FOSSILGAS IN TAXONOMIES: WHAT LIES BENEATH



Prepared by the Climate Bonds Initiative

Key messages

- Recent studies confirm that fugitive emissions from fossil gas operations double the lifecycle emissions of fossil gas-fired generation, when correctly calculated, making its climate impact comparable to that of oil- and coal-fired generation.
- Most green or sustainable taxonomies do not consider any hydrocarbon-related activities to be green or sustainable. Where fossil gas electricity generation is included, it is generally subject to rigorous carbon intensity thresholds and its use limited by time constraints.
- Compliance with the EU criteria for fossil gas generation renders the creation of a new power plant economically **unviable** when compared with existing alternatives in the field of renewable energy.

Fossil gas and energy transition

In 2023, global methane emission levels in the atmosphere reached record highs, at more than two and a half times their pre-industrial level.¹ One of the major causes identified was the



increased extraction, transportation, and utilisation of fossil gas, which cause unintended and often significant leakages of methane (fugitive emissions) across the supply chain. Recent studies put the average US leakage rate between 1.4% and 3.7%.² In Canada, the fugitive emissions rate is at least 2.7%, which is double that previously thought.³

Satellite detection of fugitive emissions via continuous monitoring of oil and gas operations

on a global scale confirms that methane emissions are much higher than previously reported.⁴ Adding fugitive emissions to the life-cycle assessment of energy-generation emissions intensity significantly changes the profile for fossil gas-based generation.⁵ While a modern combined cycle gas turbine (CCGT) plant has an average emissions intensity of 360–380 gCO₂e/kWh, the addition of just 3% of fugitive emissions makes fossil gas generation almost comparable in its greenhouse potential to coal.⁶ Research conducted by a consortium of US scientists found that on a 100-year timeframe, the effects of life-cycle GHGs from fossil gas with an approximate 5% leakage rate are on a par with lowmethane content coal mines, and 7.6% leakage is on a par with average coal mine methane leakage.

In 2022, Climate Bonds Initiative (Climate Bonds) released Accelerating the Fossil Gas Transition to Net-Zero to draw attention to the hidden danger within fossil gas operations; methane, which threatens the energy transition and climate goals of the Paris Agreement.⁹ The policy paper demonstrated how fossil gas, which mostly consists of methane, cannot be called a credible transition fuel and must be phased out to avoid the catastrophic consequences of the worst climate-change scenarios. The paper provided a sciencebased examination of the risks and hidden emissions of fossil gas infrastructure and investments, providing key policy recommendations on how these risks can be avoided. It also identified that methane emissions from the energy sector were 70% higher than official figures and called for urgent leakage mitigation measures in all fossil gas operations. These findings have been confirmed by further research and studies since then, which

have put the extent of methane emissions even higher.¹⁰





Figure 1. Average lifecycle CO_2 equivalent emissions by energy type, g CO_2 /kWh

The consequences of fugitive methane emissions may erase years of energetic and ambitious climate policy. In 2020, a study conducted by the Environmental Defense Fund found that 3.7% of natural gas produced in the US Permian Basin had leaked into the atmosphere, which alone was enough to erase the greenhouse gas benefits of the coal-to-gas switching programme that, on paper, allowed the US to substantially cut its emissions.⁸ As a result, government policies based on international climate science are addressing this alarming growth in excess methane emissions. The Inflation Reduction Act (IRA), enacted in 2022 in the US, imposes methane emission fees of USD900 (by 2024) to USD1500 (post-2026) per tonne, equivalent to USD36 and USD60 per metric ton of CO₂. It allocates USD850m for methane reduction technology and USD700m for conventional well emissions. This was followed by the EU which voted in May 2023 to enhance leak detection and repair requirements, extending them to all exporters by 2026, as part of broader decarbonisation policies adopted by developed countries like the US, Germany, and China. Increasingly, the key pillars of national decarbonisation policies are based on green and sustainable taxonomies which do not recognise any operations with fossil fuels as green or sustainable.

Fossil fuels in world taxonomies

Taxonomies have gained the status of an effective tool for the implementation of government policy because they provide a system for classifying activities into



different categories related to their place in the transition to net zero by 2050. These taxonomies serve as a dual-purpose guide, classifying activities to attract investments that align with climate objectives while avoiding the perpetuation of outdated technologies, particularly in the energy sector, which is a major contributor to global greenhouse gas emissions.

The table below reviews three main sources of fossil energy (coal, oil, and gas) and four categories of activities: extraction of fossil fuels, processing or transportation of fossil fuels; inclusion of construction of natural gas or oil pipelines; creation of new capacities involved in the generation of electricity, heating, and cooling from fossil fuels; retrofitting of existing facilities, including fossil fuels infrastructure and power plants, to reduce emissions.

Despite the many other uses of fossil fuels within industry (e.g., as a feedstock for chemicals or as a heat source in industrial processes) the vast majority of emissions, both direct and indirect,

Fossil gas and the Canadian Taxonomy

A recent Climate Bonds white paper *The role of fossil fuels in taxonomies: Canada* case study took a deep dive into the future content of the Canadian Taxonomy where the

debate on the inclusion of fossil fuels, particularly fossil gas where Canada is the world's fifth-largest producer, has presented a major stumbling block. The controversy centres on whether fossil gas should contribute to a decarbonisation pathway as an interim or a transitional fuel, or be phased out completely.

arise from these types of usage, so this table provides an accurate summary.

While the majority of taxonomies exclude hydrocarbon-related activity from green, fossil gas appears the exception in some cases. However, in the countries where it is included in the taxonomy, none do so without significant restrictions.

The most common restrictions are an emission threshold of 100g CO₂e/kWh (which would require



The white paper provides guidance on how to structure the future taxonomy to make it consistent with global best practices, and define its principles and objectives. It is estimated that the country needs CAD115bn per year to implement the decarbonisation policy, and a taxonomy is a proven means of attracting private capital to this task, including foreign direct investment.

