ASSESSING GHG IMPACTS OF NEW NATURAL GAS SUPPLIES

European Bank
for Reconstruction and Development

CARBON LIMITS

Note on concept methodology

Contents

Introduction

The attractiveness of natural gas over coal and oil resources, in terms of efficiency, local pollution and lower greenhouse gas emissions (GHG) has led to dramatic increases in supply in recent decades. The IPCC has even suggested that high-efficiency natural gas power, using combined cycle gas turbines, could be a “bridge technology” in the global transition to a low-carbon economy[1]. At the same time, construction of gas infrastructure may not only displace coal and oil, but could also potentially “lock out” other lower emission alternatives such as renewables, given the long lifetimes of power plants and industrial equipment, as well as the institutional momentum created by large investments and dominant technologies. Given the objectives of the Paris Agreement to hold global temperature increases to well below 2°C and reach zero net GHG emissions in the second half of this century, investing in new gas supply must strike a delicate balance between slowing the rate of coal use while not “locking in” fossil fuel production to the detriment of low emission energy sources.

The purpose of this note is to provide input to a generic methodology for assessing whether new natural gas supply and infrastructure projects are likely to result in net GHG emissions savings. This note follows an empirical study done for EBRD on the GHG impacts of bringing 16 billion cubic meters of gas per annum from the Caspian Sea to Turkey and Europe through the so-called Southern Gas Corridor (hereafter the “SGC Study” or “Study”). The analytical approach applied for the Study is the basis for the considerations presented in this note.

The Study shows that the GHG impacts of new gas supplies are very sensitive to assumptions made on market developments and structures, and on current and future political and regulatory frameworks. The Study concludes that emission reductions under reasonable assumptions are significant, but may with certain (extreme) assumptions be negative (i.e. higher emissions). This range of outcomes can be even larger for other geographies and political conditions than those explored for the SGC Study.

For good reasons, therefore, new gas supplies are not explicitly included in the “List of activities eligible for classification as climate mitigation finance” in the “Joint Methodology for Tracking Climate Finance” developed by multilateral development banks (MDBs). This list, however, includes a miscellaneous category (10.1) called “Other activities with net greenhouse gas emission reduction”, under which gas supplies activities might fit. Category 10.1 states that, *“Any other activity if agreed by the MDBs may be added to the Joint Typology of Mitigation Activity when the results of ex-ante GHG accounting (undertaken according to commonly agreed methodologies) show emission reductions that are higher than a commonly agreed threshold”.*

This note and the empirical results of the SGC Study will hopefully provide relevant input to determine under what conditions the activity “new gas supplies” might fit under category 10.1. Prior to a discussion of the issue, the next section provides an overview of the analytical approach chosen for the SGC Study.

[1] Edenhofer, et al., eds. Climate Change 2014. Mitigation of Climate Change. Contribution of Working Group III to the Fifth Assessment Report of the IPCC. Cambridge, United Kingdom and New York, NY, USA: Cambridge University Press, 2014.

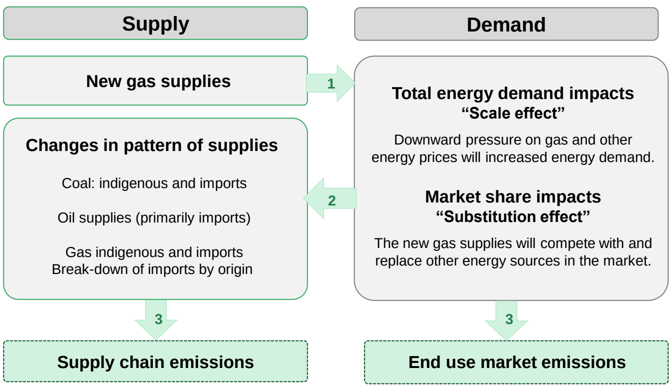
Chapter 1
The analytical approach for calculating GHG impacts

At the facility-level, natural gas can reduce GHG emissions by up to 50% compared to coal, depending on the end-use and sector. Savings in the power sector are the largest, with typical savings up to 50%, even when considering the upstream emissions from natural gas production (discussed below). Gains in industry are lower, with savings of 14% versus oil and 23% versus coal, while savings in the transport sector are even lower, and potentially negative.

