

Results and Implications of Survey on Methane Gas

To Accelerate the Implementation of Global
Methane Pledge

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Background and Implications of the Survey

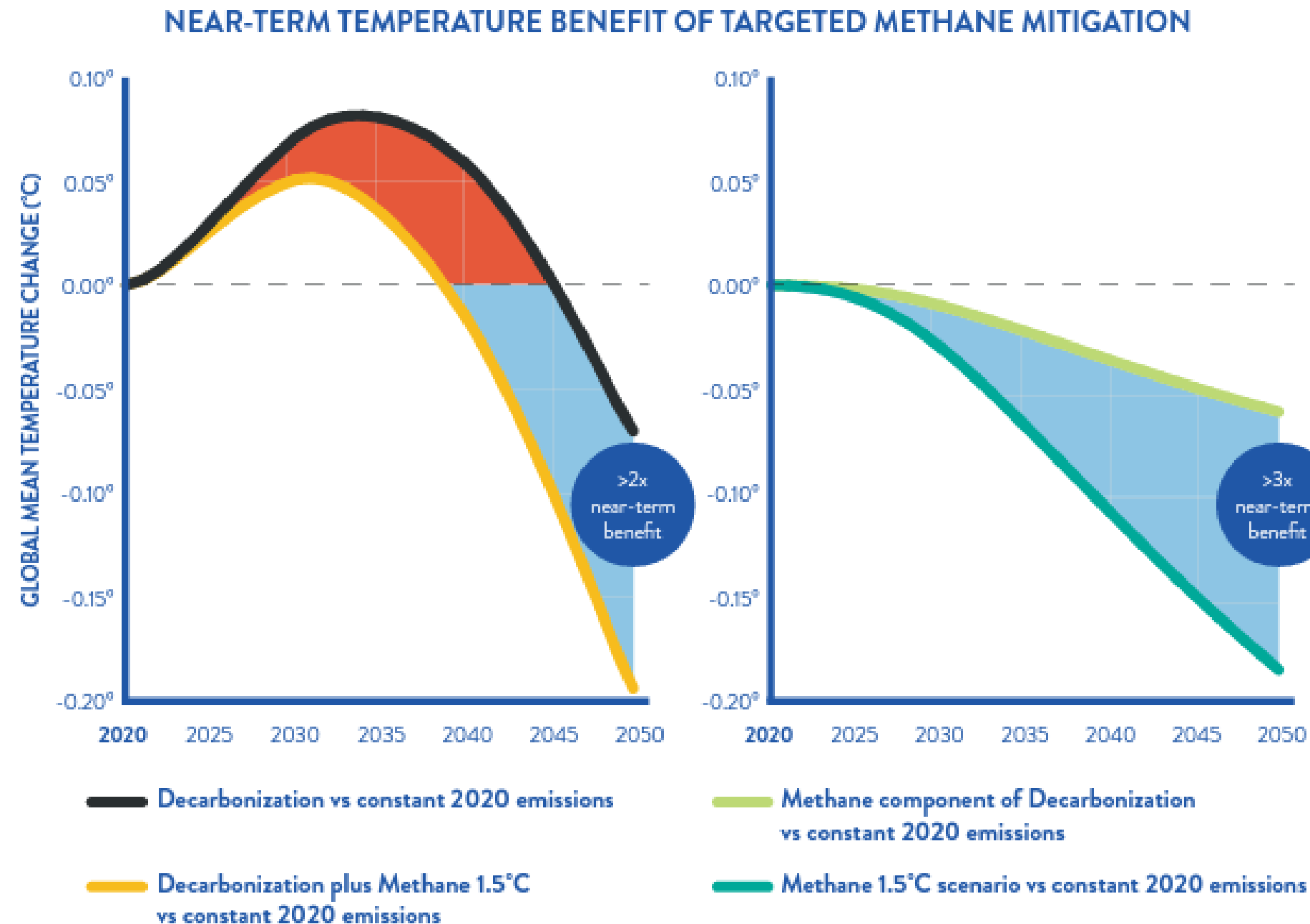
Chapter 2.

To Accelerate the Implementation of
Global Methane Pledge

01.

Background and Implications of the Survey

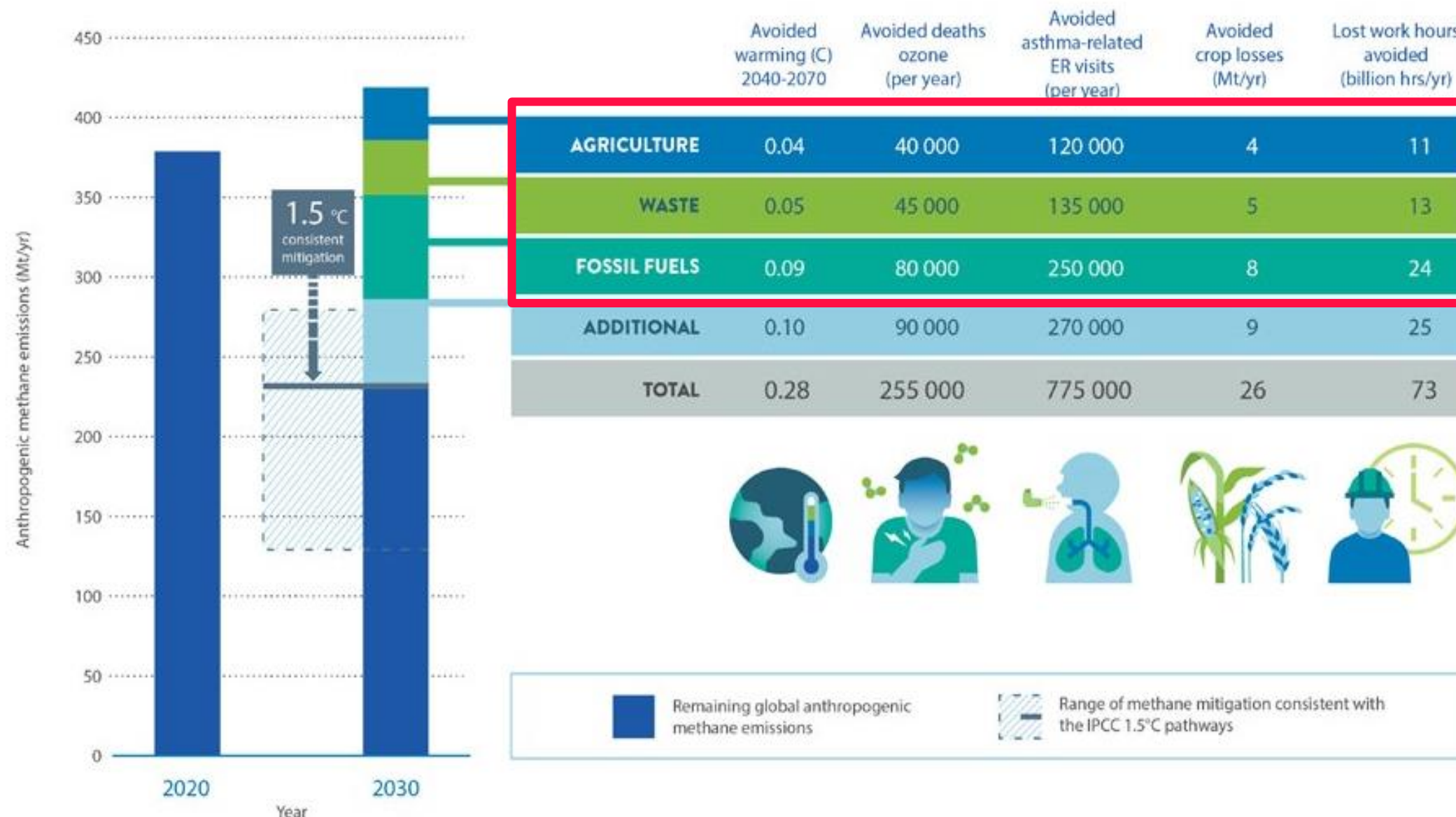
Most effective way to slowdown the global warming – UNEP methane 1.5°C scenario



