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REPORT NOVEMBER 2020

GAS, CLIMATE, AND DEVELOPMENT

EXPLORING THE CASE FOR ENDING PUBLIC FINANCE FOR FOSSIL GAS

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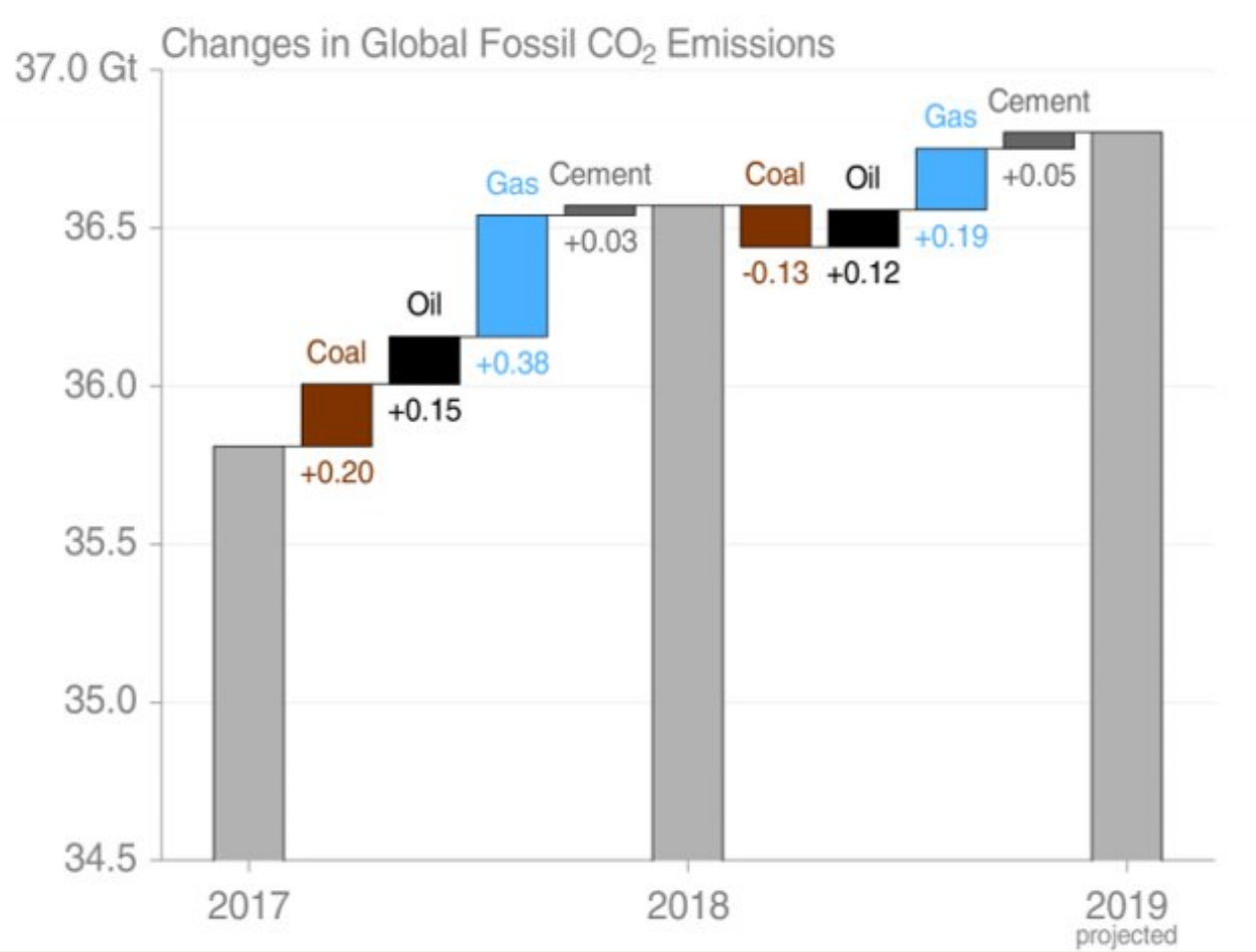
WHY TACKLE GAS NOW?

A SUMMARY OF THE ROLE OF GAS IN CLIMATE CHANGE

- Latest science and technological realities suggest that for many end uses **gas is no longer the "climate-optimal" solution.**
- Scenarios aligned with the Paris Agreement (1.5°C, no overshoot) largely require today's global gas demand to decrease, not increase, by 2030, implying a decrease in gas consumption in many developing country markets.
- According to the latest studies, as of 2019, **gas is the leading contributor to global fossil emissions increases** – whilst coal emissions are declining.
- Most **conventional climate change assessments of gas projects fail to account for the emissions in the supply chain**, e.g. methane leakage, which at certain rates can make gas as bad for the climate as coal.
- **Gas can actively hamper the transition to a climate-neutral energy system**, by displacing or crowding out renewable heat and electricity deployment.
- **Key climate-vulnerable developing countries have explicitly signalled their volition to phase out fossil fuels** toward renewable energy as part of their development

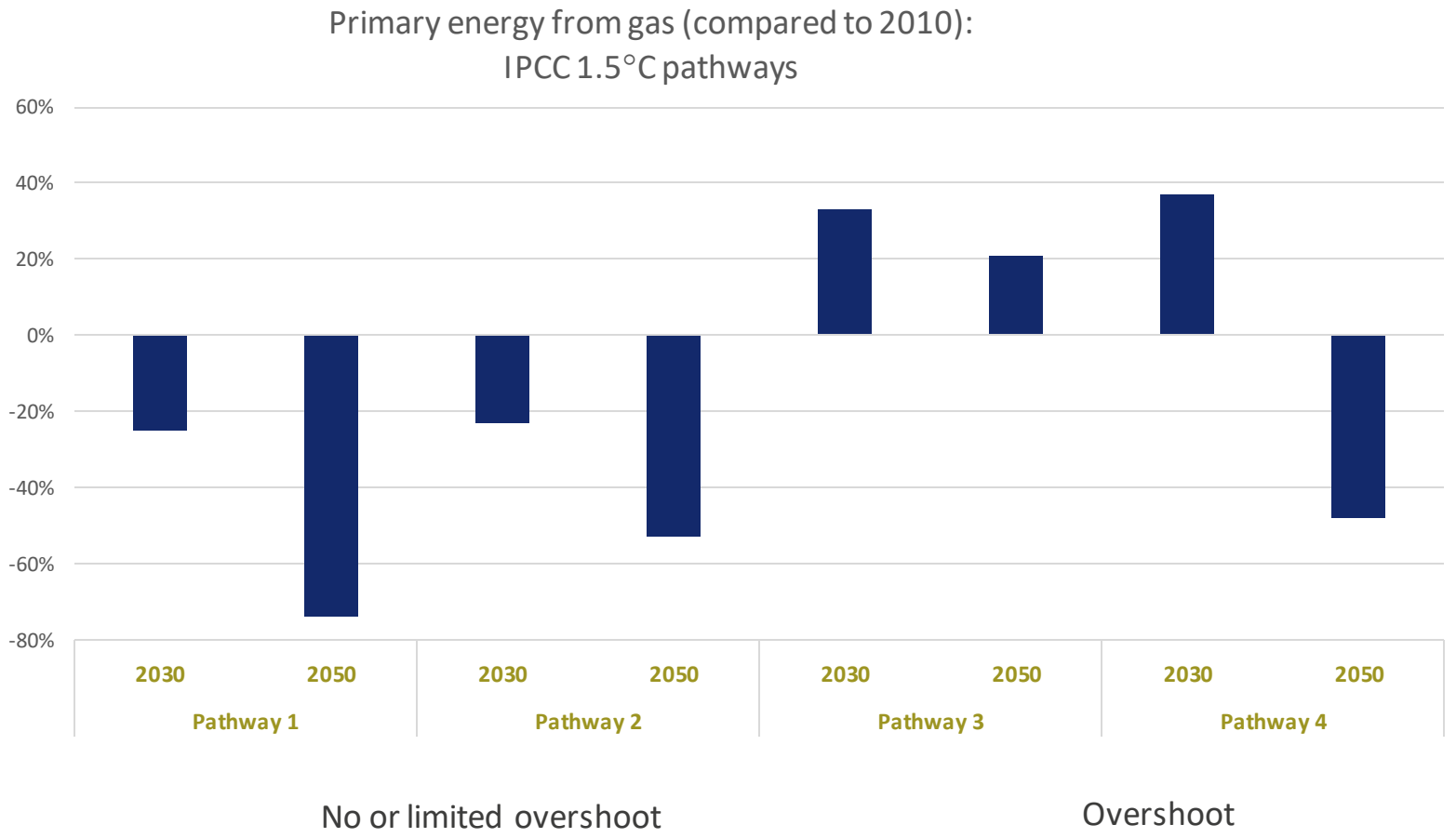
FOSSIL GAS HAS BECOME THE LARGEST SOURCE OF INCREASE IN GLOBAL FOSSIL CO_2 EMISSIONS