A review of the taxonomies of 12 countries or trading blocs with different economic structures was conducted for the purpose of the research, informed by a discussion from the perspective of Canada's three key economic partners: China, Germany, and the US.

the power plant owner to make investments that render the project uneconomical), a so-called sunset date (after which fossil gas generation can no longer be considered eligible, currently defined as 2030–2035), and the removal of gas-fired generation from the green category to a transitional category to indicate its status. Some taxonomies (e.g., China and Kazakhstan) also allow for a deep modernisation of existing fossil fuel capacity to reduce emission intensity and switch from coal and oil to fossil gas.

	Oil	Gas	Coal		
EU Taxonomy A sustainable finance taxonomy with transition activities, but a single compliance label	Extraction	Extraction	Extraction		
	Processing/transportation	Processing/transportation	Processing/transportation		
	Electricity/heating/cooling generation	Electricity/heating/cooling generation	Electricity/heating/cooling generation		
	Retrofitting	Retrofitting	Retrofitting		
Climate Bonds Taxonomy A green taxonomy with transition activities, but a single compliance label	Extraction	Extraction	Extraction		
	Processing/transportation	Processing/transportation	Processing/transportation		
	Electricity/heating/cooling generation	Electricity/heating/cooling generation	Electricity/heating/cooling generation		
	Retrofitting	Retrofitting	Retrofitting		
Ineligible and non-compliant Eligible with additional criteria (impossible or very hard to meet)					

Eligible with additional criteria (easy to meet)

Eligible and compliant with minimal or no criteria

Table 1. Fossil fuels in world taxonomies (Continued)