- Need to implement immediate methane emissions reduction policy such as participation in and cooperation with GMP to net zero
- Scientific evidence of methane emissions effects and estimates the impact of GMP
- (Left) In case of following methane 1.5°C+ decarbonization scenario instead of gradual phase-out of the fossil fuel power generation without subsidy, the near-term benefit is 2 times higher.
- (Right) In methane emissions reduction implementation of the decarbonization scenario, following the methane 1.5°C scenario pathways reduces 3 times higher near-term benefit.

Social and economic cost reduction as a result of methane emissions reduction

- : Actions based on accurate measurement of methane emissions could reduce artificially emitted methane by up to 45% simultaneously (annually 180 million(Mt)
- It is possible to prevent 250,000 premature death cases, treat 770,000 people with asthma, prevent 730 billion hours of labor lost due to extreme heat and loss of 26 million tons of crops.



- Possible to prevent damage to people and property according to evaluation on global-climate system changes as a result of methane emissions reduction and surface ozone concentration
- Up to 80% of actions for oil and gas and 98% of actions of coal can be implemented with negative or low expenses.
- ex) The biggest potential of the cost saving is the contribution to profit generation by capturing methane instead of emitting the methane to the atmosphere.

Global Methane Pledge for Methane Reduction by 2030 (1/2)

Background and Purpose

- The US and EU decided to promote the GMP program at the General Assembly (COP26) in November 2021 → to reduce global warming by at least 0.2°C by 2050 years
 - (EU) In October 2020, a strategy proposed to reduce methane emissions to achieve climate neutrality by 2050
 - (U.S.) Environmental Conservation Agency (EPA) and the Department of Agriculture (USDA) promote policies to reduce carbon emissions
 - GMP participants account for 20% of global methane emissions and 50% of the global economy, including six of the world's top 15 methane emitters
 - the IPCC also assessed that methane had an effect on raising the global average temperature, and emphasized strong and continuous measures to reduce methane emissions
- The Global Warming Index (GWP) of methane is divided into fossil fuel causes and non-causes (29.8 times and 27.2 times, respectively, as of 100 years) *The current domestic standard is 21 times the GWP level as of 1995 SAR

Global Methane Pledge for Methane Reduction by 2030 (2/2)

COP26 (Nov. 2021)



- To reduce the global methane gas emissions by 30% compared to 2020 level and pursue the utilization of optimal inventory methodologies for quantification of methane emissions focusing on high-emitting sources.
- About 100 countries joined the pledge, and Korea joined the pledge and is establish methane emissions reduction plan within the 2030 NDC implementation plan.
- (EC) Supporting the establishment of the International Methane Emissions Observatory (IMEO) by UNEP and proposing the MRV bill for methane in the energy sector
- (US) Leading Climate and Clean Air Coalition (CCAC) and announcing the standards for reducing methane and other air pollutants emissions

COP27 (Nov. 2022)



- The number of signatory countries has been expanded to 150.
- The US passed Inflation Reduction Act (IRA): Removal of 36 million tons of methane emissions in the oil and gas industries by 2035.
- - Super-Emitter Response Program): Including the operators' obligation to respond to massive amount of methane emissions reported by the third party.
- 7 counties * announced joint declaration. Commitment to strong measures in the energy sector supply chain for energy security and resolution of climate issues and