Source: *Global Carbon Project 2019*

ALL 1.5°C COMPATIBLE PATHWAYS REQUIRE A STEEP REDUCTION

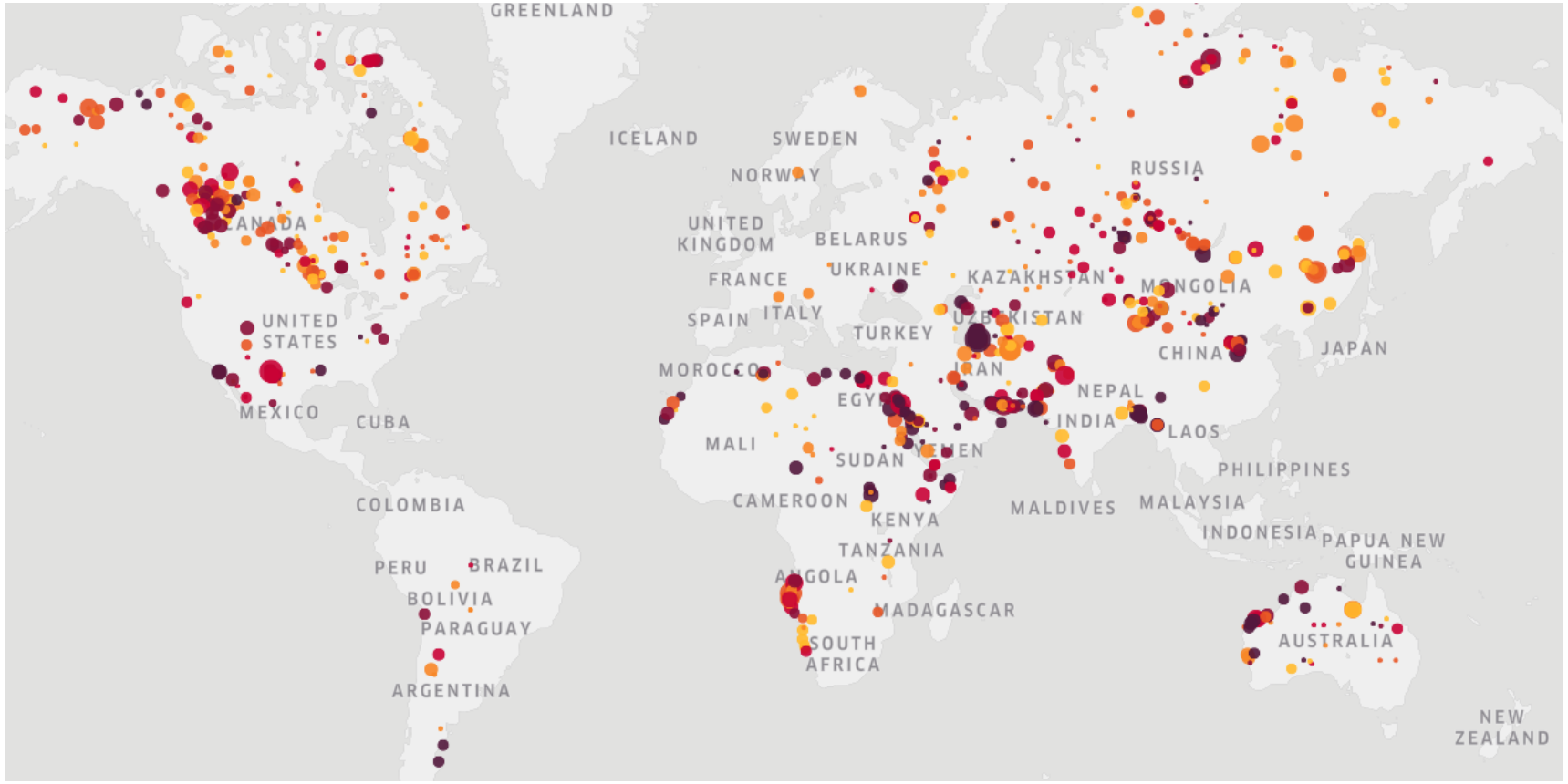
Change in primary energy consumption from fossil gas



Source: *E3G based on IPCC 1.5 report figures*

METHANE EMISSIONS OF GAS ARE SIGNIFICANT BUT OFTEN UNACCOUNTED FOR

- Out of 100 methane leakage hot spots worldwide, **50 are associated with oil and gas production.**
- MDB & DFI **carbon foot printing and shadow carbon pricing methodology often neglects these upstream ("scope 3") emissions** and uses conservative assumptions around the global warming potential of fossil gas.



Source: *European Space Agency, 2020*

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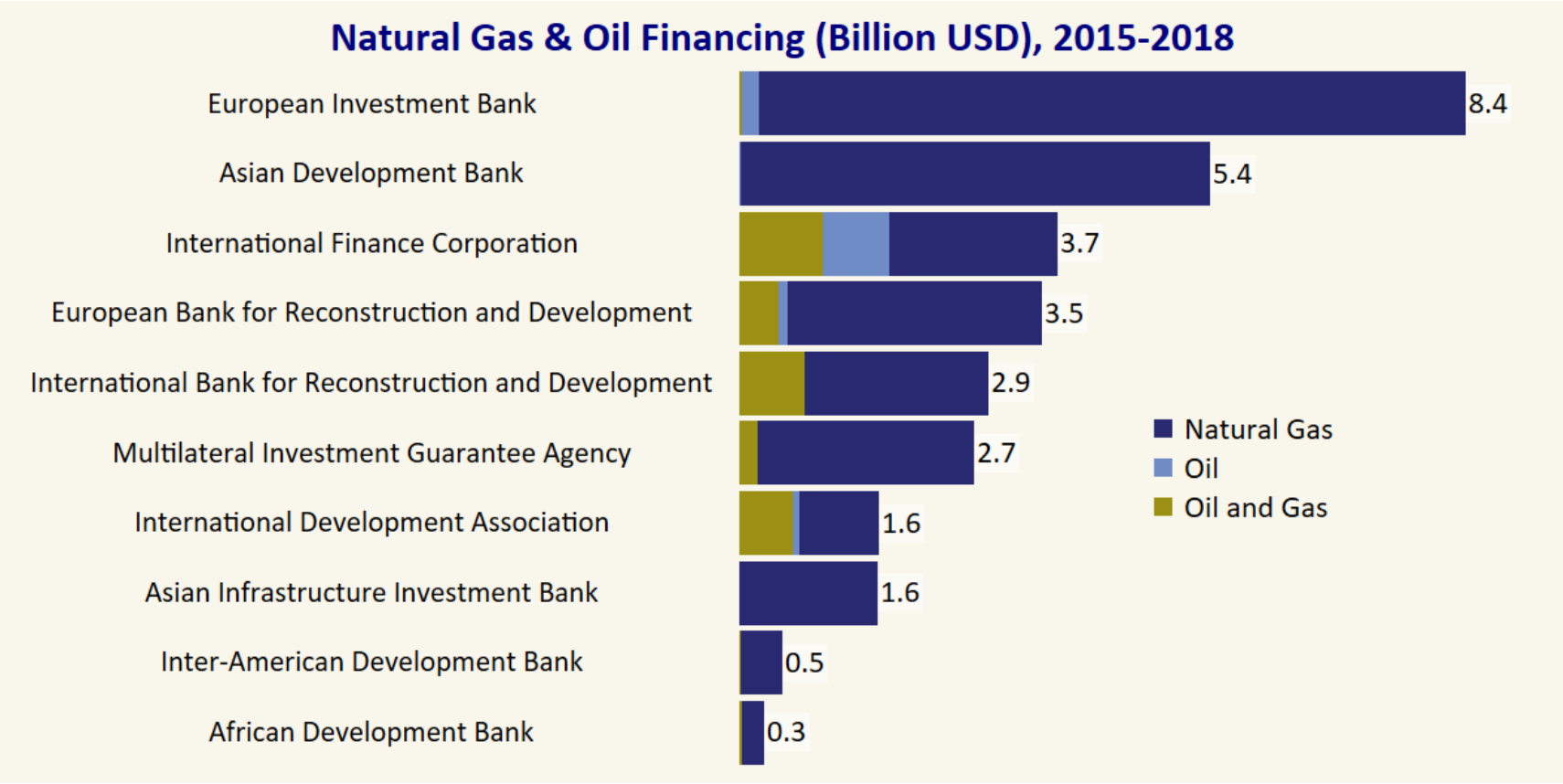
THE ROLE OF PUBLIC FINANCE INSTITUTIONS (PFIS) IN FINANCING GAS