Network Processing/transportationNorecessing/transportationNorecessing/transportationNetwork Processing/transportationRescing/transportationRescing/transportationNetwork Processing/transportationRescing/transportationRescing/transportationSpecification Processing/transportationRescing/transportationRescing/transportationSpecification Processing/transportationRescing/transportationRescing/transportationSpecification Processing/transportationRescing/transportationRescing/transportationSpecification Processing/transportationRescing/transportationRescing/transportationSpecification Processing/transportationRescing/transportationRescing/transportationSpecification Processing/transportationRescing/transportationRescing/transportationSpecification Processing/transportationRescing/transportationRescing/transportationSpecification Processing/transportationRescing/transportationRescing/transportationSpecification Processing/transportationRescing/transportationRescing/transportationSpecification Processing/transportationRescing/transportationRescing/transportationSpecification Processing/transportationRescing/transportationRescing/transportationSpecification Processing/transportationRescing/transportationRescing/transportationSpecification Processing/transportationRescing/transportationRescing/transportationSpecification Processing/transportationRescing/transportati		Oil	Gas	Coal
Project Catalogue 2021 Advite isso of each of the second product of	Chinese Green Bonds Project Catalogue 2021 A white list of eligible activities and technologies with a single label	Extraction	Extraction	Extraction
Christes and some of the source of		Processing/transportation	Processing/transportation	Processing/transportation
with a single labeiRenditingRenditingChannony Signed scionary and the scionary of the scienary and the scionary of the scienary and the scienary of the scienary and the scienary of the scienary of the scienary and the scienary of the scienary of the scienary and the scienary of the sci		Electricity/heating/cooling generation	Electricity/heating/cooling generation	Electricity/heating/cooling generation
ExactionExactionExactionExactionExactionProcessing/intraportationProcessing/intraportationProcessing/intraportationProcessing/intraportationBetricklyheting/colinggenetionExacticklyheting/colinggenetionExacticklyheting/colinggenetionReformingProcessing/intraportationFransing/intraportationProcessing/intraportationProcessing/intraportationProcessing/intraportationExacticklyheting/colinggenetionExacticklyheting/colinggenetionExacticklyheting/colinggenetionProcessing/intraportationProcessing/intraportationProcessing/intraportationProcessing/intraportationProcessing/intraportationExacticklyheting/colinggenetionExacticklyheting/colinggenetionExacticklyheting/colinggenetionProcessing/intraportationProcessing/intraportationProcessing/intraportationProcessing/intraportationProcessing/intraportationExacticklyheting/colinggenetionExacticklyheting/colinggenetionExacticklyheting/colinggenetionProcessing/intraportationExacticklyheting/colinggenetionExacticklyheting/colinggenetionExacticklyheting/colinggenetionProcessing/intraportationExacticklyheting/colinggenetionExacticklyheting/colinggenetionExacticklyheting/colinggenetionProcessing/intraportationExacticklyheting/colinggenetionExacticklyheting/colinggenetionExacticklyheting/colinggenetionProcessing/intraportationExacticklyheting/colinggenetionExacticklyheting/colinggenetionExacticklyheting/colinggenetionProcessing/intraportationExacticklyheting/colinggenetion<		Retrofitting	Retrofitting	Retrofitting
Taxony Ageen taxony with sigle labelProcessing/transportationProcessing/transportationProcessing/transportationRuter future and beingExter future Ruter futureRuter future Ruter futureRuter future Ruter futureRuter future and being future future and being future future and being future f	Colombian Green Taxonomy A green taxonomy with a single label	Extraction	Extraction	Extraction
Single LabelFlectricity/heating/cooling generationFlectricity/heating/cooling generationFlectricity/heating/cooling generationRusolittingRatrolittingRatrolittingRatrolittingRuson hatcomy and single label pluss catalogue and energy difficienty measure flucture interpretationFlucessing/transportationFlucessing/transportationRuson hatcomy and there bir green and single label f arker or ross and there bir green and marker that bir theoremy with single label f arker or ross and the factor or ross and the factor or ross 		Processing/transportation	Processing/transportation	Processing/transportation
Rend Resultance Regen taxony and per la construction and per la construction of encessing/transportationRend tractionRend tractionAugen taxony and per la construction of encessing/transportationFoncessing/transportationFoncessing/transportationFoncessing/transportationAttend transportation of encessing/transportationExtendition tendentingFoncessing/transportationFoncessing/transportationAttend tradiction taxony tradiction taxony tra		Electricity/heating/cooling generation	Electricity/heating/cooling generation	Electricity/heating/cooling generation
Resist Taxonomy agine label place atalogue of energy efficiency measure and energy efficiency measure function between efficiency measure and transmomy with any efficiency measure function between efficiency ASSAN Toxonomy Assant Taxonomy with any efficiency measure function taxonomy with any efficiency measure any efficiency measure function taxonomy with any efficiency measure any efficiency measure function taxonomy with any efficiency measure any effi		Retrofitting	Retrofitting	Retrofitting
Agene base insurance ingle base just scatasingle defining measure ingle base just scatasingle defining measure indication intervention indication intervention	Russian Taxonomy	Extraction	Extraction	Extraction
electricky/heating/cooling generationElectricky/heating/cooling generationElectricky/heating/cooling generationASEAN Taxonomy A three-tierg reactionExtractionExtractionExtractionASEAN Taxonomy A three-tierg reactionExtractionExtractionExtractionArbenetierg reactionExtractionProcessing/transportationProcessing/transportationProcessing/transportationApplies to all three tierg reactionExtractionExtractionExtractionExtractionArbenetierg reaction activities and single tabelExtractionExtractionExtractionExtractionAssatantie taxonomy with transport activities and a single tabelExtractionExtractionExtractionAssatantie taxonomy with taatsing taxonomy with tabelsExtractionExtractionExtractionAssatantie taxonomy with tantsing taxonomy with tabelsExtractionExtractionExtractionAssatantie taxonomy with tabelsExtractionExtractionExtractionAssatantie taxonomy with tabelsExtractionExtractionExtractionAssatantie t	A green taxonomy with a single label plus a catalogue	Processing/transportation	Processing/transportation	Processing/transportation
RetoftingRetoftingRetoftingRetoftingAttraction green and transition taxonomy with single bel (at ick or coss) transition taxonomy with transition taxonomy with transition taxonomy with transition taxonomy with 	of energy efficiency measures	Electricity/heating/cooling generation	Electricity/heating/cooling generation	Electricity/heating/cooling generation
AttentionExtractionExtractionExtractionAttention textoromy transition textoromy single label (a tick or cross applies to all three trier)Forecssing/transportationForecssing/transportationSouthyrican Taxonomy transition textoromy with single label (a tick or cross applies to all three trier)ExtractionExtractionSouthyrican Taxonomy transition textory with apple taxonomy with single labelExtractionExtractionSouthyrican Taxonomy transition activities and single labelExtractionExtractionAttentingExtractionExtractionAttentingExtractionExtractionAsstatiable textoromy with oncry efficiency activities and a single labelExtractionExtractionAttentingExtractionExtractionExtractionAsstatiable textoromy with and a single labelExtractionExtractionAsstatiable textoromy textoringExtractionExtractionAsstatiable textoromy assisticationExtractionExtractionAsstatiable textoromy assisticationExtractionExtractionAsstatiable textoromy assisticationExtractionExtractionAsstatiable textoromy assisticationExtractionExtractionAsstatiable textoromy assisticationExtractionE		Retrofitting	Retrofitting	Retrofitting
Athree-tier green and transition taxonomy with single label (a tick or cross applies to all three tiers) Processing/transportation Processing/transportation South African Taxonomy Agreen taxonomy with single label Electricity/heating/cooling generation Electricity/heating/cooling generation Electricity/heating/cooling generation South African Taxonomy Agreen taxonomy with ansition activities and single label Electricity/heating/cooling generation Electricity/heating/cooling generation Electricity/heating/cooling generation Kazakhaf Taxonomy Agreen taxonomy with and a sustainable taxonomy with energy efficiency activities and a sustainable faxonomy and transition taxonomy with two separet labels Everaction Processing/transportation Processing/transportation Maximum Afficien Taxonomy asingle label Everaction Everaction Everaction Everaction Agreen and transition taxonomy with two separet Everaction Everaction Everaction Everaction Agreen and transition taxonomy with two separet Everaction Everaction Everaction Everaction	ASEAN Taxonomy	Extraction	Extraction	Extraction