* US, EU, Japan, Canada, Norway, Singapore, UK

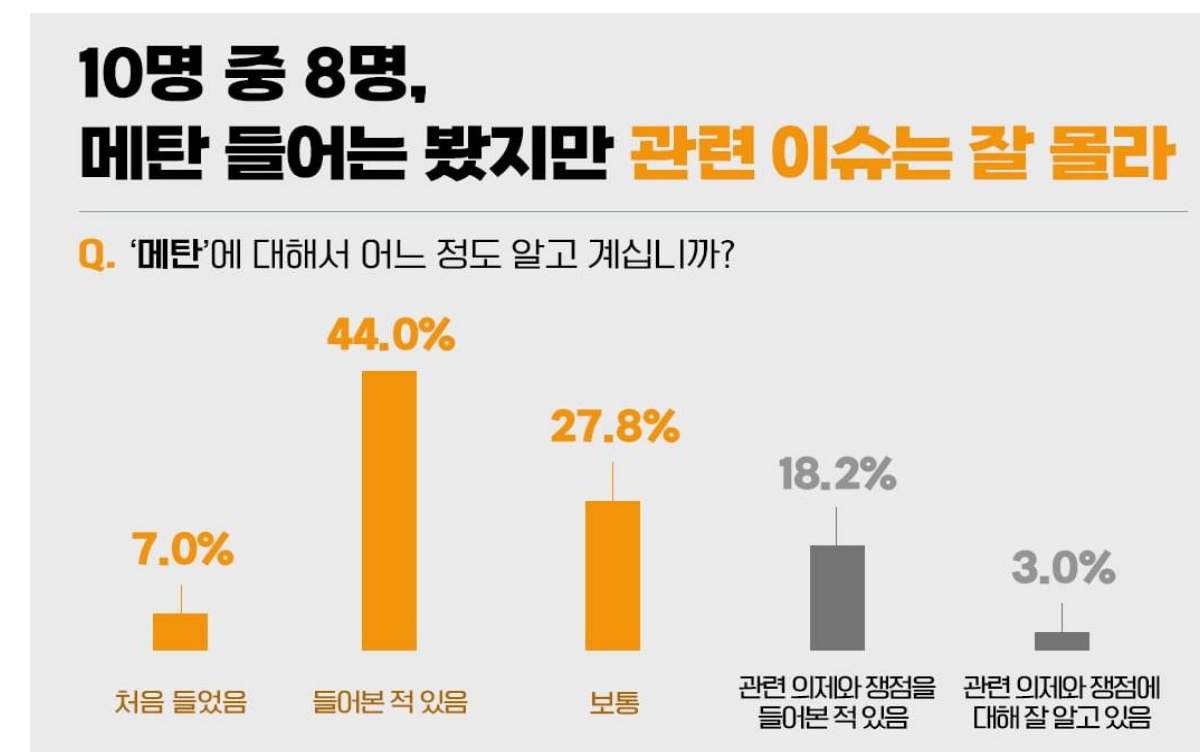
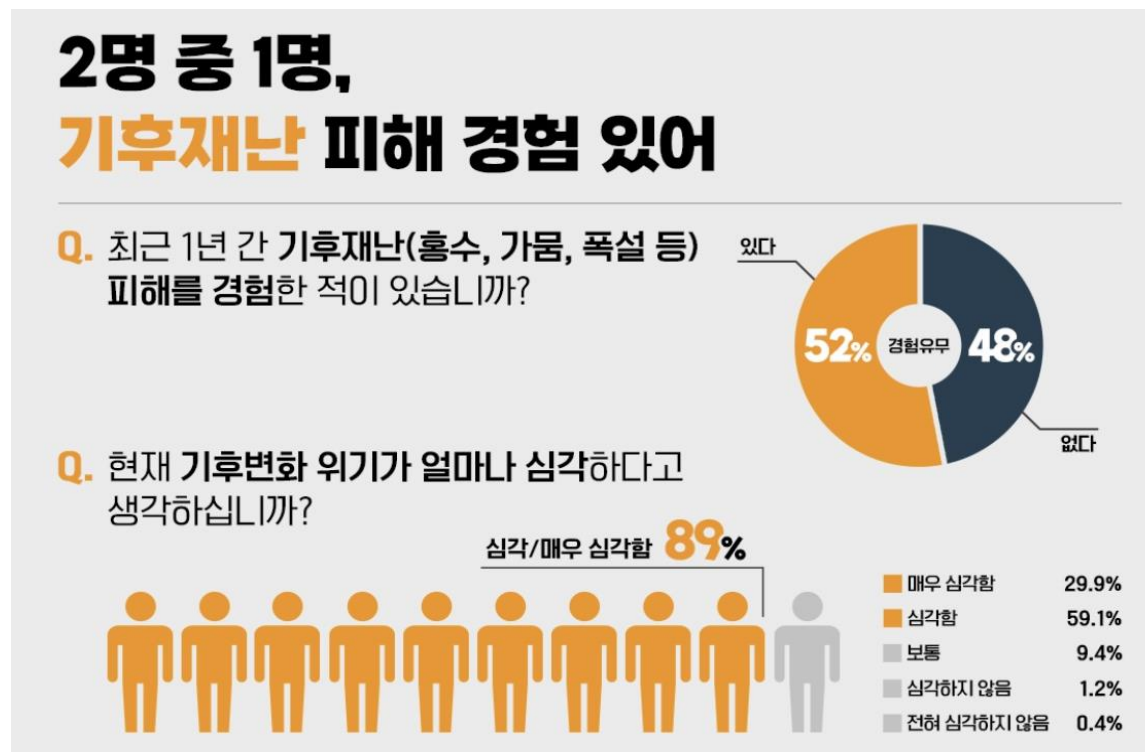
Overview of survey of the public on methane gas

- The survey on methane conducted by other institutions was at the level of identifying the awareness on greenhouse gases (ex. What is the second most abundant greenhouse gas after carbon dioxide?)
- Establishing the foundation for inducing public interest in methane and sustainable consensus as a short-term measure to slow down global warming through this survey

Classification	Content
① Sample size	▪ 1,299 (age and region were not specified for broader awareness survey)
② Survey method	▪ Survey using structured questionnaire (online)
③ Survey details	1) Awareness on climate change (global warming) - Severity of climate change, who is responsible, 2nd largest abundant greenhouse gas, etc. 2) Knowledge on methane - Concept of methane, emission source, importance of implementing reduction measures, who is responsible for reduction expenses, implementation of measures to reduce methane and CO2 emissions 3) Awareness on policies to reduce methane emitted in the energy (fossil fuel) sector - Opinion on the reduction of methane emissions in the energy sector as the top priority, possibility of realizing methane emissions reduction when the government and industry join and opinion on the participation of the government and industry, importance of each actor upon establishing policies 4) How to acquire effective information to improve the awareness on methane
④ Survey period	▪ September 26~ September 28, 2022 (3 days)

Low level of knowledge compared to high awareness of the concept of 'methane'

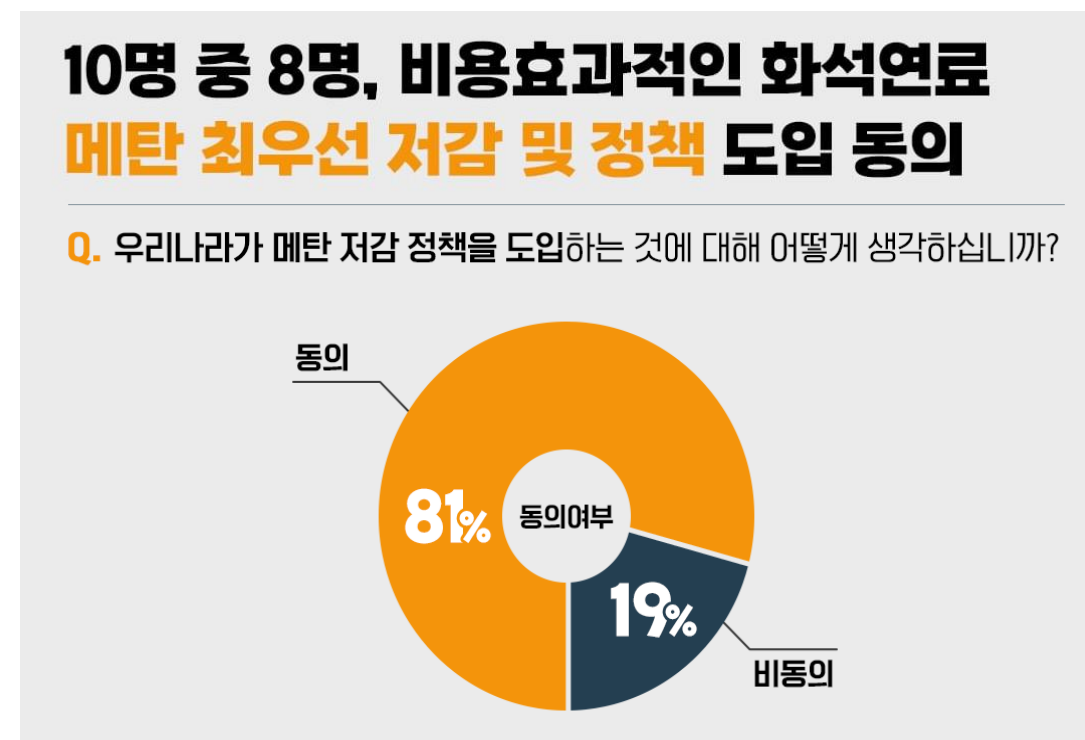
- Regarding the severity of climate change, 9 out of 10 people (89.1%) thought that it was severe, and 1 out of 2 respondents responded that they experienced damage from climate disaster for the past year
- Recognition of the concept of methane gas due to climate change response and carbon neutrality is high, but interest and awareness of related trends are very low with a 21% response rate



- More effective strategies to respond to climate crisis is necessary to limit the global temperature increase to 1.5°C.
- Need for proactive promotion and education on the cause, impact and reduction methods of methane to the level of research, technology and nurturing industries for reduction and removal of CO2

Expanding stakeholder cooperation and support for establishing and implementing feasible policies

- The energy sector which is second most recognized methane emission source by the public has the technology and methodologies to implement in the short term.
- 80% of respondents agree to reduce methane emissions from domestic fossil fuel first.