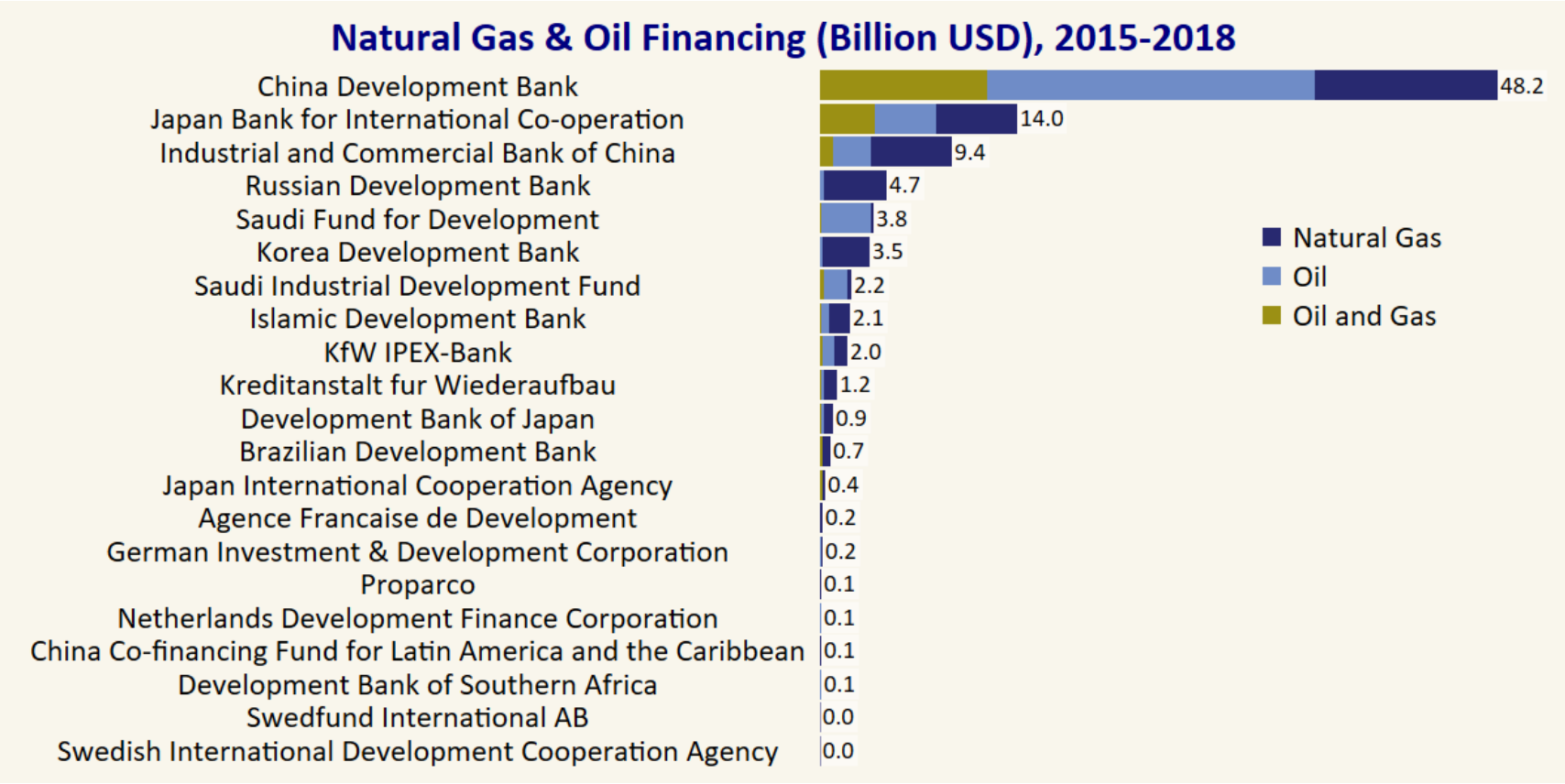
MDBS ARE SIGNIFICANTLY EXPOSED TO GAS



- The main 7 MDBs spent 31% of their energy lending on natural gas and oil between 2015 and 2018, equalling $31 billion.
- Of this, 97% went to projects involving gas.
- Some MDBs, however, are changing their approach to gas, with the EIB announcing its intention to stop financing almost all unabated gas from 2021.

Source: *E3G based on data compiled by Oil Change International*

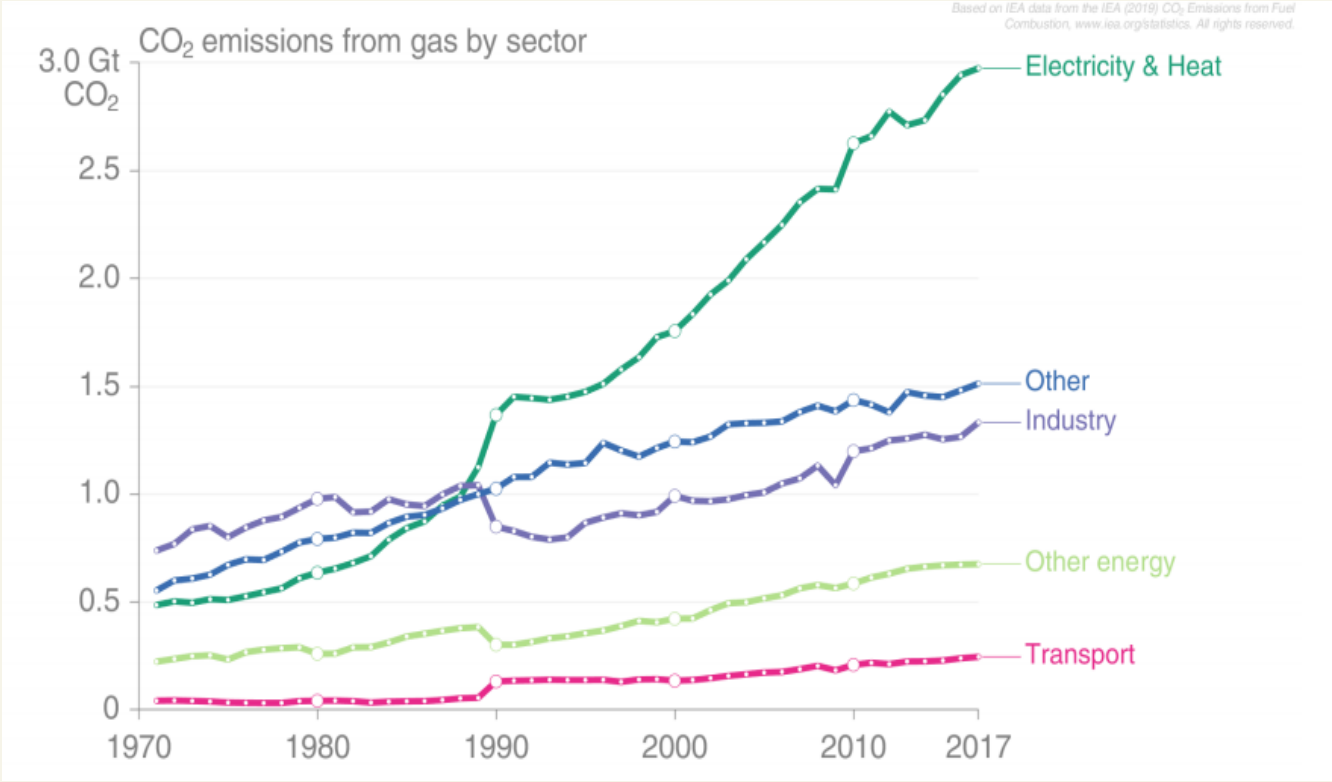
...AS ARE NATIONAL AND BILATERAL DFIS



- **East Asia** and **the Gulf** are the largest sources of gas development finance.
- **China Development Bank** is by far the largest financer of gas.

Source: *E3G based on data compiled by Oil Change International*

THE GAS TRANSITION IS MUCH MORE COMPLEX THAN THAT OF COAL...



- Gas is used and causing emissions **across all major energy consuming sectors.**
- The **alternative solutions in each sector are of different maturity** and range from near "like for like" replacement to need for systemic and regulatory change. (Slides 16 and 17 look at these alternatives)

Source: *E3G based on data compiled by Oil Change International*

THERE ARE POLITICAL AND INSTITUTIONAL REASONS FOR GAS FINANCING AT PUBLIC FINANCE INSTITUTIONS

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INSTITUTIONAL SET UP

- Investment targets for loan officers/teams incentivise big transactions which are more likely to be fossil fuel projects.
- Institutionalised “natural resources departments” continue to source and develop fossil fuel projects.
- Without formal gas exclusions, the “demand led” project pipeline of public finance institutions means better alternatives are rarely considered, as long as gas can show some GHG savings compared to business-as-usual.

COUNTRY POLITICS

- As countries phase out of coal, they perceive gas as the only alternative for dispatchable power.
- Reference to right to exploit own natural (fossil) resources and perceived associated development benefits; this association is less pronounced for renewable resources.
- Traditionally, renewable energy sources are not “institutionalised”. Therefore, limited royalties from renewable energy projects.
- Fossil fuel projects tend to be more centralised and thus enable decision makers to retain influence.
- NDCs reflect low ambition pathways and do not (yet) align with 1.5°C .

A SUMMARY OF TECHNICAL ISSUES: THE REASONS FOR SUPPORT FOR GAS AND CONSIDERATIONS BASED ON RECENT EVIDENCE

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There is a hope for quick wins, e.g. coal-to-gas

Climate goals require the energy sector to be decarbonised by mid-century. This means that both coal *and* gas must be phased out. Replacing coal plants with new gas plants will not cut emissions by nearly enough, even if methane leakage is kept to a minimum.

Gas is essential for grid reliability

Wind and solar require balancing, but gas is neither the only, nor the best, resource available for doing so. The economic case for building new coal and gas capacity is crumbling, as batteries start to encroach on the flexibility and peaking revenues enjoyed by fossil fuel plants.

Wind and solar plants that are coupled with battery storage are becoming a competitive "dispatchable" source of energy and can be operated in ways to provide grid services. The main remaining challenge is that of seasonal balancing.

The lock-in risk underestimated

Gas infrastructure built today is designed to operate and produce revenue for several decades. As alternatives (e.g. renewable energy) become cheaper this will limit countries' ability to take advantage of these developments. Hydrogen is not a silver bullet to avoid asset stranding.

A SUMMARY OF TECHNICAL ISSUES: THE REASONS FOR SUPPORT FOR GAS AND CONSIDERATIONS BASED ON RECENT EVIDENCE CONTINUED

Fossil gas is cheaper than renewables

The dramatic and ongoing cost declines for wind and solar disrupt the business model for gas in the power sector. While cost has been a constraint in the past, today, wind and solar are the cheapest forms of bulk energy supply in most major markets. Which means renewables can help support the development of developing countries. PFIs instead have an important role to play in bringing down cost of capital and risk mitigation around wind and solar in emerging markets

The environmental impact of gas is underestimated

There is no room for new fossil fuel development – gas included – within the Paris Agreement goals. Achieving the Paris goals will require governments to proactively manage the decline of all fossil fuels together. But stopping new projects alone will not be enough to keep warming well within 1.5°C target. Governments must also phase out a significant number of existing projects ahead of schedule.