Single label (a tick or cross apples to all three tiers)Electricity/heating/cooling generation RetrofittingElectricity/heating/cooling generation RetrofittingElectricity/heating/cooling generationSouth African Taxonomy A green taxonomy with ranstion activities and single labelExtractionExtractionExtractionKazakinan Extraction energy efficiency activities and a single labelExtractionExtractionExtractionKazakinan Extraction energy efficiency activities and a single labelExtractionExtractionExtractionKazakinan Extraction energy efficiency activities and a single labelExtractionExtractionProcessing/transportationRetrofittingExtractionExtractionExtractionProcessing/transportationRetrofittingExtractionExtractionExtractionExtractionYageen and transition taxonomy with two separate labelsExtractionExtractionExtractionRetrofittingExtractionExtractionExtractionExtractionProcessing/transportation a single labelExtractionExtractionExtractionRetrofittingExtractionExtractionExtractionExtractionProcessing/transportation a single labelExtractionExtractionExtractionRetrofittingExtractionExtractionExtractionExtractionRetrofittingExtractionExtractionExtractionExtractionRetrofittingExtractionExtractionExtractionRetrofittingExtrac	A three-tier green and transition taxonomy with a	Processing/transportation	Processing/transportation	Processing/transportation
applies to all three tiers)RetrofittingRetrofittingRetrofittingAgreen taxonomy with Agreen taxonomy with ranstion activities and a single labelExtractionExtractionExtractionAustractivities and a single labelExtractivity/heating/cooling generation RetrofittingExtractionExtractionKastahata Taxonomy A sustainable taxonomy with renergy efficiency activities and a single labelExtractionExtractionExtractionKastahabel taxonomy energy efficiency activities and a single labelExtractionExtractionProcessing/transportationProcessing/transportationMathematican Strategy activity/heating/cooling generationExtractionExtractionExtractionAustraliabel taxonomy energy efficiency activities and a single labelExtractionExtractionExtractionMathematican Strategy activity/heating/cooling generationExtractionExtractionExtractionAgreen and transfor apprention asingle labelExtractionExtractionExtractionNation Agreen at axonomy with that sociang/transportationExtractionExtractionExtractionAgreen at axonomy with tayseng/transportationExtractionExtractionExtractionAgreen at axonomy with tayseng/transportationExtractionExtractionExtractionAgreen at axonomy with tayseng/transportationExtractionExtractionExtractionAgreen at axonomy with tayseng/transportationExtractionExtractionExtractionAgreen at axonomy with t	single label (a tick or cross	Electricity/heating/cooling generation	Electricity/heating/cooling generation	Electricity/heating/cooling generation
South African Taxonomy A green taxonomy with transition activities and a single labelExtractionExtractionExtractionAgreen taxonomy with ransition activities and single labelElectricity/heating/cooling generationElectricity/heating/cooling generationElectricity/heating/cooling generationKazakhstan Taxonomy A sustainable taxonomy with and a single labelExtractionExtractionExtractionRetrofittingExtractionProcessing/transportationProcessing/transportationProcessing/transportationRetrofittingRetrofittingRetrofittingRetrofittingThalland Taxonomy taxonomy with labelsExtractionExtractionElectricity/heating/cooling generationRetrofittingRetrofittingRetrofittingRetrofittingThalland Taxonomy A green and transition taxonomy with labelsExtractionProcessing/transportationProcessing/transportationRetrofittingExtractionProcessing/transportationProcessing/transportationProcessing/transportationRetrofittingRetrofittingRetrofittingRetrofittingMexican Taxonomy a green taxonomy with a single labelExtractionProcessing/transportationProcessing/transportationSoutifies and single labelExtractionExtractionElectricity/heating/cooling generationRetrofittingRetrofittingRetrofittingRetrofittingAgreen at taxonomy with as single labelExtractionProcessing/transportationProcessing/transportationRetrofittingRetrofitting <t< td=""><td>applies to all three tiers)</td><td>Retrofitting</td><td>Retrofitting</td><td>Retrofitting</td></t<>	applies to all three tiers)	Retrofitting	Retrofitting	Retrofitting
Agreen taxonomy with transition activities and a single labelProcessingProcessingProcessingisingle labelElectricity/heating/cooling generationElectricity/heating/cooling generationElectricity/heating/cooling generationKazakhstan Taxonomy A sustainable taxonomy with energy efficiency activitiesExtractionExtractionExtractionA sustainable taxonomy with energy efficiency activitiesExtractionExtractionProcessing/transportationA sustainable taxonomy with energy efficiency activitiesExtractionElectricity/heating/cooling generationElectricity/heating/cooling generationA green and transition taxonomy with two separate labelsExtractionRetrofittingElectricity/heating/cooling generationKexican Taxonomy A green taxonomy with a single labelExtractionElectricity/heating/cooling generationElectricity/heating/cooling generationKexican Taxonomy a single labelExtractionElectricity/heating/cooling generationElectricity/heating/cooling generationMexican Taxonomy taxonomy with a single labelExtractionElectricity/heating/cooling generationElectricity/heating/cooling generationMexican Taxonomy taxonomy with ta single labelExtractionElectricity/heating/cooling generationElectricity/heating/cooling generationMexican Taxonomy taxonomy with ta single labelExtractionElectricity/heating/cooling generationElectricity/heating/cooling generationMexican Taxonomy taxonomy with ta single labelExtractionElectricity/heating/cooling generationElec	South African Taxonomy A green taxonomy with transition activities and a single label	Extraction	Extraction	Extraction
single labelElectricity/heating/cooling generationElectricity/heating/cooling generationElectricity/heating/cooling generationKazakhstan Taxonomy Asushiahble taxonomy with energy efficiency activitiesExtractionExtractionExtractionProcessing/transportationProcessing/transportationProcessing/transportationProcessing/transportationAustainable taxonomy energy efficiency activitiesExtractionElectricity/heating/cooling generationElectricity/heating/cooling generationArefolitingRetrofittingExtractionExtractionExtractionArgeen and transition taxonomy with two separation alselsExtractionProcessing/transportationProcessing/transportationMaterian Station taxonomy with a single labelExtractionRetrofittingRetrofittingMaterian Station tayonomy with a single labelExtractionExtractionProcessing/transportationMaterian Station 		Processing	Processing	Processing
RetrofittingRetrofittingRetrofittingRetrofittingKazakhstan Taxonomy A sustainable taxonomy with energy efficiency activities and a single labelExtractionProcessing/transportationProcessing/transportationInterrop efficiency activities energy efficiency activities and a single labelExtractionExtractionExtractionRetrofittingRetrofittingRetrofittingRetrofittingThailand Taxonomy A green and transition taxonomy with two separate labelsExtractionExtractionExtractionRetrofittingExtractionExtractionProcessing/transportationProcessing/transportationA green and transition taxonomy with a single labelExtractionExtractionRetrofittingRetrofittingExtractionExtractionExtractionExtractionRetrofittingExtractionExtractionExtractionExtractionA green taxonomy with a single labelExtractionExtractionExtractionSouthorem Taxonomy A sustainable finance taxonomy with transition extractionExtractionExtractionExtractionSouthorem Taxonomy A sustainable finance taxonomy with transition atomine tabelExtractionExtractionExtractionSouthorem Taxonomy A sustainable finance taxonomy with transition atomine tabelExtractionExtractionExtractionSouthorem Taxonomy tay and a single compliance labelExtractionExtractionExtractionFittingExtractionExtractionExtractionExtracti		Electricity/heating/cooling generation	Electricity/heating/cooling generation	Electricity/heating/cooling generation