- The government needs to promote public debate and efforts to reduce methane emissions reduction in energy sector as the public's willingness to respond to methane emissions reduction is high.
- Need for industry participation as it is possible to reduce emissions by 75% based on 2050 IEA net zero scenario and current technology and methodologies.

Necessary policies and feasibility with the participation of the government and industry

- The necessity of each policy is high in the order of ‘strengthening cooperation with and support for the industry’ > ‘expansion of science and technology utilization and investment’ > ‘securing finance for implementing projects’.
- If the domestic government and industry strive to reduce methane, more than half (70.8%) of the opinions on the possibility of realizing methane reduction are “feasible.”

정책 수립 시 정부의 적극적인 선제 대응, 산업계 협력 방안 고려해야

Q. 우리나라의 석유·가스 분야에서 메탄 저감 정책 수립 시 필요하다고 생각하는 항목은 무엇입니까?

산업계와의 협력과 지원 강화 82.1%

과학기술 활용과 투자 확대 79.1%

사업추진에 필요한 자원 마련

일반 시민과의 소통 강화

메탄 저감 관련 법·제도·조직체계 등 정비

자발적 이니셔티브 가입 등 국제 협력 강화

.....

10명 중 7명, 정부·산업계 노력 시 저감 실현 가능

Q. 우리나라 정부와 산업계가 이에 동참한다면 메탄 감축 실현 가능성에 대해 어떻게 생각하십니까?

0.3%

실현
어려울 것

9.8%

어렵지만
실현을 위해
노력해야 할 것

19.1%

보통

57.4%

어렵지만 실현
가능할 것

13.4%

충분히 실현
가능할 것

- Need to collect opinion of the industry and present specific plan when the methane reduction plan in the domestic energy sector is established according to Global Methane Pledge.
- Currently, feasibility is vague compared to other sectors because the plan includes only ▲ strengthening natural gas leakage management technology and management, ▲ reduction of goal and LNG power generation and energy efficiency improvement)

02.

To Accelerate the Implementation of Global Methane Pledge

Joint Declaration from Energy Importers and Exporters *US, EU, Japan, Canada, Norway, Singapore, UK

- The oil and gas production ranking of each country (as of 2021, IEA): No.1 (US), No. 4 (Canada), No.10 (Norway), No.20 (UK)
- Northeast Asia is th largest LNG importer and second largest exporter to Southeast Asia after the Middle East and Africa (2021, BP World Energy Statistics Review)

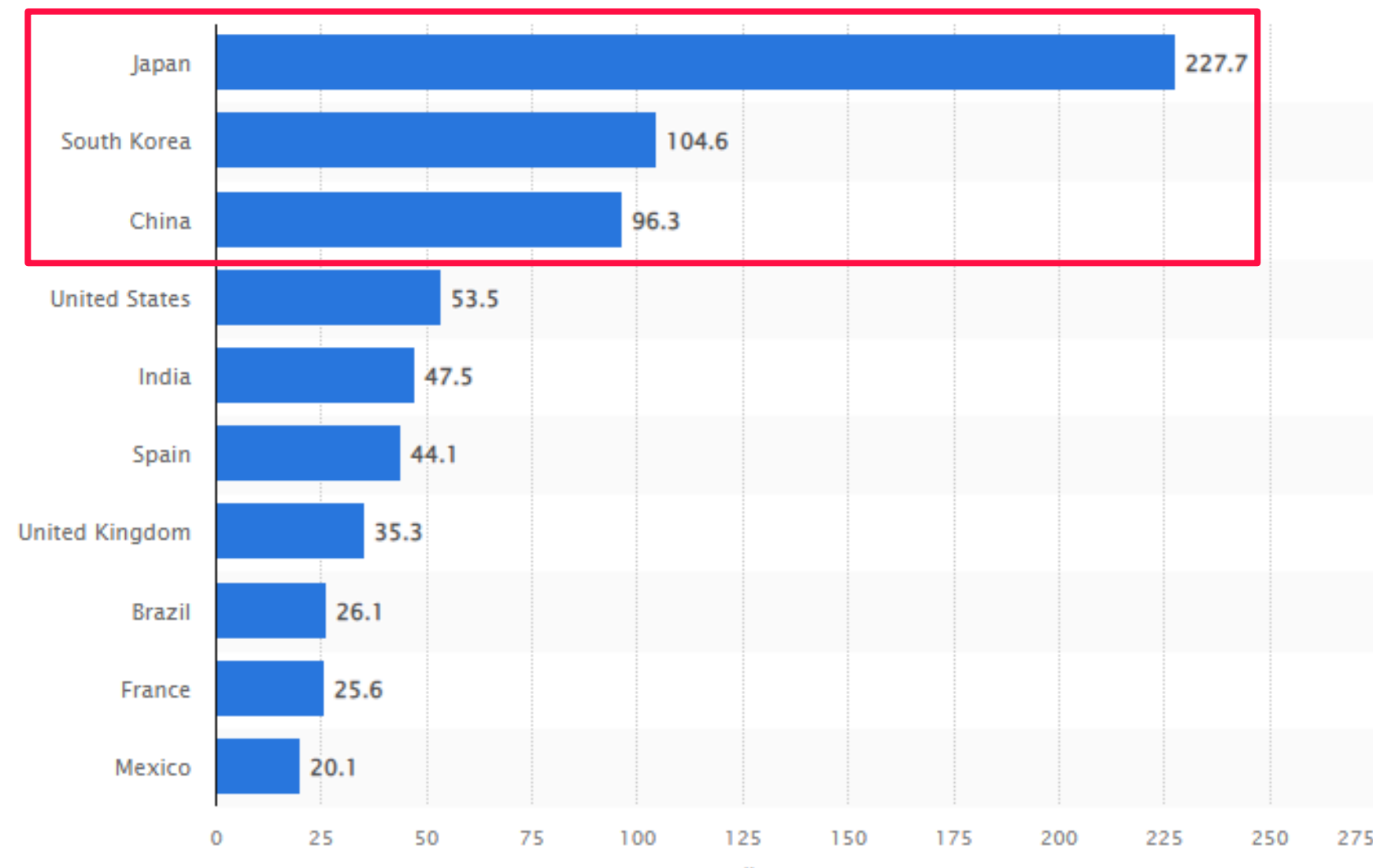
- Energy sector can reduce the methane emissions rapidly within short period of time using commercialized technologies and cost-effective reduction methods.
- It is possible to solve energy security crisis by preventing energy loss caused by unnecessary emission, combustion and leakage of natural gas and contribute to public health and environmental conservation by removing air pollutants.