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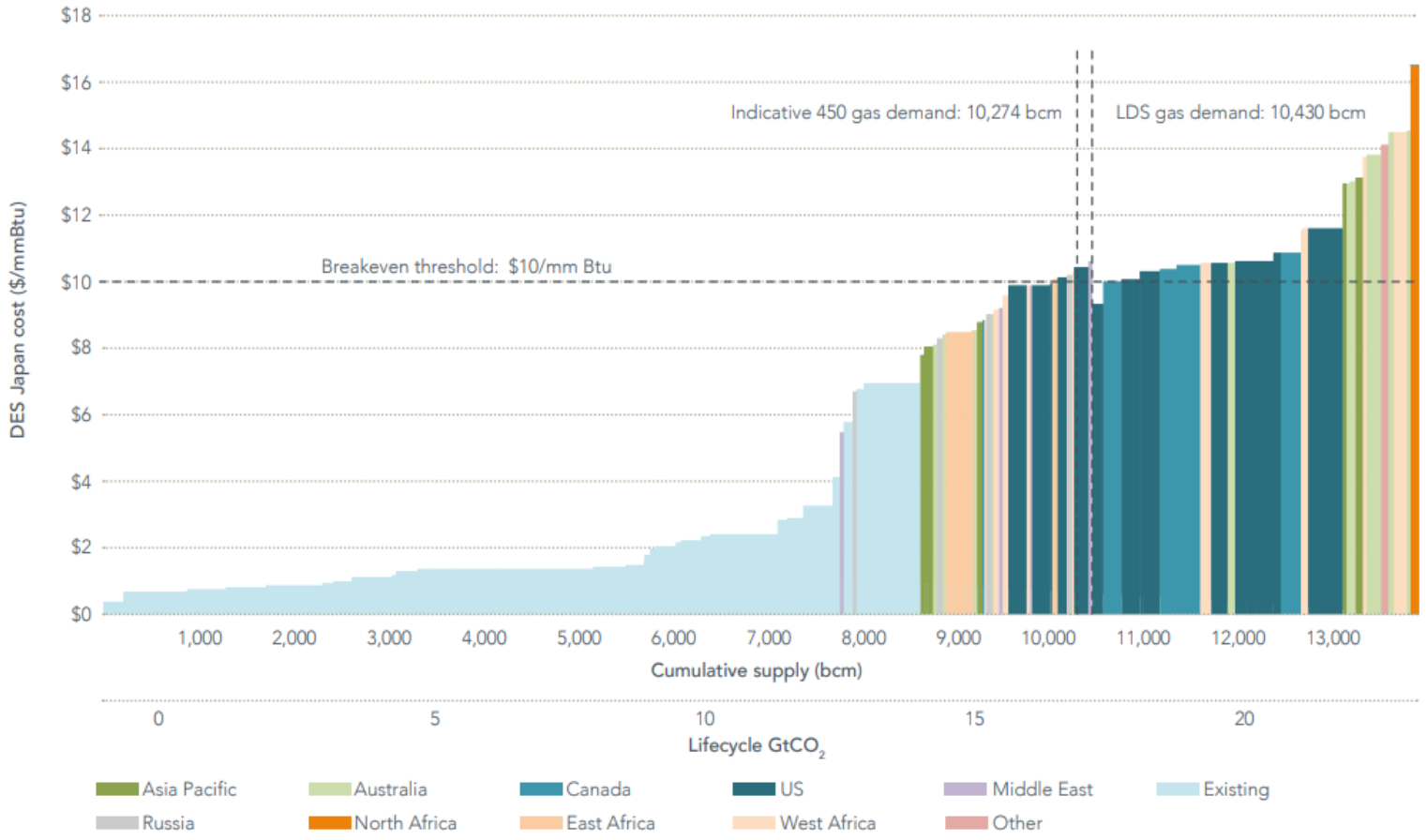
MAPPING THE COMPLEXITY AND OPTIONS IN THE GAS TRANSITION

A. SUPPLY CHAIN ANALYSIS
B. GAS INVESTMENTS FACE FINANCIAL RISKS
C. THE ROLE OF GAS IN DEVELOPMENT
D. SUMMARY OF CROSS-CUTTING ISSUES

A. SUPPLY CHAIN ANALYSIS
UPSTREAM

- If the world acts successfully on climate change, demand for fossil gas will decrease. The EU, still the world's largest gas consumer, will reduce gas consumption to near-zero. **Only the most cost-competitive exporters will be able to continue to supply,** most of this is existing supply**.**
- IEA WEO scenarios estimate higher fossil fuel demand until 2050, due to optimistic assumptions on negative emissions technologies. Where these are the basis for (fossil) export-led growth strategies, **development and stranded asset risks may be underestimated**.



Source: *Carbon Tracker, Global LNG cost supply cost curve, 2015–2035*

SUPPLY CHAIN ANALYSIS: **MIDSTREAM**

- Midstream gas infrastructure has lifetimes of up to 60 years. Where demand is eroded by increasing electrification and efficiency, **utilisation rates may decline, and a stranded asset risk arises.**
- In many countries, midstream infrastructure is part of the regulated asset base and thus enjoys a "guaranteed return". This means borrowing costs on capital markets are low and the use of **concessional finance in this case does not necessarily make a difference for whether the project comes forward.** It could make a difference for consumer bills, but this may be achieved through other measures (e.g. building renovation) altogether.
- Often, the rollout of demand-side measures (energy efficiency, reducing cooling needs) or better market integration could provide a less risky and more cost-effective pathway to achieving system stability. This has been modelled in the EU context. **Testing against alternatives is however not what most MDBs, which consider themselves "project takers", do.**

SUPPLY CHAIN ANALYSIS: **DOWNSTREAM**

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	POWER, INC FOR DESALINATION	HEATING, COOLING AND COOKING	PASSENGER TRANSPORT	HEAT, FEEDSTOCK	SHIPPING AND AVIATION
THE ALTERNATIVES TO GAS	Costs of renewables and batteries for dispatchable power are falling, challenge is grids & regulation. High maturity.	Heat networks, heat pumps, energy efficiency, electric cooking, and are mature.	Electric vehicles are increasingly cost-competitive and are mature.	Emerging technologies: Hydrogen for high temperature heat, and solar for fertilizers, are growing in maturity	A wide range of alternative fuels for ships are being tested, but limited maturity.
					
HIGHEST VALUE ADD FOR PUBLIC FINANCIAL INSTITUTIONS	Scaling renewables, invest in enabling system stability (grids, local storage, and interconnectors).	Electrification of heat and renewables powered cookstoves, heating and cooling efficiency.	Enabling infrastructure & fleet electrification, particularly in urban areas (private/public). "Avoid, modal shift and improve".	Deploy best available technology where available, demand reduction and support to R&D.	Supply chain efficiency, battery systems, fuel cell systems and sail. "Avoid, shift and improve".

HYDROGEN AND BIOMETHANE: NOT A SILVER BULLET

Costs of renewables and fossil-based hydrogen are above those of gas.

Cost reduction potentials are large for renewables-based hydrogen (H_2), with the rate of deployment of low-cost renewables as a key factor.

As hydrogen is expected to be more expensive than gas, demand for hydrogen may thus be lower than for gas unless subsidised, the latter may put pressure on public budgets.

Fossil gas infrastructure (up-, mid- and downstream) needs to be adapted for hydrogen use.

In Europe, only around 10-15% of H_2 can be blended safely into most parts of the existing system. Geographically, existing gas networks do not always connect to supplies of renewables-based hydrogen.

Liquefying hydrogen for export reduces the energy content by around 30% and requires significant adaptation of LNG infrastructure.

Global availability of sustainably sourced biomass and renewable hydrogen is limited.

Availability of renewables-based hydrogen is a direct function of deployment of renewables.

In addition, impacts on water use need to be managed to avoid exacerbating freshwater scarcity. Estimates suggest that 1kg of H_2 will use at least 16l of fresh water. This means they are premium products that should be focused in hard-to-electrify sectors.

HYDROGEN AND BIOMETHANE: NOT A SILVER BULLET CONTINUED

Biomass may be most valuable for non-energy sectors for replacing fossil fuels in materials production (plastics).

"Blue hydrogen", made from fossil gas in combination with carbon capture and storage, may be a temporary solution but is not fully net-zero compatible. This is because of methane emissions.

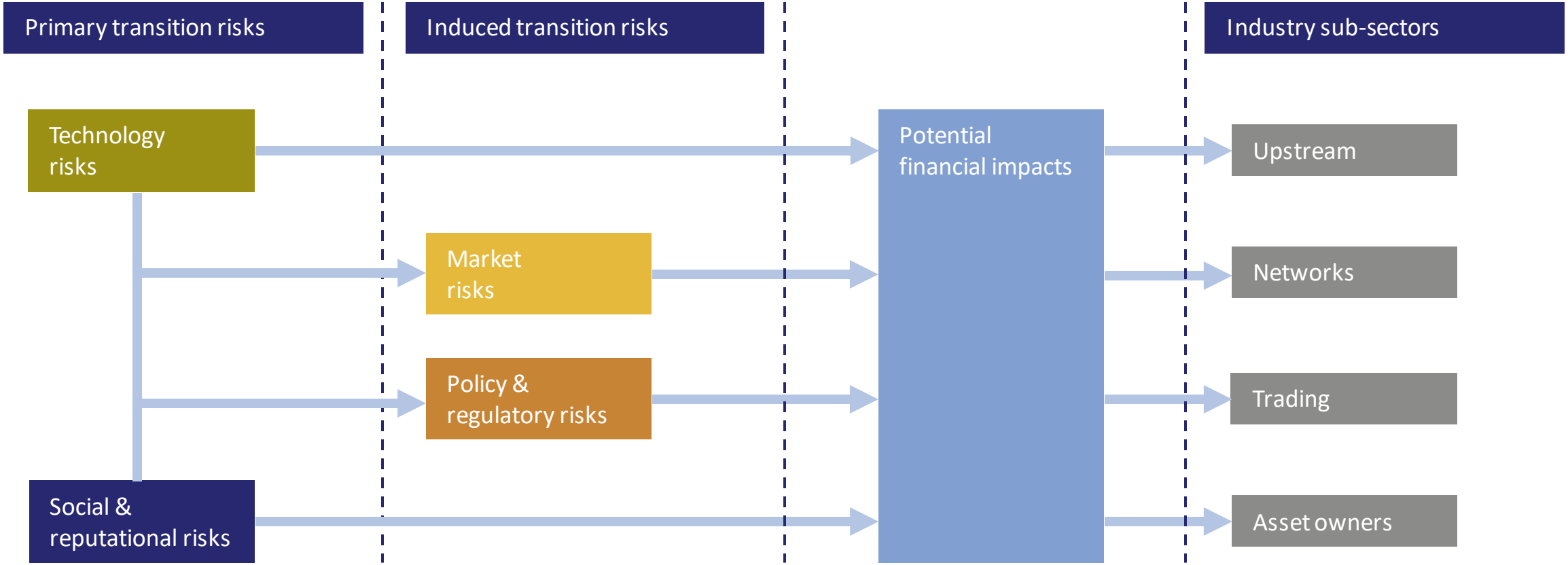
In addition, costs, availability and permanence of CO_2 capture are very uncertain.
It is thus hard to evaluate whether deploying blue hydrogen only for temporary use is worth the investment.