Kazakhstan Taxonomy A sustainable taxonomy with energy efficiency activities and a single labelExtractionExtractionProcessing/transportationProcessing/transportationProcessing/transportationI certicity/heating/cooling generationElectricity/heating/cooling generationElectricity/heating/cooling generationElectricity/heating/cooling generationThailand Taxonomy A green and transition axonomy with two separate labelsExtractionRetrofittingRetrofittingMerofittingExtractionProcessing/transportationProcessing/transportationProcessing/transportationProcessing/transportationProcessing/transportationElectricity/heating/cooling generationElectricity/heating/cooling generationMerofittingRetrofittingRetrofittingMargen taxonomy with a single labelExtractionProcessing/transportationProcessing/transportationMargen taxonomy with a single labelExtractionExtractionExtractionMargen taxonomy with a single labelExtractionExtractionExtractionMargen taxonomy with a single labelExtractionElectricity/heating/cooling generationElectricity/heating/cooling generationMargen taxonomy with a single labelExtractionElectricity/heating/cooling generationElectricity/heating/cooling generationMargen taxonomy with a single labelExtractionElectricity/heating/cooling generationElectricity/heating/cooling generationMargen taxonomy with a single labelElectricity/heating/cooling generationElectricity/heating/cooling generat		Retrofitting	Retrofitting	Retrofitting
Assistanable taxonomy with energy efficiency activities and a single label and a single label efficiency activities and a single labelProcessing/transportationProcessing/transportationProcessing/transportationRetrofittingRetrofittingRetrofittingRetrofittingThailand Taxonomy Agreen and transition taxonomy with two separate labelsExtractionExtractionExtractionProcessing/transportation taxonomy with two separate labelsExtractionProcessing/transportationProcessing/transportationMetrofittingRetrofittingRetrofittingRetrofittingAgreen taxonomy with a single labelExtractionExtractionExtractionProcessing/transportationProcessing/transportationProcessing/transportationAgreen taxonomy with a single labelExtractionExtractionExtractionProcessing/transportationElectricity/heating/cooling generationElectricity/heating/cooling generationRetrofittingRetrofittingRetrofittingRetrofittingSouth Korean Taxonomy a single labelElectricity/heating/cooling generationElectricity/heating/cooling generationSouth Korean Taxonomy Asustainable finance taxonomy with transition activities but a single compliance labelElectricity/heating/cooling generationProcessing/transportationProcessing/transportationElectricity/heating/cooling generationProcessing/transportationElectricity/heating/cooling generationSouth Korean Taxonomy taxonomy with transition activities but a single faronomy (draft) Agreen and transiti	Kazakhstan Taxonomy	Extraction	Extraction	Extraction
and a single labelElectricity/heating/cooling generationElectricity/heating/cooling generationElectricity/heating/cooling generationRetrofittingRetrofittingRetrofittingRetrofittingA green and transition taxonomy with two separate labelsExtractionExtractionExtractionRetrofittingForcessing/transportationProcessing/transportationElectricity/heating/cooling generationElectricity/heating/cooling generationMexican Taxonomy A green taxonomy with a single labelExtractionExtractionExtractionExtractionRetrofittingRetrofittingElectricity/heating/cooling generationElectricity/heating/cooling generationElectricity/heating/cooling generationMexican Taxonomy A green taxonomy with a single labelExtractionElectricity/heating/cooling generationElectricity/heating/cooling generationNexican Taxonomy with ransition a single labelExtractionProcessing/transportationProcessing/transportationNotatianable finance taxonomy with transition activities but a single compliance labelExtractionElectricity/heating/cooling generationSingapore-Asia Faxonomy (draft) A green and transition taxonomy with transition taxonomy with transition taxonomy with transition taxonomy with transition taxonomy with two separate labelsExtractionElectricity/heating/cooling generationFinderitingRetrofittingRetrofittingRetrofittingRetrofittingSingapore-Asia Faxonomy with two separate labelsExtractionElectricity/heating/cooling generation	A sustainable taxonomy with energy efficiency activities	Processing/transportation	Processing/transportation	Processing/transportation
Indianal sectorRetrofittingRetrofittingRetrofittingArgeen and transition axonomy with two separate labelsExtractionExtractionExtractionProcessing/transportationProcessing/transportationIelectricity/heating/cooling generationIelectricity/heating/cooling generationRetrofittingRetrofittingRetrofittingRetrofittingMaxican Taxonomy a single labelExtractionExtractionExtractionProcessing/transportationForcessing/transportationProcessing/transportationProcessing/transportationProcessing/transportationElectricity/heating/cooling generationElectricity/heating/cooling generationElectricity/heating/cooling generationSouth Korean Taxonomy 	and a single label	Electricity/heating/cooling generation	Electricity/heating/cooling generation	Electricity/heating/cooling generation
Failand Taxonomy Agreen and transition taxonomy with two separate belowsExtractionExtractionExtractionProcessing/transportation taxonomy with two separate belowsProcessing/transportationProcessing/transportationProcessing/transportationRetrofitingRetrofittingRetrofittingRetrofittingMexican Taxonomy Agreen taxonomy with a single labelExtractionExtractionExtractionProcessing/transportation taing/cooling generationProcessing/transportationProcessing/transportationRetrofittingRetrofittingRetrofittingRetrofittingSouth Korean Taxonomy with tais single labelExtractionRetrofittingRetrofittingRetrofittingRetrofittingRetrofittingRetrofittingSouth Korean Taxonomy with transition actionProcessing/transportationProcessing/transportationProcessing/transportationSouth Korean Taxonomy with transition actionExtractionRetrofittingRetrofittingRetrofittingRetrofittingRetrofittingRetrofittingSouth Korean Taxonomy with transition actionProcessing/transportationProcessing/transportationProcessing/transportationProcessing/transportationProcessing/transportationRetrofitingRetrofitingRetrofitingRetrofitingRetrofitingRetrofitingRetrofitingRetrofitingProcessing/transportationProcessing/transportationProcessing/transportationRetrofitingRetrofitingRetrofitingRetrof		Retrofitting	Retrofitting	Retrofitting
A green and transition taxonomy with two separate labelsProcessing/transportationProcessing/transportationProcessing/transportationIntervention lectricity/heating/cooling generationIelectricity/heating/cooling generationIelectricity/heating/cooling generationIelectricity/heating/cooling generationMexican Taxonomy A green taxonomy with a single labelExtractionExtractionExtractionProcessing/transportationProcessing/transportationProcessing/transportationProcessing/transportationNotesting/tabelExtractionProcessing/transportationIelectricity/heating/cooling generationIelectricity/heating/cooling generationSouth Korean Taxonomy activities but a single compliance labelExtractionIelectricity/heating/cooling generationIelectricity/heating/cooling generationSingapore-Asia Taxonomy (draft) spearate labelsExtractionIelectricity/heating/cooling generationIelectricity/heating/cooling generationSingapore-Asia taxonomy with two separate labelsExtractionExtractionIelectricity/heating/cooling generationSingapore-Asia taxonomy with two separate labelsExtractionExtractionIelectricity/heating/cooling generationRetrofittingExtractionExtractionExtractionIelectricity/heating/cooling generationSingapore-Asia taxonomy with two separate labelsExtractionIelectricity/heating/cooling generationRetrofittingExtractionExtractionIelectricity/heating/cooling generationSingapore-Asia taxonomy with two separate labels <td< td=""><td>Thailand Taxonomy</td><td>Extraction</td><td>Extraction</td><td>Extraction</td></td<>	Thailand Taxonomy	Extraction	Extraction	Extraction
LabelsElectricity/heating/cooling generationElectricity/heating/cooling generationRetrofitingRetrofitingRetrofitingMexican Taxonomy A green taxonomy with a single labelExtractionExtractionProcessing/transportationProcessing/transportationProcessing/transportationRetrofittingRetrofittingRetrofittingRetrofittingRetrofittingRetrofittingSouth Korean Taxonomy activities but a single compliance labelExtractionRetrofittingRetrofittingRetrofittingRetrofittingRetrofittingRetrofittingRetrofittingSingapore-Asia taxonomy with two separent labelsExtractionRetrofittingRetrofittingRetrofittingRetrofittingRetrofittingProcessing/transportationProcessing/transportationRetrofittingRetrofittingRetrofittingRetrofittingRetrofittingRetrofittingRetrofittingRetrofittingRetrofittingRetrofittingRetrofittingRetrofittingRetrofittingProcessing/transportationProcessing/transportationRetrofittingRetrofittingRetrofittingRetrofittingProcessing/transportationProcessing/transportationRetrofittingRetrofittingRetrofittingRetrofittingProcessing/transportationProcessing/transportationRetrofittingProcessing/transportationProcessing/transportationRetrofittingProcessing/transportationProcessing/transportation<	A green and transition taxonomy with two separate labels	Processing/transportation	Processing/transportation	Processing/transportation