- Supporting the development of MRV (monitoring, reporting and verification) mechanism or standards to make sure that purchasers can provide methane and CO2 emission information throughout the supply chain to supplier by establishing methane emission data based on accuracy, transparency and reliability.
- Stopping daily emissions and combustion and introduction of policies related to LDAR (leak detection and repair) throughout the oil and gas supply chain
- Narrowing the gap between bottom-up and top-down data by supporting IMEO and partnership with multilateral partners as part of international efforts to improve the measurement of methane emissions
- Exchanging information on methane emission reduction across the fossil fuel import and export supply chain and providing technical support with companies' participating in OGMP 2.0

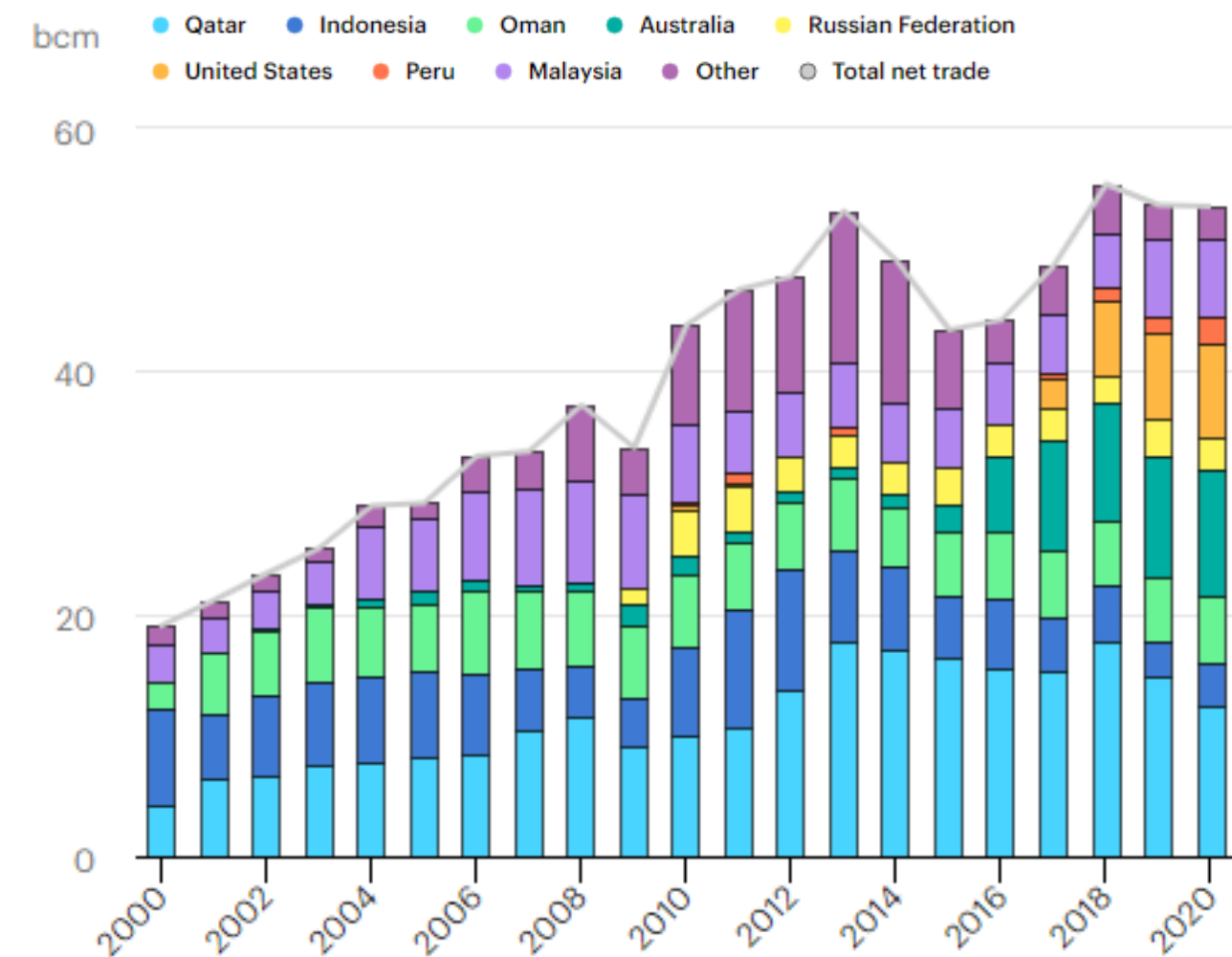
① Reducing methane in the energy sector to resolve the energy crisis and achieve the 2030 NDC

- Already Japan, S.Korea, and China account for 50% of the world's LNG trade
- Asia-Pacific nations account for 43% of global methane emissions and 10% of oil and gas methane

2022 Countries with largest LNG import capacity in operation worldwide (in million metric tons per year)



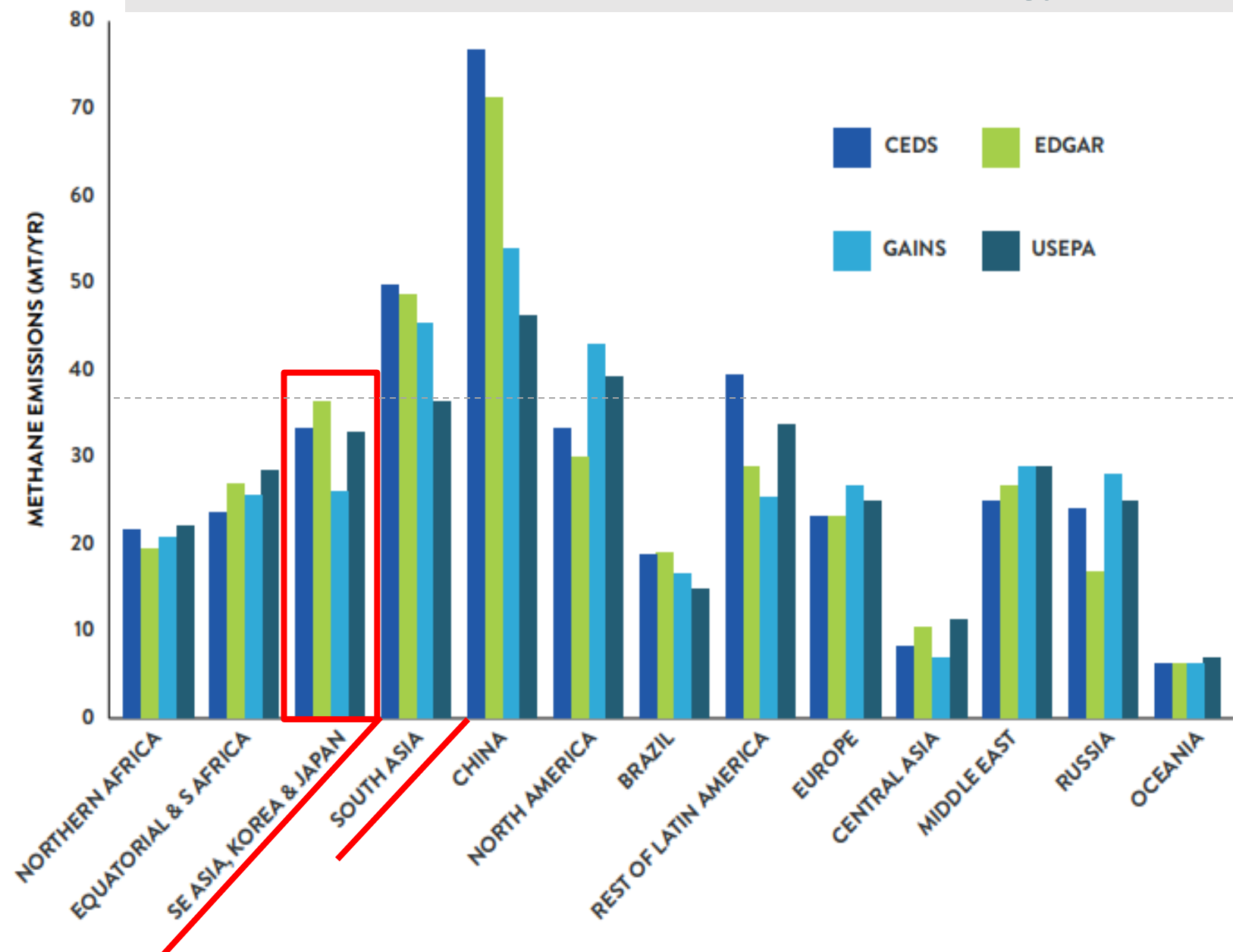
Natural gas net imports in Korea, 2000-2020 (IEA)