Should a globally traded hydrogen market emerge, and fossil producers switch from exporting gas to exporting hydrogen, they will continue to suffer from similar public revenue swings.

These will be due to price volatility and domestic inflation caused by foreign currency influx.

B. GAS INVESTMENTS FACE FINANCIAL RISKS

RISKS VARY ACROSS SUPPLY CHAIN AND GEOGRAPHY

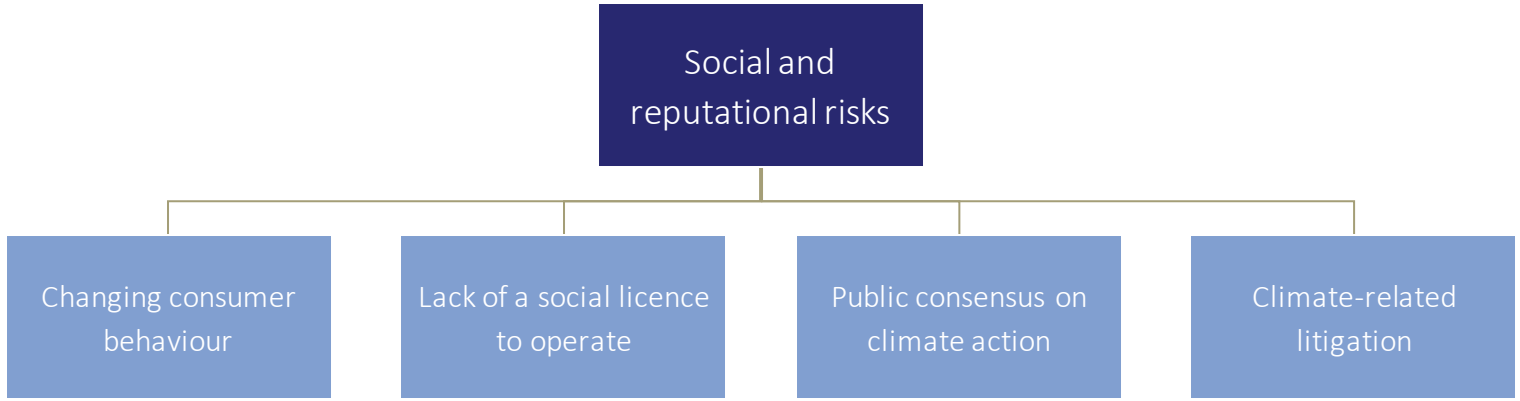


Source: *Pathway to a Climate Neutral 2050: Financial Risks for Gas Investments in Europe (E3G, 2020)*

SOCIAL AND REPUTATIONAL RISKS

CASE STUDY EXAMPLES

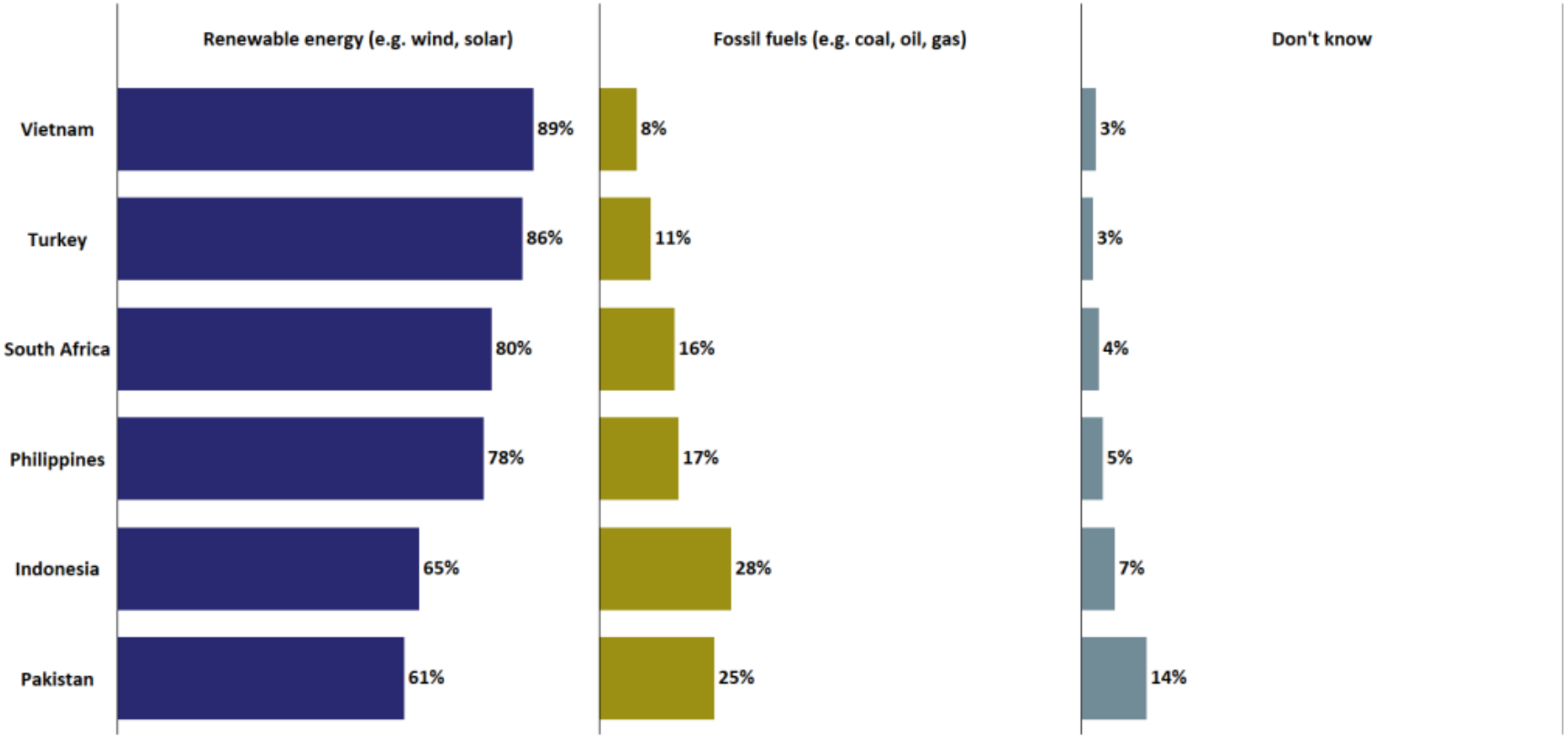
- Social movements pressing for more climate action **reached a new level in 2019**, with strikes and protests across European cities – most notably in London where there were widespread demonstrations and direct action by Extinction Rebellion.
- **Over 40,000 people** signed a petition in 2019 for the European Investment Bank to **stop funding fossil fuel infrastructure.**
- South Africa's **Just Transition Transaction plan** will likely be a US$11 billion package which, in part, shall support workers who will be **left stranded as coal mining and power generation are phase out.**



Source: *Pathway to a Climate Neutral 2050: Financial Risks for Gas Investments in Europe (E3G, 2020)*

CITIZENS' VIEWS IN DEVELOPING COUNTRIES: RENEWABLE VS FOSSIL ENERGY

If you had to choose, which one, if either, of the following do you think it is better to invest in today for long-term development of [COUNTRY]?