RetrofittingRetrofittingRetrofittingMexican Taxonomy Agreen taxonomy with a single labelExtractionExtractionExtractionProcessing/transportationProcessing/transportationProcessing/transportationProcessing/transportationExtraction/Lectricity/heating/cooling generationElectricity/heating/cooling generationRetrofittingSouth Korean Taxonomy axonomy with transition activities but a single compliance labelExtractionExtractionFinance taxonomy with transition 		Electricity/heating/cooling generation	Electricity/heating/cooling generation	Electricity/heating/cooling generation
Mexican Taxonomy A green taxonomy with a single labelExtractionExtractionExtractionExtractionA green taxonomy with a single labelProcessing/transportationProcessing/transportationProcessing/transportationEctricity/heating/cooling generationEctricity/heating/cooling generationEctricity/heating/cooling generationEctricity/heating/cooling generationEctricity/heating/cooling generationSouth Korean Taxonomy A sustainable finance taxonomy with transition activities but a single compliance labelExtractionExtractionExtractionForcessing/transportation Compliance labelExtractionEctricity/heating/cooling generationProcessing/transportationProcessing/transportationSingapore-Asia Taxonomy (drath) A green and transition taxonomy with two separate labelsExtractionExtractionExtractionForcessing/transportation taxonomy with two separate labelsExtractionExtractionExtractionRetrofittingRetrofittingProcessing/transportationProcessing/transportationForcessing/transportation taxonomy with two separate labelsExtractionExtractionRetrofittingProcessing/transportationProcessing/transportationProcessing/transportationRetrofittingProcessing/transportationProcessing/transportationProcessing/transportationArgeen and transition taxonomy with two separate labelsEctricity/heating/cooling generationEctricity/heating/cooling generationRetrofittingRetrofittingProcessing/transportationEctricity/h		Retrofitting	Retrofitting	Retrofitting
A green taxonomy with a single labelProcessing/transportationProcessing/transportationProcessing/transportationa single labelElectricity/heating/cooling generationElectricity/heating/cooling generationElectricity/heating/cooling generationRetrofittingRetrofittingRetrofittingRetrofittingSouth Korean Taxonomy A sustainable finance taxonomy with transition activities but a single compliance labelExtractionExtractionFrocessing/transportationProcessing/transportationProcessing/transportationProcessing/transportationSingapore-Asia Taxonomy (draft) A green and transition taxonomy with two separate labelsExtractionExtractionExtractionRetrofittingProcessing/transportationProcessing/transportationProcessing/transportationBectricity/heating/cooling generation taxonomy with two separate labelsExtractionExtractionRetrofittingRetrofittingProcessing/transportationProcessing/transportationRetrofittingProcessing/transportationProcessing/transportationProcessing/transportationRetrofittingRetrofittingProcessing/transportationProcessing/transportationProcessing/transportationProcessing/transportationProcessing/transportationProcessing/transportationRetrofittingProcessing/transportationProcessing/transportationProcessing/transportationProcessing/transportationProcessing/transportationProcessing/transportationProcessing/transportationRetrofittingRetrofitting <t< td=""><td rowspan="4">Mexican Taxonomy A green taxonomy with a single label</td><td>Extraction</td><td>Extraction</td><td>Extraction</td></t<>	Mexican Taxonomy A green taxonomy with a single label	Extraction	Extraction	Extraction
Electricity/heating/cooling generationElectricity/heating/cooling generationElectricity/heating/cooling generationRetrofittingRetrofittingRetrofittingRetrofittingSouth Korean Taxonomy A sustainable finance taxonomy with transition activities but a single compliance labelExtractionExtractionExtractionProcessing/transportationElectricity/heating/cooling generationElectricity/heating/cooling generationProcessing/transportationSingapore-Asia Taxonomy (draft) A green and transition 		Processing/transportation	Processing/transportation	Processing/transportation
RetrofittingRetrofittingRetrofittingRetrofittingSouth Korean Taxonomy A sustainable finance taxonomy with transition activities but a single compliance labelExtractionExtractionExtractionProcessing/transportationProcessing/transportationProcessing/transportationProcessing/transportationSingapore-Asia Taxonomy (draft) A green and transition separate labelsExtractionExtractionExtractionRetrofittingProcessing/transportationProcessing/transportationExtractionRetrofittingProcessing/transportationProcessing/transportationProcessing/transportationRetrofittingProcessing/transportationProcessing/transportationProcessing/transportationRetrofittingRetrofittingProcessing/transportationProcessing/transportationRetrofittingRetrofittingRetrofittingRetrofitting		Electricity/heating/cooling generation	Electricity/heating/cooling generation	Electricity/heating/cooling generation
South Korean Taxonomy A sustainable finance taxonomy with transition activities but a single compliance labelExtractionExtractionExtractionProcessing/transportation compliance labelProcessing/transportation Electricity/heating/cooling generationProcessing/transportation Electricity/heating/cooling generationElectricity/heating/cooling generation Electricity/heating/cooling generationSingapore-Asia Taxonomy (draft) Agreen and transition taxonomy with two separate labelsExtractionExtractionExtractionImage: Processing/transportation Electricity/heating/cooling generation RetrofittingProcessing/transportationProcessing/transportationImage: Processing/transportation Electricity/heating/cooling generation RetrofittingProcessing/transportationElectricity/heating/cooling generationRetrofittingRetrofittingRetrofittingRetrofittingRetrofitting		Retrofitting	Retrofitting	Retrofitting
Assistanable finance taxonomy with transition activities but a single compliance labelProcessing/transportationProcessing/transportationProcessing/transportationElectricity/heating/cooling generation compliance labelElectricity/heating/cooling generationElectricity/heating/cooling generationElectricity/heating/cooling generationSingapore-Asia Taxonomy (draft) A green and transition taxonomy with two separate labelsExtractionExtractionExtractionElectricity/heating/cooling generation taxonomy with two separate labelsElectricity/heating/cooling generationElectricity/heating/cooling generationRetrofittingRetrofittingProcessing/transportationProcessing/transportationRetrofittingRetrofittingRetrofittingRetrofittingRetrofittingRetrofitting	South Korean Taxonomy A sustainable finance taxonomy with transition	Extraction	Extraction	Extraction
activities but a single compliance labelElectricity/heating/cooling generationElectricity/heating/cooling generationRetrofittingRetrofittingRetrofittingRetrofittingSingapore-Asia Taxonomy (draft) A green and transition taxonomy with two separate labelsExtractionExtractionExtractionRetrofittingProcessing/transportationProcessing/transportationProcessing/transportationProcessing/transportationRetrofittingRetrofittingRetrofittingRetrofittingRetrofitting		Processing/transportation	Processing/transportation	Processing/transportation
Compliance tabelRetrofittingRetrofittingRetrofittingSingapore-Asia Taxonomy (draft) A green and transition taxonomy with two separate labelsExtractionExtractionExtractionProcessing/transportation taxonomy with two separate labelsProcessing/transportationProcessing/transportationProcessing/transportationRetrofittingRetrofittingRetrofittingRetrofittingRetrofitting	activities but a single	Electricity/heating/cooling generation	Electricity/heating/cooling generation	Electricity/heating/cooling generation
Singapore-AsiaExtractionExtractionTaxonomy (draft)Processing/transportationProcessing/transportationProcessing/transportationA green and transition taxonomy with two separate labelsElectricity/heating/cooling generationElectricity/heating/cooling generationElectricity/heating/cooling generationRetrofittingRetrofittingRetrofittingRetrofitting	compliance label	Retrofitting	Retrofitting	Retrofitting
Laxonomy (drart) A green and transition taxonomy with two separate labelsProcessing/transportationProcessing/transportationProcessing/transportationRetrofittingElectricity/heating/cooling generationElectricity/heating/cooling generationElectricity/heating/cooling generation	Singapore-Asia Taxonomy (draft) A green and transition taxonomy with two separate labels	Extraction	Extraction	Extraction
taxonomy with two separate labelsElectricity/heating/cooling generationElectricity/heating/cooling generationElectricity/heating/cooling generationRetrofittingRetrofittingRetrofittingRetrofitting		Processing/transportation	Processing/transportation	Processing/transportation
Retrofitting Retrofitting Retrofitting Retrofitting		Electricity/heating/cooling generation	Electricity/heating/cooling generation	Electricity/heating/cooling generation
		Retrofitting	Retrofitting	Retrofitting