The GHG impacts considered in the SGC Study were not limited to a specific plant or market segment, but covered the broader market ramifications of new gas supplies. This implied broad sectoral and geographical boundaries and a relatively long time horizon. This broad scope makes scenario analysis the most suitable approach. The basis for analysing impacts is a reference scenario for energy market developments covering a defined time period, including a description of the key factors that shape future energy supply and demand patterns. GHG emission impacts are then calculated on the basis of an analysis of how the energy market reference scenario changes in response to additional gas supplies entering the market.

The impacts are shown schematically in Figure 1.

Figure 1: Analytical framework for GHG emission calculations



The sequential order of presenting impacts shown in the figure, is of, course a simplification of the actual supply - demand interactions in a real market, but helps in presenting the main categories of impacts that are of relevance here:

1. Consistent with standard economic theory, new and additional gas supplies have the potential to lower gas prices, and subsequently influence other energy sources that compete with gas. This has two effects in the market; a so-called "scale effect", which is an increase in total consumption in response to lower end-use energy prices, and a "substitution effect", which is a change in the consumption patterns as the price reduction changes the market shares of different energy sources. Natural gas will typically increase its market share at the expense of coal and oil. Another part of the substitution effect, which is important for the impacts to be analyzed here, is the potential competition between gas and low carbon alternatives such as renewables[2]. This could contribute to higher emissions of GHGs.
2. Changes in energy supply options and consumption will alter energy supply patterns. Existing domestic and imported supplies will be affected, and the composition of imports by origin will also change when the new gas supplies enter the market. Changes in supply patterns lead to changes in GHG emissions because supply chain emission factors can vary significantly by source & origin of supplies.
3. The final step of the analysis is to estimate the emission impacts once the changes in end-use

[2] Renewable energy sources such as solar, wind and bio-energy are not the only low carbon sources that typically have lower emission of GHGs than gas, but they are the sources that are expected in the future to be in direct competition with gas. Investments in nuclear, large hydro power and geothermal are considered to be driven by political decisions and therefore less relevant for the "lock-in effects" discussed here.

markets and the energy supply chains have been quantified. Calculating emission impacts in energy markets is straightforward using standard emission factors for fuels and grid emission factors for electricity. Supply chain emission impact calculations are much more complex and have high uncertainty since there is no standard conversion from energy transported to supply chain emissions; the emissions happen at a variety of emission points along the supply chain and show large differences among different sources of supplies.

Two factors may contribute to increased emissions when new natural gas is supplied to a market: the scale effect, which could increase emissions by increasing consumption; and the lock-in of gas supplies at the expense of investments in renewable energy sources. In the short-term, the scale effect is normally easier to assess that the lock-in effect, because the latter will grow in importance as renewable energy sources become more competitive on a purely commercial basis. As mentioned above, current supply chain emission factors are uncertain, which makes it hard to estimate supply chain emissions. This is made worse by the difficulties in assumptions on how emission factors for a specific supply chain may develop over time. As the SGC Study showed, there are major differences in emissions per unit energy from the SGC supply chain compared to existing Russian gas supply chains. Uncertainty about the development of energy supply patterns (by origin) adds to the complications of estimating supply chain emission impacts.

In principle all these impacts can be calculated within the framework of a comprehensive energy-economic model with cost structures and price responsiveness of energy supplies by source and origin, and demand by sector and energy source. Such models exist and might be used for this purpose, but they may not have the details and flexibility required for analysing the specific case in question, and/or the time and resources required to implement necessary model modifications might be too large.

