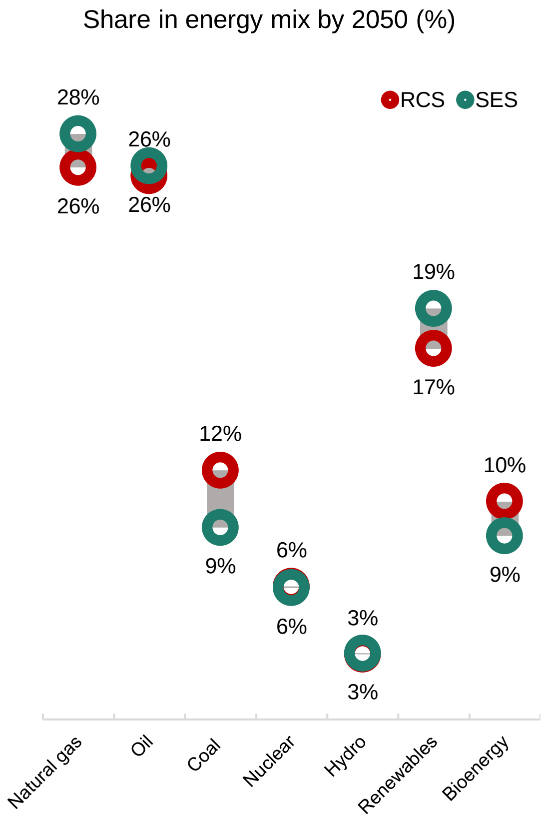
- **Residential sector:** Rapid decline in traditional biomass use in Sub-Saharan Africa along with upscaling adoption of dual-purpose heating pumps in advanced economies
- **Commercial sector:** Rapid expansion of data centers and AI-Application leading to increased demand for electricity generation
- **Transport sector:** Improved adoption of LNG-fueled trucks and vessels
- **Power sector:** Increased energy efficiency of CCGT power plants and inclusion of intermittency in the LCOE. Additionally, accelerated retirement of coal-fired power plants in OECD economies, India and China is assumed

Accelerated decarbonisation

- Accelerated **CCUS upscaling** in the industry, power and hydrogen sectors
- **Efficiency enhancement** in the industrial and power sectors
- **Accelerated coal-to-gas switching**

By 2050, primary energy consumption in the SES exceeds that of the RCS by 25 EJ, an amount outpacing Sub-Saharan Africa’s current total primary energy use