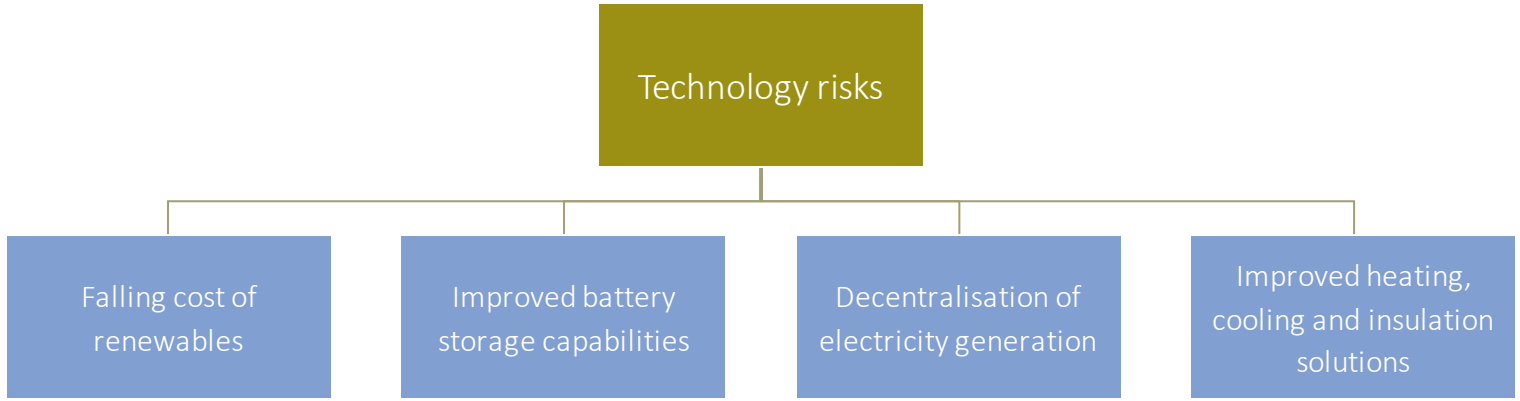


Source: YouGov polling for E3G, April 2019

TECHNOLOGY RISKS

CASE STUDY EXAMPLES

- Steep falls in production costs mean lithium-ion batteries for some **Electric vehicles could reach price-parity with conventional engines in 2024**. This is significant for emission-free vehicles (rather than using gas), as well as deployment of better battery storage for decentralised solar generation.
- **45%** of projected gas demand growth in the Middle East is driven by desalination, which conventionally is coupled with thermal cogeneration. Increasing introduction of the electricity based "reverse osmosis" process could substantially reduce this growth profile.



Source: *Pathway to a Climate Neutral 2050: Financial Risks for Gas Investments in Europe (E3G, 2020)*

POLICY AND REGULATORY RISKS

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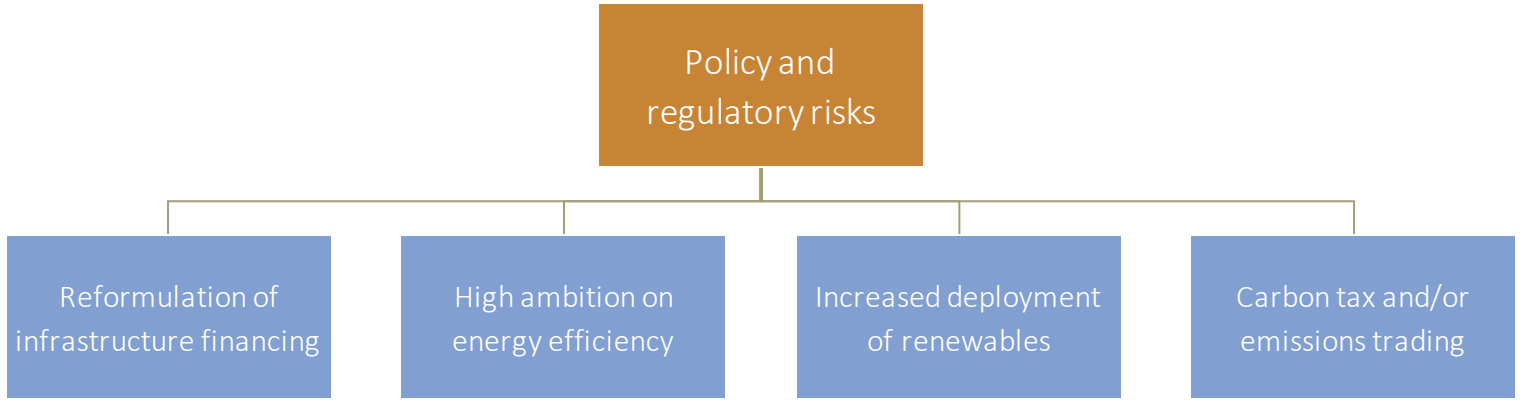
CASE STUDY EXAMPLES

- Energy regulators in France and Spain refused permission for the construction of the Midi-Catalonia cross-border gas pipeline because it was **deemed unnecessary and too expensive.** Analysis showed the pipeline would deliver **little economic value to either country.**
- **The European Union is considering a Carbon Border Adjustment Mechanism as part of its Green Deal, which would see carbon/ emissions intensive products being taxed or having to meet emissions standards.** The EU is one of the most significant importers of gas worldwide.



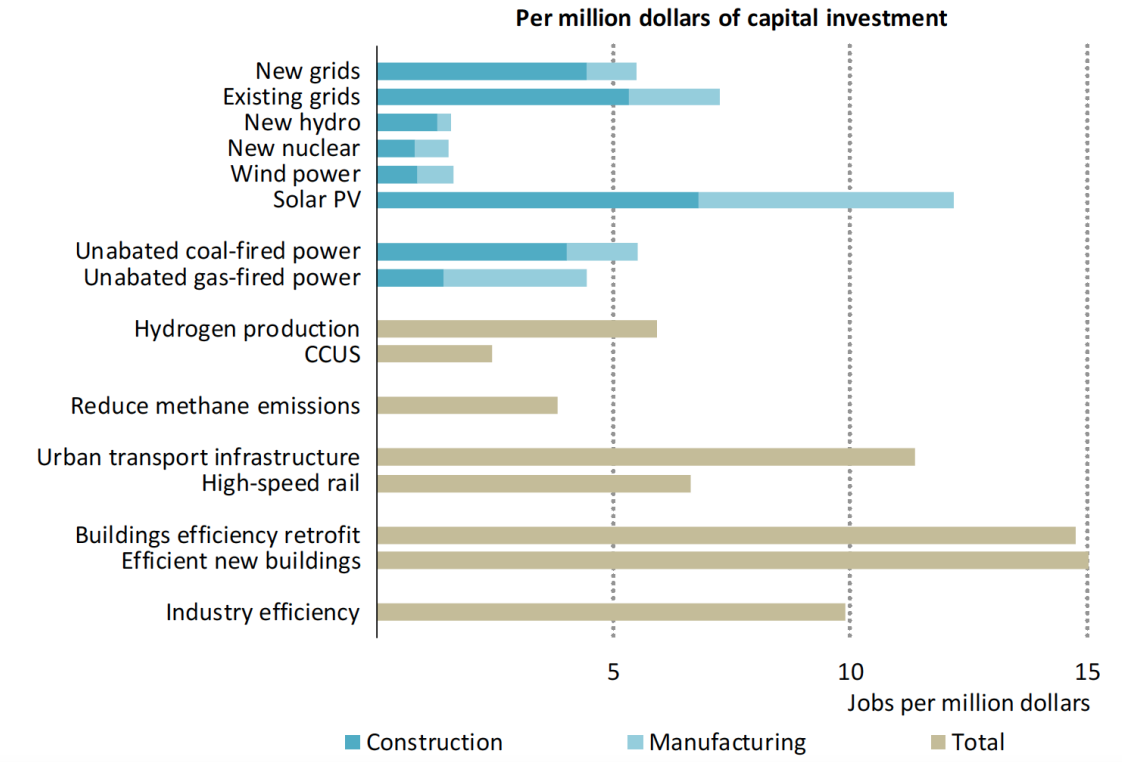
- Rising cooling needs fuel the buildout of thermal generation. **Refrigerant conversions driven by the Montreal Protocol have already catalysed significant improvements in the energy efficiency of up to 60%** in some subsectors, eroding electricity demand growth.

Source: *Pathway to a Climate Neutral 2050: Financial Risks for Gas Investments in Europe (E3G, 2020)*

C. THE ROLE OF GAS IN DEVELOPMENT

- Price declines in renewables have transformed energy options in the past decade. Energy costs are set to shift again in the coming decade, **creating wide-reaching financial risks for gas investments – upstream, midstream, and downstream.**
- **From a development perspective, this may lead to negative impacts from fossil-based power generation assets becoming stranded before end-of-life**, with potential ramifications for government revenue, local employment, taxpayers and utility ratepayers.
- **IEA estimates show that the job potential in clean industries such as solar, energy efficiency and urban transport infrastructure outstrips that of conventional power generation**. PFIs can support local development by choosing high job potential interventions and combining them with adequate skills and training programmes in country.

Construction and manufacturing jobs created per million dollars of capital investment and spending by measure **Source:** *IEA, 2020*