For the SGC Study, an excel-based energy model was used with a demand side representation of gas and competing fuels, but without built in (endogenous) economic behaviour for investment decisions and short-term fuel choices. The model was primarily an accounting tool that captured key energy flows in three energy markets, including the efficiency of energy conversion and some aspects of “economic behaviour”.

Chapter 2
Elements of a methodology for assessing net GHG impacts

2.1 Overview

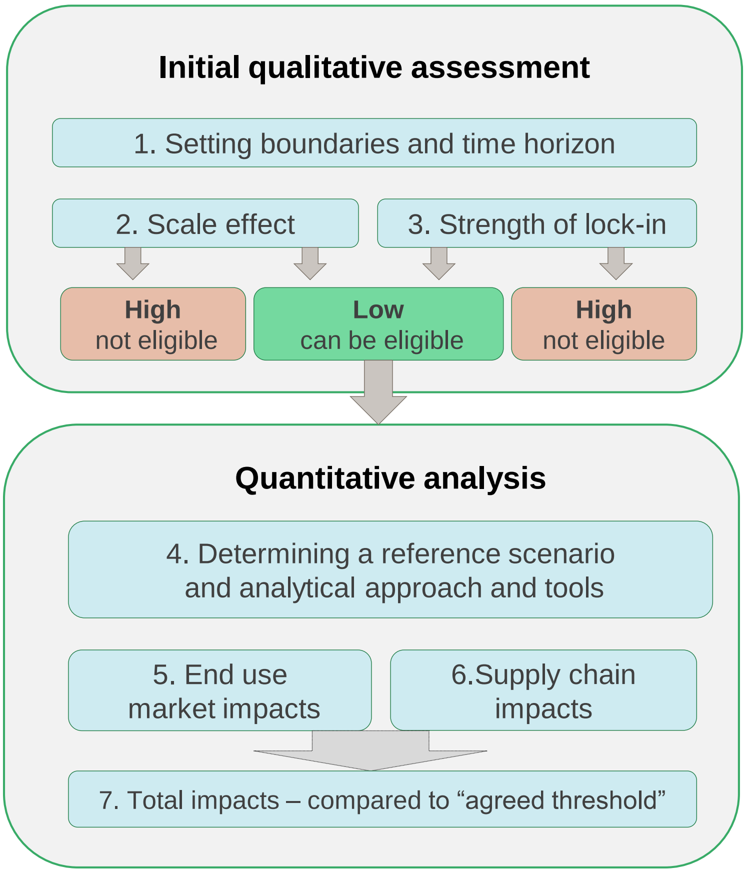
This section presents elements of a methodology for assessing GHG impacts of new gas supplies (Figure 2). As noted above, the GHG impacts and hence their “eligibility for classification as climate mitigation finance” can vary greatly from project to project and be very sensitive to key assumptions on developments in policy and market trends. A methodology needs to be rigorous enough to cater for this and at the same time be simple enough to provide results without too much effort dedicated to detailed empirical analysis.

Two broad categories for assessing GHG impacts and eligibility are presented; first an assessment of the importance of a scale effect (i.e. higher energy consumption and higher emissions), and second an evaluation of the possible timing and scale of a large lock-in effect (i.e. increasing emissions through reduced investments in renewable energy sources).

If the activity passes this initial eligibility test, the next category covers a quantitative analysis of the GHG impacts in the end-use markets and in the affected energy supply chains. The results of the quantitative analysis should then be sufficient to conclude on whether the emission reductions are higher than a commonly agreed threshold, as called for in the Joint Methodology for Tracking Climate Finance.

Each step is explained in the following sections.

Figure 2: Overview of methodology



2.2 Initial qualitative assessment

Step 1: Set boundary and time horizon for GHG impacts analysis

Prior to the two qualitative assessment steps, the geographic and sectoral boundaries of the analysis should be set. The geographic definition of the target market for the gas (i.e. a country, multi-country market or a sub-national area) should reflect not only the initial market segment to which gas is supplied, but other linked markets that are connected with sufficient transmission capacity to respond to new gas supplies.