***Australia joins GMP at COP27**

Effective methane emission information infrastructure to prepare for high LNG import dependence

2021 Countries with Methane Emissions in Energy Sector

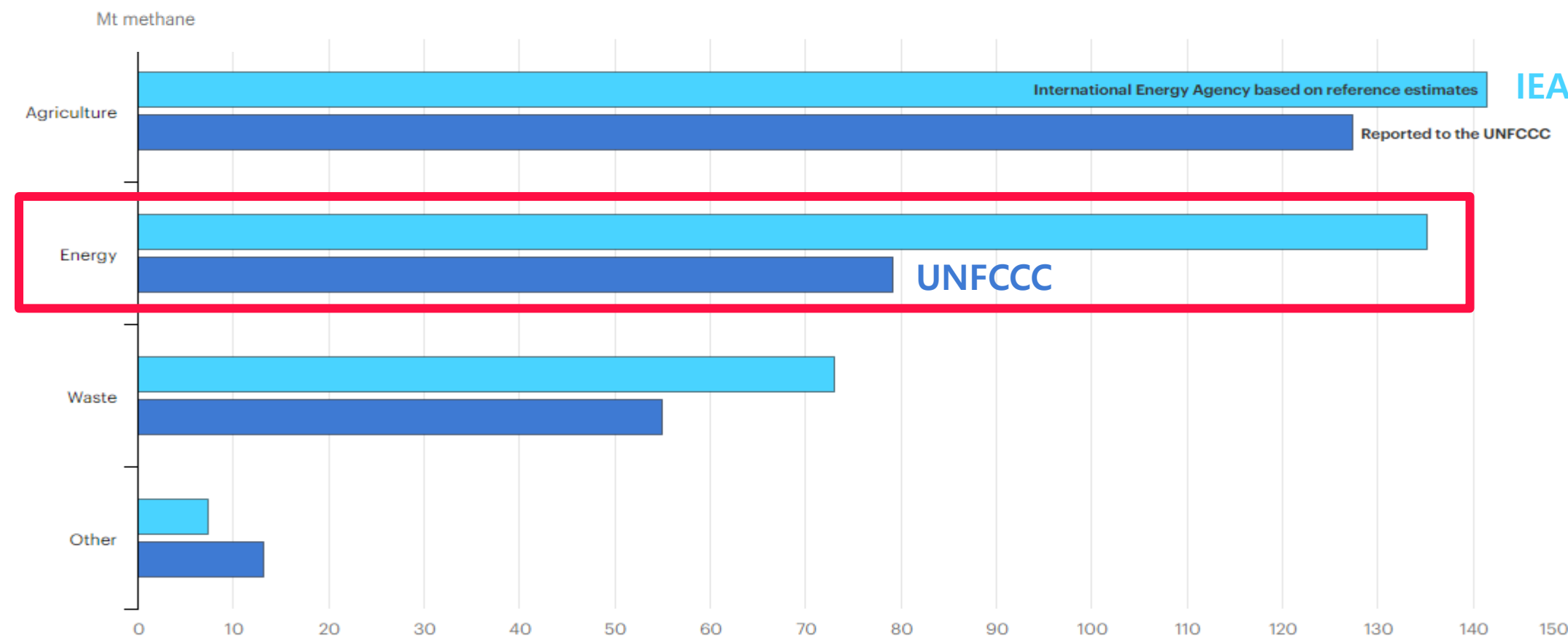


South Korean 2030 NDC's Methane Reduction Targets by Sources

Sector		Energy	Agriculture	Waste Management	Industry	LULUCF	Total
Methane Emission (MtCO ₂ e)	2018 (Baseline)	6.3	12.2	8.6	0.6	0.3	28.0
	2030 (Target)	4.5	9.7	4.6	0.7	0.3	19.7
Target Reduction Rate		28.6%	20.9%	46.5%	-13.3%	N/A	29.7%

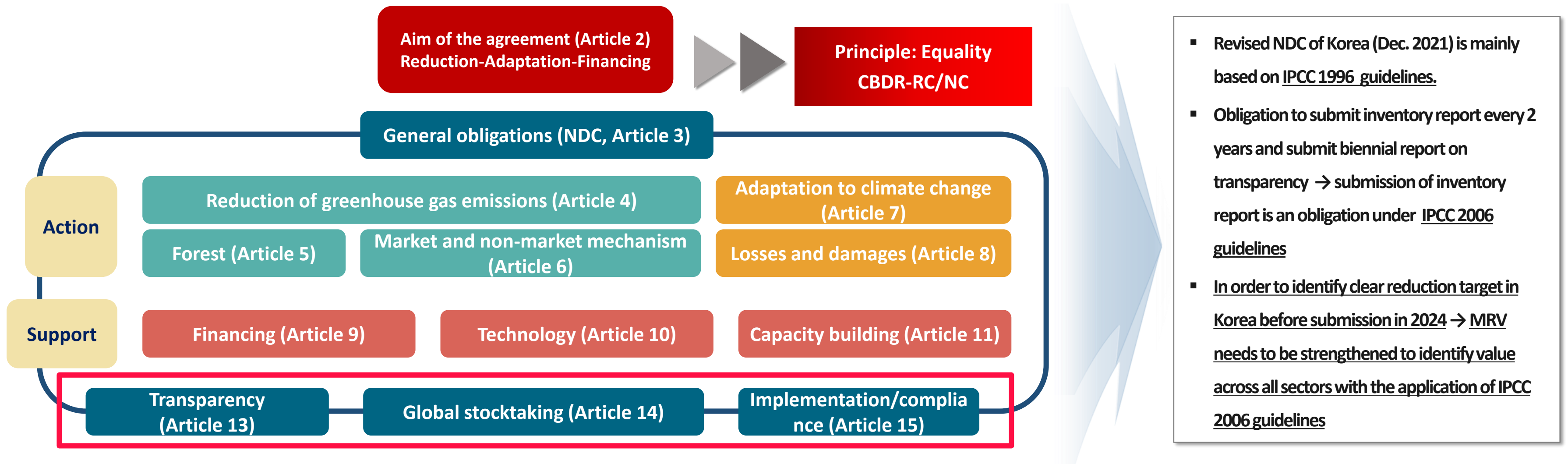
- Japan, Korea and China have high dependence on LNG import to the extent that they account for 50% of global LNG import. Therefore, they need to act preemptively as they may face trade barriers due to strengthening standards and regulation on methane in the EU and US
- → However, the current criteria for calculating methane gas emissions, such as natural gas evasion, are Tier 1 to 3, which utilizes parameter values, and a more accurate field-based measurement and reporting mechanism should be preceded to further reduce methane