igible and non-compliant 🛛 🚺 Eligible with additional criteria (impossible or vei

Eligible with additional criteria (easy to meet)

Eligible and compliant with minimal or no criteria

The EU Taxonomy gas criteria

The inclusion of fossil gas criteria in the European Taxonomy in early 2022 raised serious concerns among the international climate community, not least the risk



that many developing countries might follow this lead by diluting requirements to allow gas-fired generation to be classified as green. When the first draft was published in June 2020, fossil gas-related activities were not in scope. It was the adoption of a subsequent Complementary Climate Delegated Act that permitted the inclusion of two fossil gas-related activities: activity 4.29 Electricity generation from fossil gaseous fuels and activity 4.30 High-efficiency co-generation of heat/cool and power from fossil gaseous fuels.¹¹ When these activities were included under a transitional category of the Taxonomy Regulation, the justification provided by the European Commission was that it would 'allow us to accelerate the shift from more polluting activities, such as coal generation, towards a climate-neutral future, mostly based on renewable energy sources.'12

Fortunately, the criteria for these two activities are so specific and limiting in nature, that it is unlikely that any green financial products will align with the requirements. The criteria specify that the activity in question must comply with either a 100g CO₂e/kWh threshold or comply with all requirements on an extensive list, which includes a 270g CO2e/kWh threshold (alternatively 550kg CO₂e/kWh on average over 20 years). The threshold of 100 gCO₂/kWh lifecycle emissions as well as the threshold of 270 gCO₂e/ kWh of direct (scope 1) emissions are currently unachievable by gas-powered plants unless fitted with additional CCS/CCUS installations. Current best-in-class combined-cycle gas turbines (CCGT) have direct emissions of approximately 320-350g CO₂/KWh (see Figure 2) to achieve lower emissions than currently possible through further efficiency gains via H2 blending or with CCS. Realworld emissions can be much higher.