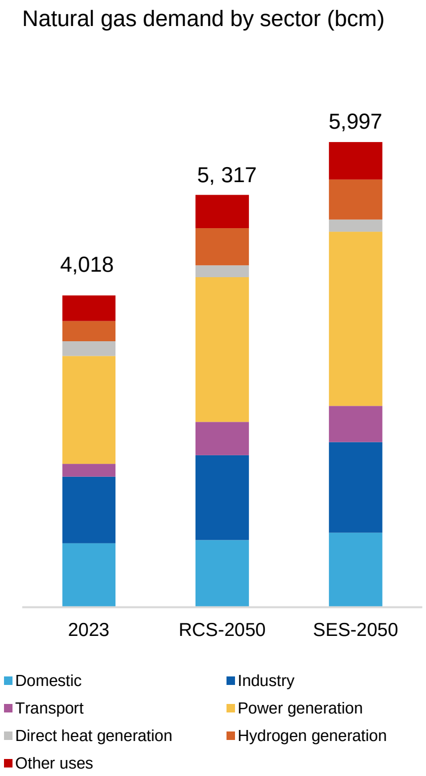


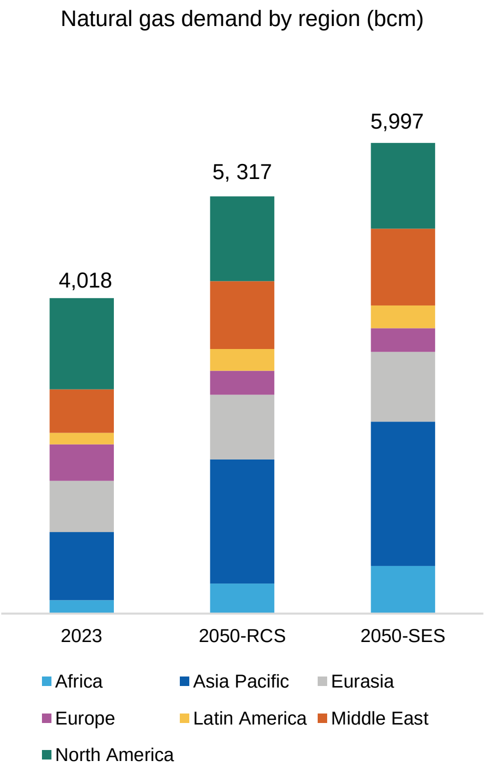


- **Global primary energy demand** in the SES will rise 22% by 2050, reaching 775 EJ, higher than the 18% growth in the RCS
- **Primary energy consumption per capita** in Africa reaches 34 GJ/person in the SES, around half of global average
- Between the two scenarios, **natural gas and renewables** see the largest increases in incremental primary energy consumption, while coal and traditional biomass use declines
- Contribution of **natural gas** in the global energy mix by 2050 increases to 28%, compared with 26% in the RCS

Source: GECF Secretariat based on GGM

Natural gas plays a dual role in the evolving global energy landscape under the SES

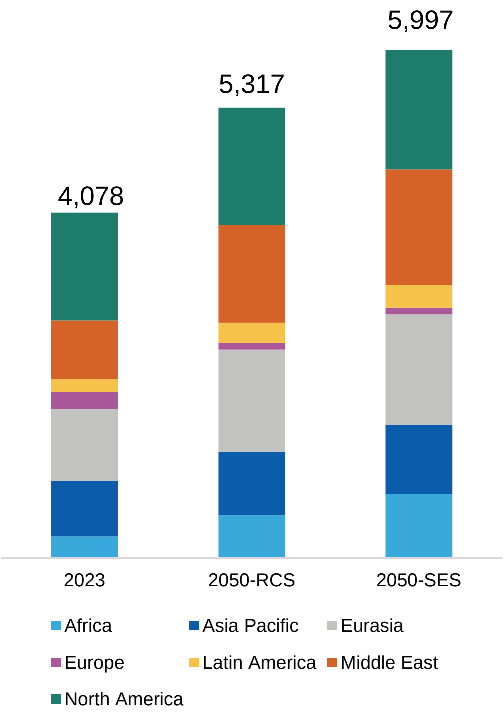




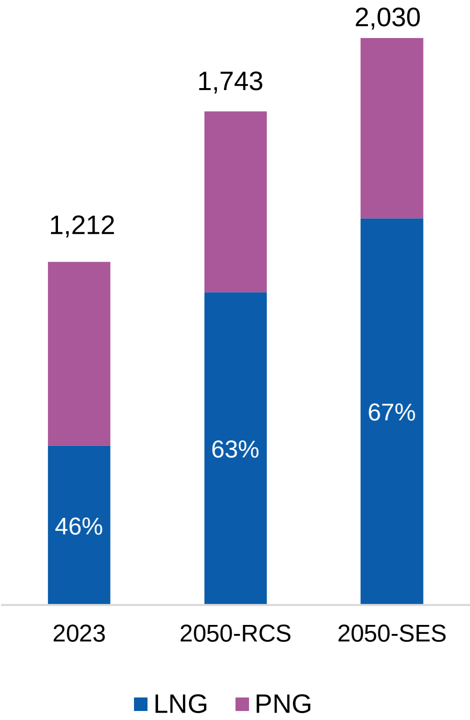
- By 2050, **natural gas demand** in the SES exceeds that of the RCS by 680 bcm, an increase roughly equal to **Eurasia**'s current total natural gas consumption
- Nearly one-third of this net growth is attributed to the **Asia Pacific** region, driven primarily by power generation
- **Africa** closely follows, accounting for one-quarter of the increase, with residential use as the main driver
- Meanwhile, in **North America and Europe**, natural gas demand under the SES either gradually declines or remains on a prolonged plateau by 2050

With abundant resources, strong infrastructure, and investment appeal, the Middle East and Africa dominate natural gas supply and trade under the SES, surpassing their role in the RCS

Natural gas supply by region (bcm)



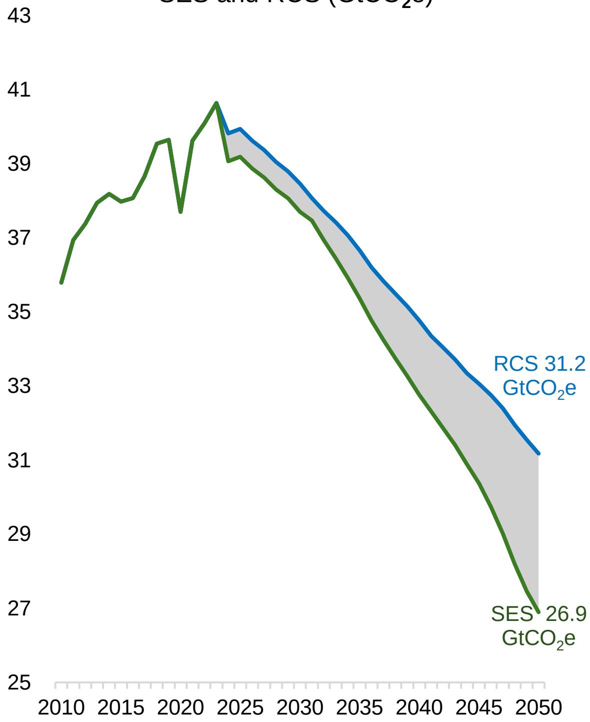
Natural gas trade by flow type (bcm)