Methane Data Quality Management Contributes to Effective Policy and Countermeasures



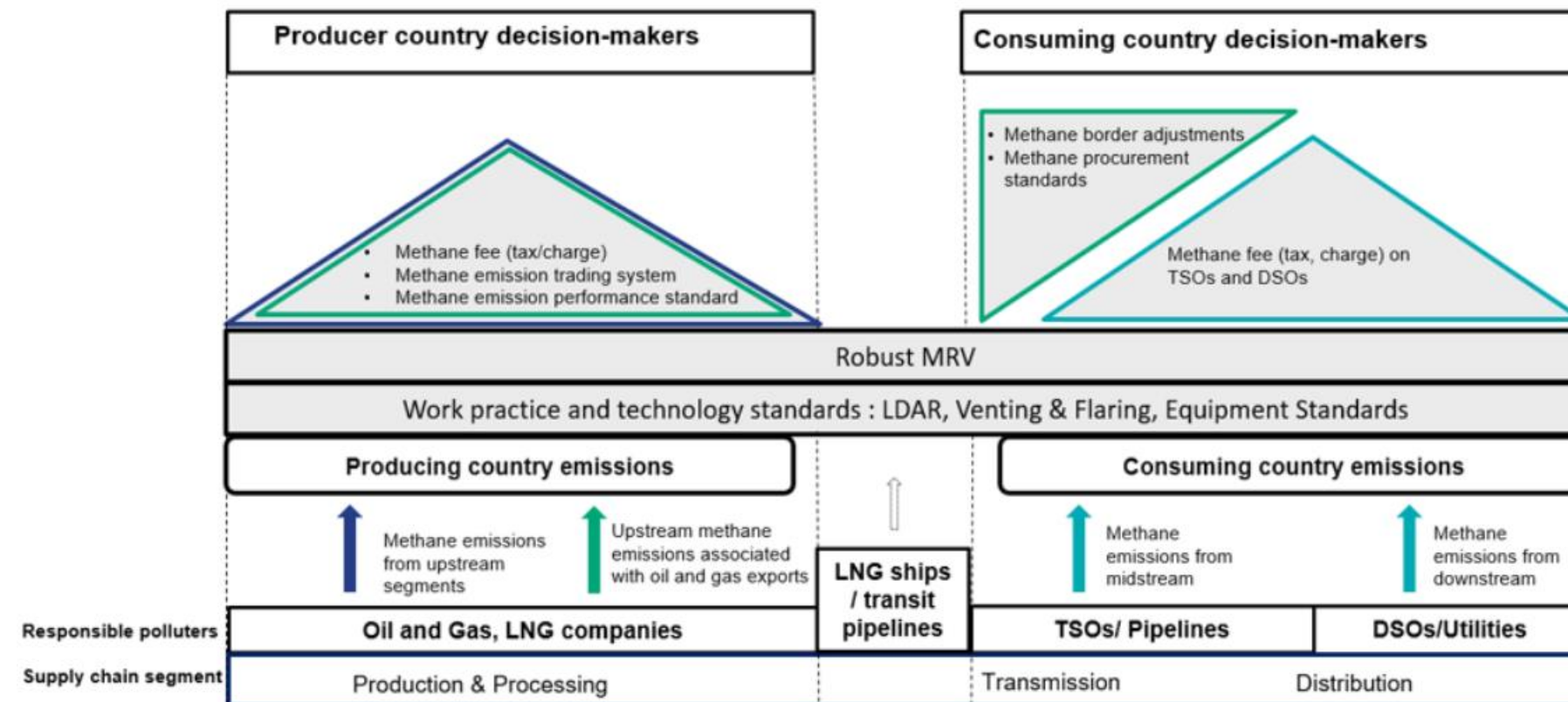
- Gap between emissions reported by public institutions such as UNFCCC that rarely utilize directly measured data and data from IEA which is based on measurement and science
→ IEA estimates that actual methane gas emissions is at least 70% higher than emissions inventory estimate by the government or official data
- Significant gap of data by emission source at the global/national and bottom-up/top-down level, making it difficult to establish methane emissions reduction plan
- In particular, narrowing the data gap in the oil and gas industry will help to understand the scope of methane gas reduction accurately and establish effective policies
→ Unexpected accidents and failure in the operation of oil and gas facilities may not be collected in the bottom-up data (the number of facilities, operation scope)

Global Stocktaking starting from 2023 under the Paris Agreement



- First global stocktaking will be conducted in 2023 and progress will be evaluated based on long-term target every 5 years.
 - Establishing the system for Article 13 Transparency in order to understand Paris Rulebook(2021), achievement of Paris Agreement target and climate change actions clearly
 - Utilizing MRV (measurement, reporting, verification) as judgment tools to collect information such as GHG emissions, emission sources and reduction strategies
- Global stock taking in 2023 will be mainly based on IPCC 6th evaluation report, putting more burden on increasing target as a result of emissions gap including existing NDC

Energy importer-specific policy instruments requiring accurate and transparent methane data



■ Methane tax, methane MRV standard, methane border adjustment, etc.

→ Suggested as policy tool kits, and methane reporting obligations are expected to be strengthened for accurate methane data calculation

■ Major energy companies such as BP and Shell participate in partnership (ex. Through OGMP 2.0, OGCI), it is used to establish methane reduction strategies