This is similar to the definition of an electricity grid, and what plants could be affected by a new grid-connected power plant. The sectors would be those where gas could feasibly compete with other energy sources. Finally, the boundary should include upstream impacts, because supply chain emissions of the fuels that compete with the new gas supplies can differ significantly from those in the new gas supply chain.

Step 1: Checklist of issues to be covered	
Geography	The boundaries of the relevant market should be defined taking into consideration transmission links, the amount of imports/exports between countries, as well as any regulatory coordination (e.g. a regional energy regulator managing supply or market development) or barriers to trading.
Sectors	Relevant sectors will be those designated for new gas supplies and where gas consumption is significant according to historical energy balances. Three broad sectors are normally the most important to cover: i) power and combined heat and power systems, ii) industry, and iii) residential and service sectors. In some markets, gas consumption in transport and gas used as feedstock in petrochemical industries may also be of significance. Note that the latter use does not lead to GHG emissions from combustion.
Supply chain	These are emissions in the supply chain of coal, oil and other sources of gas that compete with the new gas supplies in end-use energy markets. This would cover all emissions from energy extraction to end-use delivery of the fuel to the final consumer. This information will normally not exist in the form of a regular statistical series of fuel use and losses and/or related emissions data, but will be drawn from specific studies of emissions per unit of energy transported/supplied, by fuel and origin of the energy source.
Time horizon	The time horizon may be the lifetime for which the new supply system is expected to be in operation (i.e. its economic lifetime) or shorter. The longer the time horizon, the more uncertain/speculative the GHG emission estimates become. On the other hand, a short time horizon may not capture the effects of possible carbon “lock-in”, because new low carbon alternatives in a majority of markets and applications are not yet competitive.
Second order impacts	A decision should be made whether some second order impacts on the supply and demand side will be considered. The analysis of the supply chain impact might include consideration of what happens to the supplies that are pushed out of the market by new gas supplies (e.g. Russian gas going elsewhere if pushed out of the EU market by Southern Gas Corridor gas). The most relevant second order end-use market impact is in the case of an Emission Trading Scheme, where any emissions impacts might be nullified by the pre-determined cap on emissions. Both these impacts are complicated to analyze, but can still be significant.

Following this clarification of boundaries and time horizon, the next two qualitative steps are meant to determine cases (i.e. activities) where the possibility of increased consumption and/or competition between gas and renewables could lead to increases in GHG emissions.

Step 2: Scale effect – assessing the potential impact on total energy consumption

The next step is to qualitatively assess whether and/or to what extent the new natural gas supplies could increase total energy consumption, here called the "scale effect". The question is not just whether energy prices could change as a result of supply additions, but also whether those price changes actually are expected to influence consumption. Assessing this impact is related to what drives price formation in the main sectors/markets and how responsive consumption is to price changes (this will eventually be further addressed in the quantitative analysis described below). A check list of issues to consider is proposed here:

Step 2: Checklist of issues to be considered	
Market share of new gas supplies	The likelihood of a scale effect increases with the share of new gas supplies in the total market in which it competes.
From primary fuel prices to end-use prices	The extent to which lower fuel prices are passed on to end-use prices typically varies by sector. For example, price formation in the power sector is often complex, and there may be weak links between gas prices paid by utilities and the price charged by the same utilities for electricity consumption, both in a deregulated competitive market and a regulated market. Price formation in other market segments can also vary greatly, but as a general rule, end-use prices in industry will be more affected by any reduction of wholesale prices, because fuel taxes and distribution costs have much less impact on industrial end-use prices as compared to end-use prices in the residential and service sectors.
Price responsiveness & price elasticities	Even if impacts on end-use prices are significant, driven by the factors mentioned above, the total scale effect can still be modest. This depends on the price elasticities of demand (i.e. the change in energy demand relative to a given price change). A qualitative assessment will, of course, not go deeply into the complexities of supply and demand responses to price changes, but the literature on price responses in energy markets can be a guide, particularly estimates of price elasticities for electricity demand and demand for energy services in industry and residential and service sectors.