Figure 2. Specific emissions from electricity generation, considering leakages



Detailed 2022 data on the emissions intensity of different types of fossil fuels, calculated by the German Federal Agency for Environmental Protection, clearly shows direct CO₂ emissions from natural gas in relation to the primary energy content of around 358g CO₂e/kWh.¹³ The average efficiency of modern fossil gas power plants (based on German data) varies between 39% (turbine) and 59% (CCGT).¹⁴ Consequently, the real emissions intensity of these types of installations fluctuates from 512–340 gCO₂/kWh of direct emissions respectively.¹⁵ The United Nations Economic Convention for Europe gives similar numbers: 434 gCO₂e/kWh on average of direct emissions for unabated gas power plants (CCGT) and 128 gCO₂e/ kWh for natural gas plants (CCGT) with CCS.¹⁶

Importantly, the first entry within the EU Taxonomy fossil gas criteria limits emissions not only to 100g CO2e/kWh but also on a lifecycle (LCA) basis, which requires taking account of the emissions during fossil gas extraction, transportation, storage, and utilisation. This makes it challenging for any company to comply with the EU Taxonomy gas generation criteria without deploying the most up-to-date CCS installations. Research conducted by the Institute for Energy Economics and Financial Analysis estimates the levelised cost of energy for gas with CCS power plants to be significantly higher than that of ordinary gas power plants and almost two times above current alternatives such as renewable energy plus storage.17

Although the alternative average annual direct emissions threshold of 550kg CO₂e/kW of capacity over 20 years initially appears feasible, it still creates investment risk. Compliance with the threshold requires a justified projection of future emissions that together add up to 550gCO₂e/kWh on average over the 20-year horizon, which may not be demonstrable. Even if it were (many financial professionals question its feasibility) the owner of the activity is also required to prove compliance with a further eight requirements.¹⁸ As a consequence, these obligations make the project so expensive and cumbersome (no existing gas-powered plant meeting the requirements was identified at the time of writing) that the taxonomy can hardly be called gas-friendly.

Outlook

While the debate continues on the future phase-out of the harmful climate effects related to oil and coal, fossil gas has been perceived as a safer and cleaner fuel.



However, increasing atmospheric concentrations of methane emitted in huge quantities during the extraction and utilisation of fossil fuels highlights the risks that this poses to the energy transition and climate goals of the Paris Agreement. Methane accounts for 12% of GHG emissions and is shorterlived than CO_2 but is 84 times more potent in its ability to absorb heat over a 20-year period.¹⁹ Fossil fuels are not only a climate problem, but also a political one, given that Russia was the largest supplier of natural gas imports to the EU before 2022.²⁰ This underlines the need to transition away from fossil energy sources to renewables and increase energy efficiency measures through the adoption of credible transition plans.

Endnotes

- https://www.noaa.gov/news-release/greenhouse-gases-continuedto-increase-rapidly-in-2022
 https://www.scientificamerican.com/article/methane-leaks-erasesome-of-the-climate-benefits-of-natural-gas/
 https://fafca/custom/uploads/2022/05/TAF_Fugitive-methaneguidelines_2022-2.pdf
 https://seas.harvard.edu/news/2023/02/methanes-role-climatechange#-retx=hand%20because%2006%20its%20chemical.only%20 about%2010%E2%80%9320%20years.
- 5. https://www.volker-quaschning.de/datserv/CO2-spez/index_e.php 6. https://www.volker-quaschning.de/datserv/CO_-spez/index_e.php
- 7. https://iopscience.iop.org/article/10.1088/1748-9326/ace3db/pdf

<u>https://www.scientificamerican.com/article/methane-leaks-erase-some-of-the-climate-benefits-of-natural-gas/</u>
<u>https://www.climatebonds.net/files/page/files/cbi_</u>

gaspolicy_2022_01d.pdf

10. https://cpree.princeton.edu/news/2023/uk-substantiallyunderestimates-its-methane-emissions-oil-and-gas-production 11. https://eur-lex.europa.eu/legal-content/EN/ TXT/Turi=urisery.OJL_2022.188.01.0001.01 ENG

12. https://ec.europa.eu/commission/presscorner/detail/en/ip_22_711

13. https://www.olker-quaschning.de/datserv/CO_spez/index_e.php 14. Combined cycle gas turbine, a more modern and effective version of fossil gas power generation device

15. Ibid.

16. https://unece.org/sites/default/files/2022-04/LCA_3_FINAL%20 March%202022.pdf

17. https://ieefa.org/resources/ccs-power-yet-stack-against-alternatives 18. https://clarity.ai/research-and-insights/eu-taxonomy-how-toreport-on-fossil-gas-related-activities/

19. https://www.climatebonds.net/climate-change-101

20. https://www.euronews.com/green/2023/02/24/europes-energywar-in-data-how-have-eu-imports-changed-since-russias-invasionof-ukraine



Prepared by the Climate Bonds Initiative

Authors: Mikhail Korostikov and Bridget Boule

Editorial support: Stephanie Edghill, Caroline Harrison

Design: Godfrey Design, Joel Milstead

© Published by Climate Bonds Initiative, November 2023

www.climatebonds.net



This report was produced by Climate Bonds in consultation with and support from the Insurance Bureau of Canada

Disclaimer: The information contained in this communication does not constitute investment advice in any form and the Climate Bonds Initiative is not an investment adviser. Any reference to a financial organisation or debt instrument or investment product is for information purposes only. Links to external websites are for information purposes only. The Climate Bonds Initiative accepts no responsibility for content on external websites. The Climate Bonds Initiative is not endorsing, recommending or advising on the financial merits or otherwise of any debt instrument or investment product and no information within this communication should be taken as such, nor should any information in this communication be relied upon in making any investment decision. Certification under the Climate Bond Standard only reflects the climate attributes of the use of proceeds of a designated debt instrument. It does not reflect the credit worthiness of the designated debt instrument, nor its compliance with national or international laws. A decision to invest in anything is solely yours. The Climate Bonds Initiative accepts no inpart on any information contained within this, or any other Climate Bonds Initiative public communication.