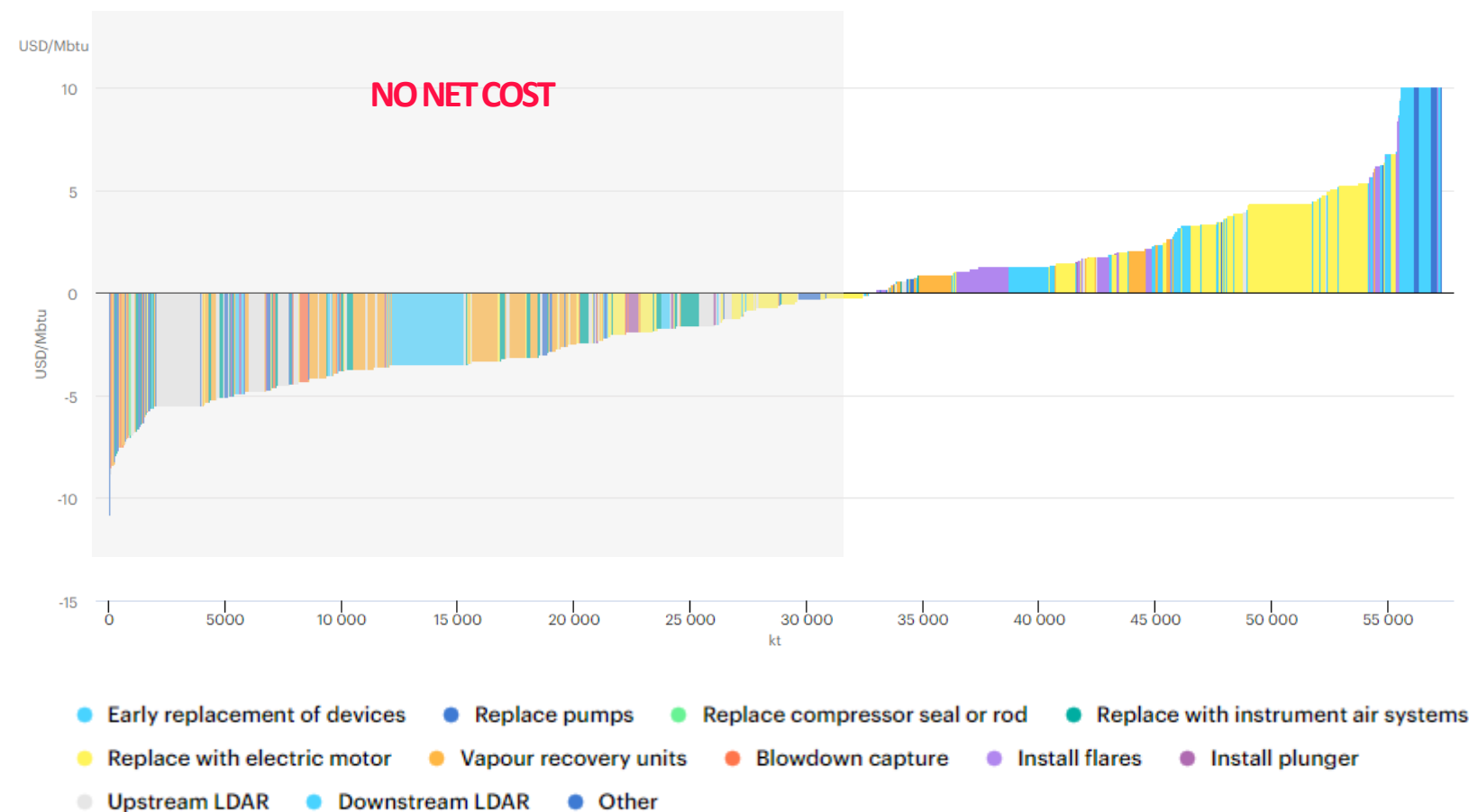
→ Increase competitiveness by companies by preemptively preparing for methane regulations such as sharing related trends and technologies, participating in MRV quality improvement, and forming partnerships

→ Based on the OGMP 2.0 framework, the EU proposes legislation that includes methane MRVs, regulatory standards, etc. in the 'Fit for 55' package

Current technology reduces energy sector methane emissions

: IEA, being able to reduce methane emissions by 70% by 2030 and two thirds of them can be reduced without additional cost if energy loss is saved and methane reduction is achieved using commercialized technologies and methodologies.

Marginal abatement cost curve for oil and gas-related methane emissions by mitigation measure, 2021(IEA)



- Several countries have already introduced policies to reduce methane emissions, including spill detection, repair requirements, technical standards, and prohibition of flaring and bifurcation in emergency situations
- ExxonMobil, acquiring grade A from MiQ, a not for profit group that assesses methane leakage with the introduction of currently available technology in May 2021
- If such technical and institutional support is provided to domestic companies, it will be able to help strengthen regulatory capabilities such as trade barriers and contribute to achieving the national 2030 NDC

Paris Agreement Article 6. Carbon Market

: Possible to achieve goals of Paris Agreement in a cost effective way based on Article 6 of the Paris Agreement as the marginal abatement cost of each country is different even though the carbon emissions have the same impact on the climate change regardless of emission source region from the perspective of climate change

6.1 (Basic principles)

- Presenting basic objectives and intention (voluntary cooperation to implement NDC, high level of mitigation and adaptation, promotion of sustainable development and environmental soundness): shared objectives and standards

6.2 (Bilateral cooperation)

- Cooperative approach at the bilateral and multilateral level ('nationally determined')
 - Different conditions of each party, bilateral/multilateral cooperation, innovative cooperative measures

6.4 (SDM)

- 6.4 Mechanism under the authority of COP (in line with 'centrally managed')
- Foundation for global carbon pricing system and market formation

6.8 (Non-market approach)

- Non-market approach (in line with No One Leaves Behind)

- Expected to integrate MRV according to CBDR
- The establishment of an advanced MRV system is a solution to help develop innovative technologies and strengthen market competitiveness
- The importance of "voluntary market to compensate for the limitations of the compliance market is increasing, improving greenhouse gas management and reduction capabilities through offset credits as well as GMP contributions.

A Case Study of Corporate Participation in the Methane External Reduction Project

: Develop technology-based MRV methodologies jointly with partner countries, or use them for emission absorption and removal projects as approved methodologies for CDM projects

Korea Midland Power Co.,Ltd.

- For the first time in Korea, it secured a total of 770,000 tons of overseas greenhouse gas emissions through the CDM project to prevent gas leakage by reinforcing 500,000 aging gas pipes in Bangladesh, and converted to domestic emissions in 2021

Bluesource Methane Reduction Program

- Containing 3,500 low-venting pneumatic controllers designed to reduce natural gas venting in Alberta’s oil and gas industry and is designed to help companies meet methane venting requirements
 - A reduction of 2-3 million tons of carbon dioxide equivalent are expected for the existing program in Alberta by the end of 2022.
- It is necessary to support cost-effective corporate participation so that private companies such as Korea Gas Corporation and SK E&S, which are leading LNG resource development and cooperation projects, can contribute to national carbon neutrality and energy security through methane reduction projects.

→ About 82 million tons of methane emitted by oil and gas companies in 2019 is estimated to be the same level as " about 19 billion dollars in sales (IEA, 2019)

AM0023 Leak detection and repair in gas production, processing, transmission, storage and distribution systems and in refinery facilities

Typical project(s)	Identification and repair of natural gas (NG) and refinery gas (RG) leaks in above-ground process equipment in natural gas production, processing, transmission, storage, distribution systems and in refinery facilities.
Type of GHG emissions mitigation action	• GHG formation avoidance. Avoidance of CH ₄ emissions.
Important conditions under which the methodology is applicable	• No systems are in place to systematically identify and repair leaks in the transmission and distribution system; • Leaks can be identified and accurately measured; • A monitoring system ensures the permanence of the repairs.
Important parameters	Monitored: • Leak flow; • Methane concentration in the flow.

Thank you