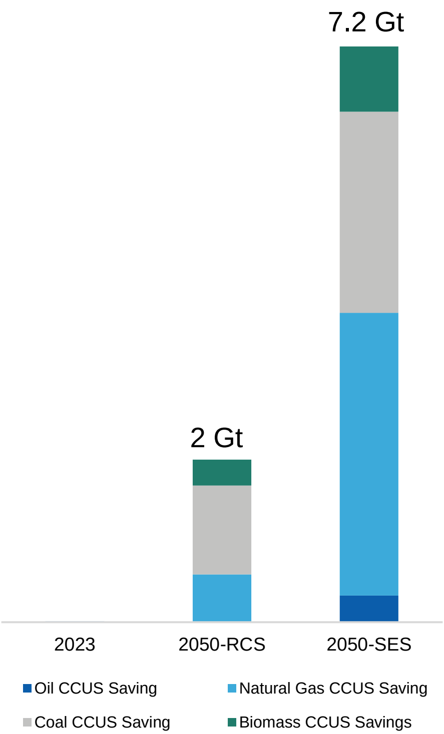
- **Africa** emerges as the largest contributor to increase in the natural gas supply in the SES compared to the RCS, accounting for nearly **40%** of total supply difference between the two scenarios.
- **LNG** drives 91% of global natural gas trade growth, surging by 582 Mt to reach 996 Mt by 2050. As a result, LNG's share in global trade rises to **67%** under the SES, up from 63% in the RCS
- **Asia Pacific** leads LNG import growth, while the Middle East and Africa drive the largest increase in LNG exports under the SES compared to the RCS by 2050
- The **cumulative capital investment required** for natural gas from 2024-2050 in the SES is projected to reach **USD 12.1 trillion**, exceeding the RCS by approximately USD 1 trillion

With emission reductions from NbS, carbon sinks, and DAC, the SES trajectory aligns with the Paris Agreement's 2°C target, with a 50% likelihood

Energy-related emissions outlook in SES and RCS ($GtCO_2e$)



CCUS savings outlook by fuel type in SES and RCS (GtCO2e)



- Despite a growing energy system in the SES, **energy-related emissions** drop from 40.6 $GtCO_2e$ in 2023 to 26.9 Gt CO_2e by 2050, a reduction equal to today's total emissions from transport and agriculture combined
- Under the SES, the **contribution of CCUS** to emissions reduction is expected to grow from 41 $MtCO_2e$ in 2023 to **7.2 $GtCO_2e$** by 2050
- By 2050, **natural gas-based CCUS** is projected to cut emissions by over **3.6 $GtCO_2e$** in the SES, 2.9 $GtCO_2e$ more than in the RCS
- **Asia Pacific** is expected to account for 63% of total CCUS savings by 2050, under the SES

Key Takeaways

Key takeaways

- Global primary **energy demand** is set to grow by **18%** between 2023 and 2050, with no peak expected.
- The structure of the global energy mix is becoming more diversified, with **natural gas** contribution making up more than a quarter **(26%) by 2050**.
- Global **natural gas demand** will rise steadily to about 5,317 bcm by 2050 – **32%** higher than the 2023 level. Second fastest growth after renewables.
- The center of gravity in global natural gas supply is shifting to **the Middle East, Eurasia and Africa, accounting for nearly 87%** of global natural gas production expansion by 2050.
- Global natural gas trade undergoes a transformation with the dominating role of **LNG trade**, expected to double to reach **800 Mt by 2050**.
- Cumulative natural gas **global investment** required in the period to 2050 is projected to amount **USD 11.1 trillion**, with the upstream accounting for USD 10.4 trillion and downstream for USD 0.7 trillion.
- **Natural gas**, combined with **decarbonisation technologies** such as **CCUS** offers a viable pathways for balanced energy transitions.

GECF

Gas Exporting Countries Forum

Thank you for your attention

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