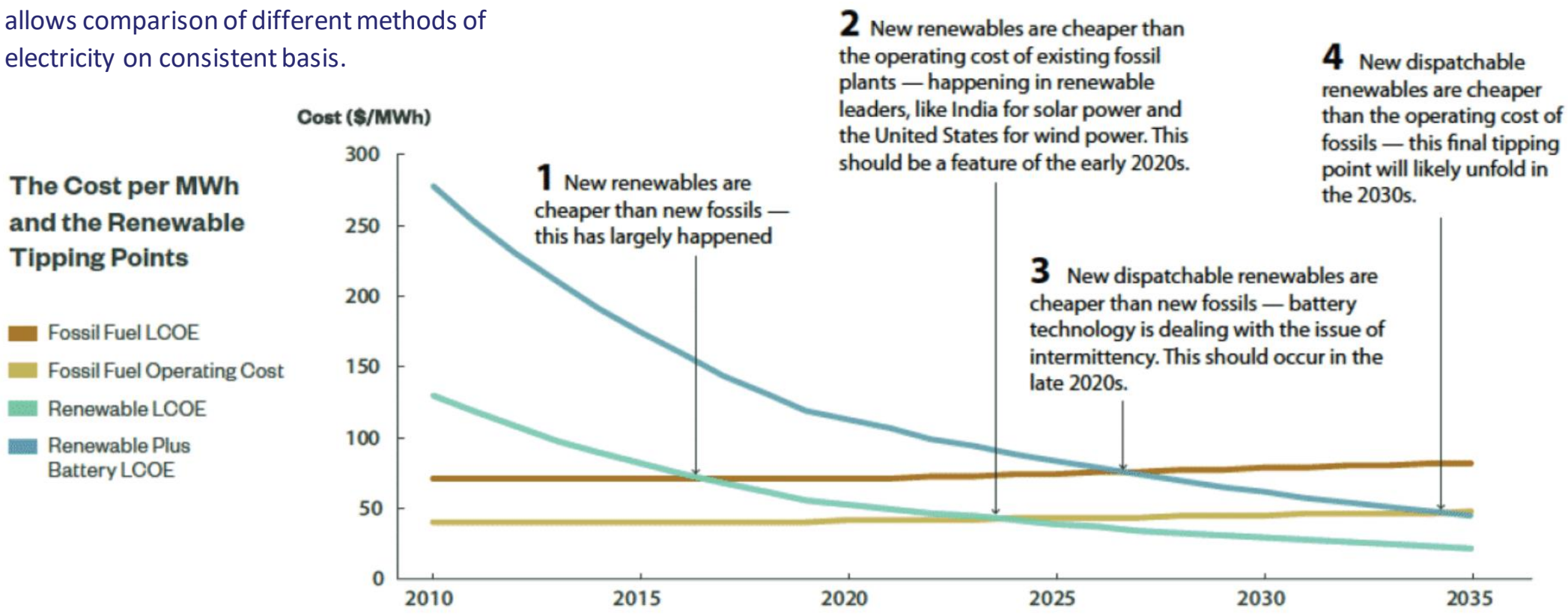
C. THE ROLE OF GAS IN DEVELOPMENT CONTINUED

- While health concerns related to cooking, e.g. with wood stoves, need to be addressed urgently, **the health impacts of gas in cooking are only being fully understood and suggest that gas may have more negative impacts than previously thought.**

- For **fossil fuel-exporting countries**, low demand of fuel sources, in combination with policy pressure to reduce GHG emissions, would **increase the urgency to diversify exports away from fossil fuels toward cleaner energy forms.**
- For **mineral-rich developing countries**, the abatement of emissions from this sector could contribute significantly to overall emissions reductions.

THE 4 TIPPING POINTS FOR RENEWABLE ENERGY

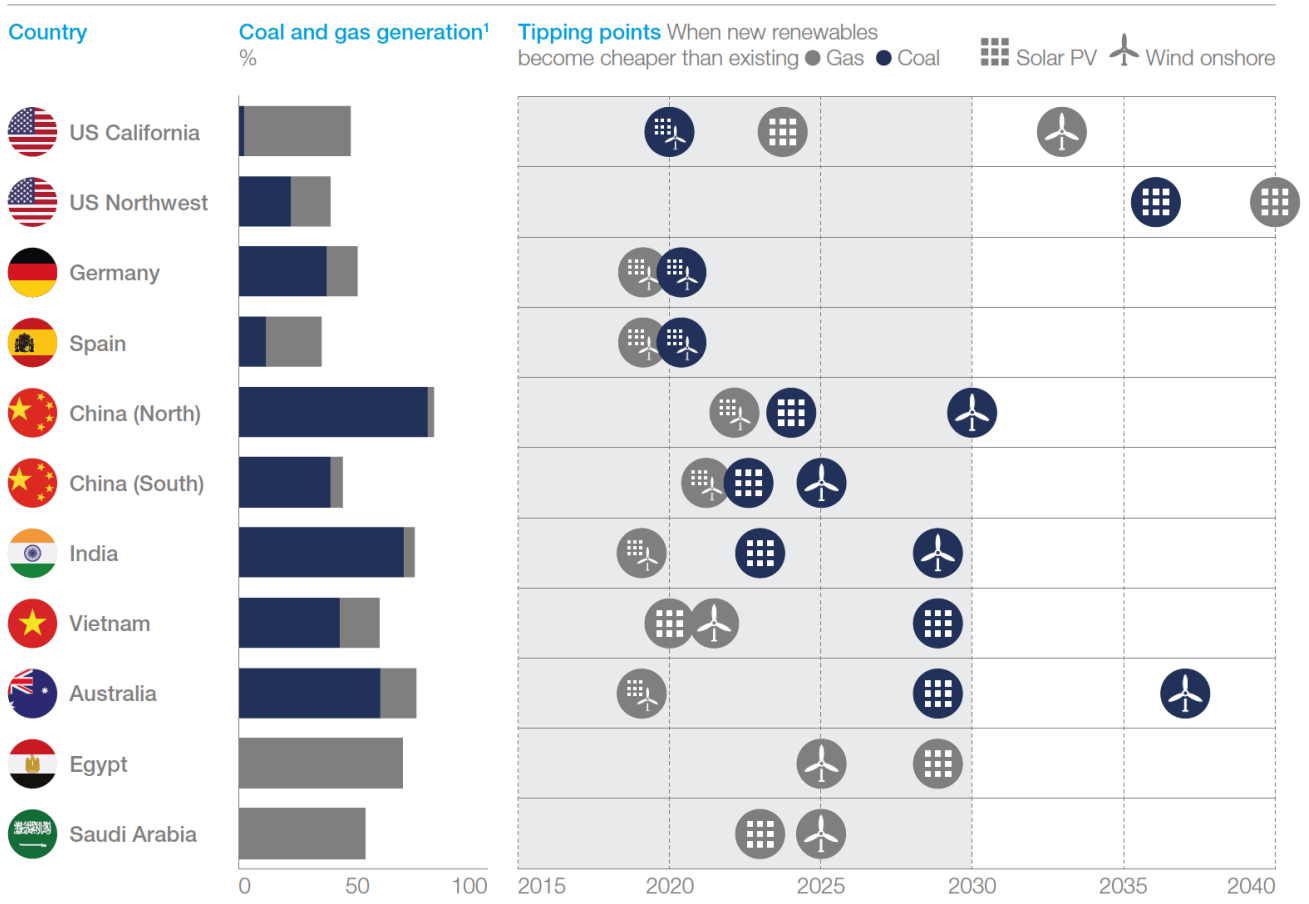
LCOE is the levelised cost of energy, which allows comparison of different methods of electricity on consistent basis.



Source: *Carbon Tracker*

RENEWABLES WILL BECOME CHEAPER THAN EXISTING COAL AND GAS IN MOST REGIONS BEFORE 2030

- By 2030, new renewable capacity will **outcompete existing fossil fuel generations on energy cost** in most countries.
- The majority of countries will reach this **tipping point in the next 5 years**.
- The US Northwest is the exception to this with tipping points post-2035, driven by relatively low fossil fuel prices as well as low solar potential.
- A tipping point represents a year when **new renewables become cheaper than existing fossil fuel plants.**



Source: *McKinsey (2019)*

EXPORT-LED DEVELOPMENT BASED ON GAS CAN BECOME A HIGH-RISK PATH: EXAMPLE MOZAMBIQUE

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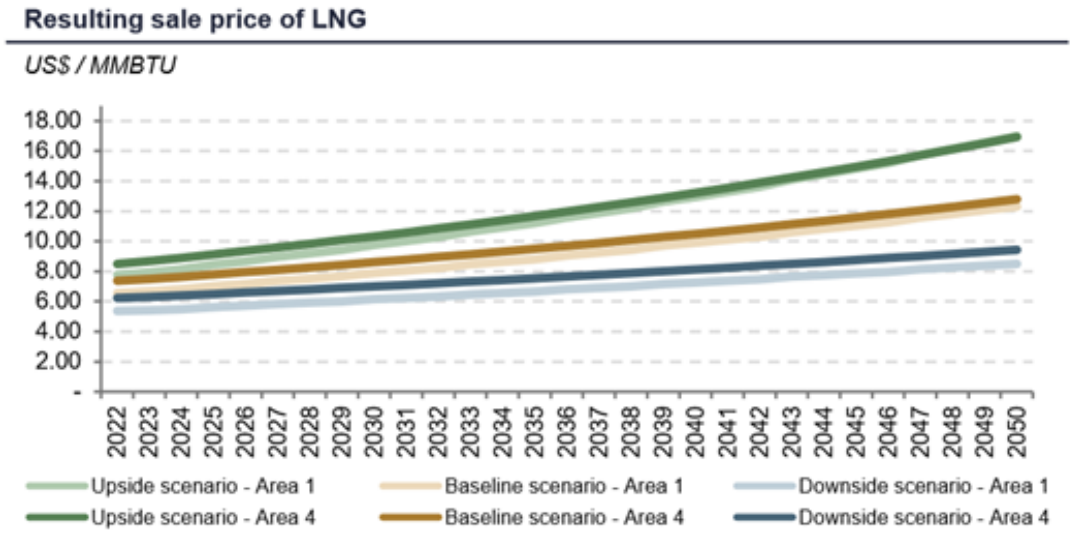
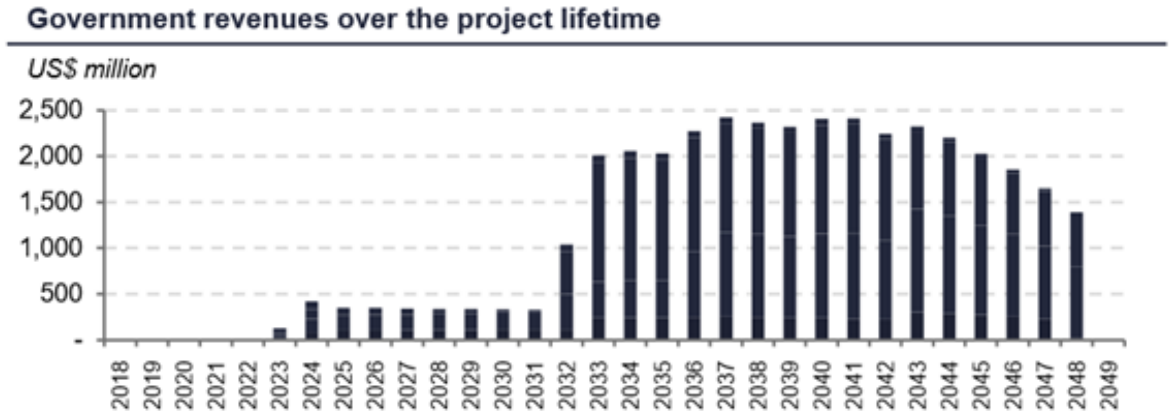
- The export revenue in Mozambique based on gas may double government revenue. But the revenue projections are dependent on a volatile global gas price, may not accrue before the 2030s and may be flattened by a faster global uptake of low carbon solutions (see graphs below).
- In the meantime, in anticipation of the resource revenues, economic volatility, price inflation and violent conflict are already intensifying.