Summary of main data requirements for the assessment under this step:

1. New gas supplies as a share of total gas demand in the market
2. Wholesale gas price as a percentage of the total cost (end-use price) of the energy source
3. Price elasticities for total energy demand per sector

Step 3: Strength of lock-in – assess potential for competition with low carbon energy sources

The next step is to qualitatively assess the likelihood that the new natural gas supply project could displace investments in renewable energy sources, instead of or in addition to displacing fossil fuel resources, and therefore increase energy sector emissions. The question here is whether gas could crowd out renewables because the short-term price for gas-based services is lower than for renewables, net of any policy support. Conversely, the analysis should consider whether there are policies in place that would ensure renewables supply even if fossil fuel supply and prices change. Three key considerations are listed.

Step 3: Checklist of issues to be considered	
LCOE for energy generated from renewables versus gas	Costs of renewable energy supplies have dropped significantly over the past 5-7 years and in some market segments they are already competitive with fossil fuel alternatives. In the short- to medium-term, however, investments in renewables still need public support in most markets to be financially viable. At the time when the supply costs of renewables (e.g. calculated as Levelised Cost of Electricity, LCOE) are at or below the average unit price paid in the market, then there is market-based competition between renewables and gas supplies which may give rise to a lock-in effect. An assessment of the likelihood of this happening in a specific market and within a set timeframe should therefore be based on information on cost developments for renewable energy supplies and competing fossil fuel alternatives, as well as long term energy supply and demand scenarios. In addition to capital expenditures the alternatives are largely affected by the development in fuel prices.
Carbon pricing	The pace of investments in renewable energy in most markets is currently largely determined by policy support schemes. The scenario analysis used in this type of impact assessment would normally hold these measures constant in the two scenarios. These factors should be taken into consideration.
Investments in energy supply infrastructure	Countries are at different levels in development of their supply infrastructure. For example, Turkey has for many years had annual growth well above 5% in energy demand, a situation which is expected to continue, while the EU has almost no growth. High growth in energy supply capacity therefore increases the risk of lock-in.

Summary of main data requirements for the assessment under this step:

1. Development of LCOE for renewables versus gas
2. Development of carbon prices
3. Growth in energy consumption and how it effects investments in new energy supply capacity

2.3 Quantitative analysis

Step 4: Determine a reference scenario, analytical approach and tools

Step 1 clarified the boundaries and time horizon of the analysis. A further specification of the reference scenario should be clarified here. The reference scenario should include all relevant variables of an energy balance (i.e. supply and demand of gas by sector) and also sector specific demand for energy sources that compete with gas. In the SGC Study the following level of specification was used (see Table 1).

The common approach is to define the reference scenario as the likely market outcome in absence of new gas supplies. It is based on a set of assumption of key economic drivers and technology trends as well as relevant policies and regulations. Given that future energy market trends currently are strongly influenced by climate considerations and the possibility of emission reduction targets becoming even more ambitious, the climate policy agenda and the specific formulation of policies and measures need particular

Table 1: Reference scenario specifications

Sectors	Coal	Oil	Gas	Nuclear & Hydro	Renewables	Power & Heat
Power and heat						
Industry						
Residential and services						

focus when defining the reference scenario. A common approach is to create energy market projections which are consistent with the country's NDC[3]. The NDC only has a time horizon to 2030, so other sources of information must be used for the longer term. One approach can be to assume further development that is consistent with the 2 degrees target[4], and consider this being achieved through carbon pricing as the principal policy instrument. This gives some guidance on reference scenario development, including the competition between gas and renewables, but it should be noted that it is difficult to share the emission reduction burden between countries for a post-2030 scenario. In addition, there could be a major break in the time series for many countries since their NDC targets are not sufficient to put the world on target for a 2-degree scenario.