Source: *Republic of Mozambique (2018), Projected government revenues from gas projects*

D. SUMMARY OF CROSS-CUTTING ISSUES

Macro-economic risks from gas dependence are often underestimated.

- For some countries, gas imports can become a strain on public budgets if import prices exceed local ability to pay, and subsidies become necessary.
- If renewables start undercutting existing gas power plants, utilities, underwritten by public funds, could suffer a similar shock as Eskom in South Africa as a result of coal over-investment.
- Price volatility can potentially cause national budget deficit. In turn, this could lead to a failure in meeting existing obligations e.g. salaries and pensions.
- Decreased export revenues impact overall trade balances which would exert downward pressure on local currencies. As a result, foreign exchange reserves gets used to maintain currency stability.

Demand-side risks to gas projects are often underestimated.

- Modelling of optimal energy systems is often very supply side-focused.
- Risks of declining utilisation often not built into cost-benefit analysis.
- MDBs tend not to evaluate alternatives across the energy system as they consider themselves "project takers".

Global modelling with respect to gas consumption does not provide a solid reference point for risk-based analysis (e.g. the IEA WEO).

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RECOMMENDATIONS FOR PUBLIC FINANCIAL INSTITUTIONS (PFIS)

MDB OFFICIAL POLICIES ON GAS

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MDB	Policy	Policy Date
EIB	**Full value chain excluded from end 2021 with exceptions:** (1) projects on 4th PCI list; (2) 250g CO_2/kWh lifetime average; (3) networks with plans for low-carbon; (4) small boilers for buildings and SMEs.	November 2019
World Bank Group	**Upstream gas excluded, but exemptions by economic status:** upstream in the "poorest countries". Exclusion does not apply to technical assistance.	2017
EBRD	**No exclusions:** projects must (1) not displace less carbon-intensive source or lead to carbon lock-in or stranded assets, (2) be subject to shadow carbon price and other externality costs, and (3) be consistent with NDCs and the Bank's Environmental and Social Policy.	December 2018
AfDB	**Upstream gas** excluded	2011
ADB	**Upstream gas** excluded	2009
AIIB	**Upstream gas** projects recognised as "higher risk" and needs "thorough assessment". Gas "part of transition".	2017
IDB	**Upstream gas excluded with exemptions:** if projects demonstrate a clear benefit in terms of energy access for the poor and where GHG emissions are minimized, consistent with national goals on climate change, and risks of stranded assets are analyzed.	September 2020
IsDB	**Upstream gas** excluded from IsDB green finance	November 2019

EXAMPLE DFI POLICIES ON GAS

DFI	Policy	Policy date
AFD	**Conditions:** Gas power generation in Least Developed Countries and fragile states; gas for domestic cooking and heating in Africa and Asia; gas hybrid mini-grids and energy intensive industries.	2019
FMO	**Upstream gas excluded**. No specific guidance on other types of investments (downstream and power plants). Consultation ongoing.	End of 2020
Nordic Investment Bank	**Unclear** – LNG investments included based on anecdotal evidence.	N/A
CDC (UK)	**Upstream gas exclusion.** Pursue gas midstream projects if they fulfil the requirements of CDC's emerging guidance tool to demonstrate alignment with countries' pathways to net zero emissions by 2050.	July 2020
KfW	**No exclusions.** Gas considered important for energy transition and security of supply.	July 2017

SUMMARY RECOMMENDATIONS FOR PARIS ALIGNMENT OF PFIs INVESTMENTS

Expansion of gas demand in the long term is not compatible with a 1.5°degree pathway. Many parts of the supply chain are also exposed to significant financial risk or come with development or social disbenefits. **For many parts of the gas value chain this means it is hard to make a case that gas use is Paris-aligned or supports economic development – this includes upstream, most midstream, and end uses such as power generation and heating in buildings.**

1

PFIs should cease to invest in gas altogether and instead focus on enabling alternative, "best-of-a-kind" solutions to come forward. Any exemptions should be governed by clear **decision-trees and Emissions Performance Standards that can respond to evolving technologies, science and local context**, e.g. require proposed gas projects to:

a. demonstrate why the identified development could not be met by net-zero energy technologies
b. evaluate the risk of asset-stranding or future unprofitability given technological and regulatory risks and
c. showcase computability with the Paris Agreement.

Decommissioning of gas infrastructure or "early retirement and replacement" projects may be added to the exemptions if they accelerate the phaseout.

SUMMARY RECOMMENDATIONS FOR PARIS ALIGNMENT OF PFIs INVESTMENTS CONTINUED

2

Develop capacity to adopt "whole system" approaches to energy investments/plans, that examine proposed investments in gas against alternative solutions across the energy system (e.g. demand-side measures, electricity interconnectors, renewable options, storage, efficiency, electrification of heat etc) in line with the Paris Agreement.

3

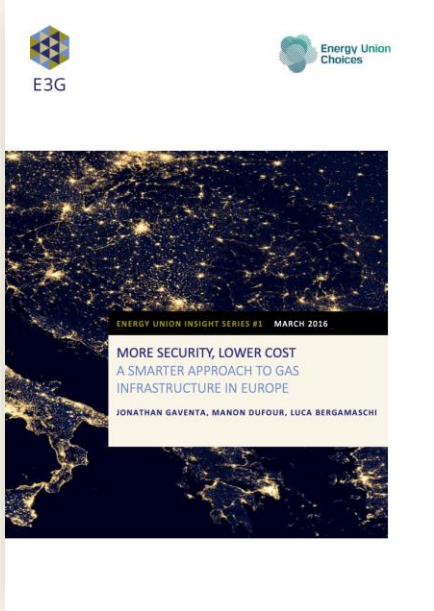
Improve methodologies on greenhouse gas footprint assessments.

1. Assess carbon footprints in relation to wider ranges of alternatives.
2. Incorporate lifecycle methane emissions into foot printing and shadow carbon pricing.
3. Stress test against different global warming potential values.

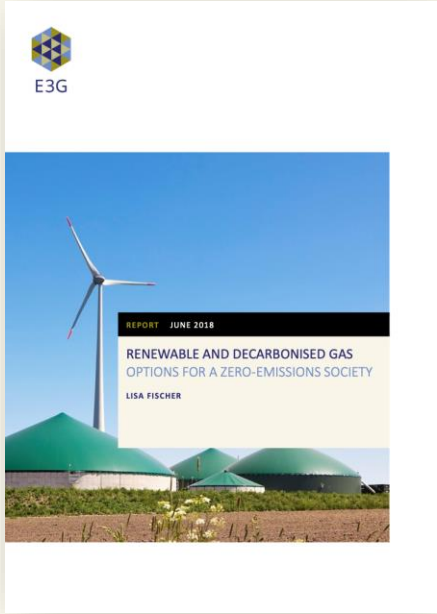
4

Pursue hydrogen and biogas as niche, premium solutions and not a "silver bullet". In many sectors there are better alternatives to pursue, and here, rather than "H_2 readiness" assessment for future-proofing, the focus should be on alternatives. In terms of sectors with less alternatives (e.g. industry), public finance could focus on best-in-kind solutions (e.g. for hydrogen and ammonia).

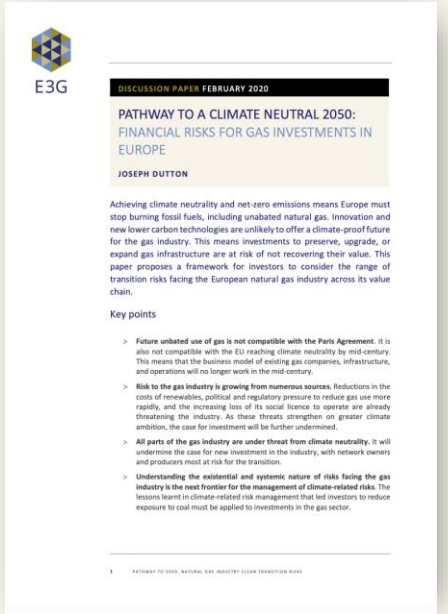
FURTHER READING



[More security, lower cost: A smarter approach to gas infrastructure in Europe] (E3G, 2016)



[Renewable and decarbonised gas: Options for a zero-emissions society] (E3G, 2018)



[Pathway to a Climate Neutral 2050: Financial Risks for Gas Investments in Europe] (E3G, 2020)

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ABOUT E3G

E3G is an independent climate change think tank accelerating the transition to a climate-safe world.

E3G builds cross-sectoral coalitions to achieve carefully defined outcomes, chosen for their capacity to leverage change. E3G works closely with like-minded partners in government, politics, business, civil society, science, the media, public interest foundations and elsewhere.

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