Summary of main data requirements for the assessment under this step:

1. Historical development of energy supply and consumption with emphasis on market shares for gas (e.g. from national or IEA energy balances).
2. Broad emissions and energy trends in line with NDCs. Further sector and energy source specifications based on official projections and full specification of key assumptions with emphasis on public policies and measures (e.g. from national sources or independent studies such as IEA World Energy Outlook).
3. Emissions and energy projections beyond 2030. Could be several alternatives based on different levels of ambitions in GHG emission reduction targets. Carbon pricing may be used as the principal policy measure unless other alternatives are considered more realistic or relevant.

Step 5: Estimate fuel substitution

Figure 2 presented two categories of end-use market impacts; the scale effect and the substitution effect. The scale effect was assesses qualitatively under step 2, and only those activities for which this is judged to be a negligible impact would proceed as far as Step 5.

The new gas primarily competes with four other energy sources: coal, oil, heat and power (for end-use), and renewables. Nuclear and hydro power investments are assumed for the most part to not be affected by new gas supplies, due to their very low operating costs, and therefore are held constant in the alternative scenarios. The "lock-in" effects from competition between gas and investments in renewables (other than hydro) is however an issue which requires careful consideration, even if it was established under Step 2 that it is not significant in the short to medium term.

The fuel substitution impacts can be quantified using a comprehensive energy-economic model, with specification of energy supply and demand for the main sectors of gas use, including investments in new supply capacity, particularly in the power sector. The alternative approach, as done in the SGC Study, is to conduct a more partial and linear analysis. This may lack the consistency of economic behaviour built into a more complex model framework, but if offers flexibility and transparency into the causal relationships between assumptions and results.

The main steps of such an approach are presented here, with an emphasis on estimating the fuel substitution impacts. This has two sub-steps:

1. An estimate of how much of the new gas supplies will end up in each sector[5]
2. An estimate of the outcome of the competition between the new gas and other energy sources for each sector

The sectoral demand responses to price changes (i.e. the price elasticities) and relative net prices of different energy sources, which both vary greatly by country and sector, will determine the degree of substitution. In addition, the current structure of energy demand and the development which is assumed in the reference scenario will also include the degree of substitution.

[3] Nationally Determined Contributions as submitted under the Paris Agreement.
[4] In other words, targets that limit global average temperature increases to 2 degree Celsius versus pre-industrial levels.
[5] Normally three sectors will be specified: power & heat, industry, residential & services.

Step 5: Checklist of issues to be considered	
Sector allocation of new gas supplies	**Sensitivity of demand to changes in relative prices** is a key determinant for the sector allocation since it is the lower price of new gas supplies that gives room for a new gas market outlet. A review of price elasticities from the economic literature will show some typical differences by sector but also vary greatly based on specific conditions in the markets being studied. Generally speaking, power sector fuel demand is much more sensitive to price changes than other sectors, partly because of the technical potential for rapid fuel switching and also because the sector normally is operated on the basis of sophisticated procedures of cost minimization. Longer term investment decisions in the power sector are therefore normally also more sensitive to prices than in industry and residential/commercial sectors.
	Total market share of gas is obviously an important factor for the total quantity allocated to each sector. The market share indicates how mature the markets are for natural gas. A very low market share could suggest a shortage of infrastructure for gas distribution, while a very high market share (e.g. 80% or more) may suggests that the scope for further growth is limited. This indicates that the potential for substitution is the highest when the gas market share is somewhere in the middle (e.g. above 50% but below 80%).
	Reference scenario development (drivers for change). The development in actual gas consumption is very much driven by large discrete decisions on energy infrastructure (e.g. gas processing plants, pipelines, power plants), which may be driven by both commercial considerations and political decisions. Direct regulations can also play an important role. Such factors should be reflected in the reference scenario and are not altered in the scenario with new supplies. If they are, this must be clearly justified.
Fuel substitution within sectors	The **market share of energy sources within each sector** is a good indication of the scope for fuel substitution. The issue in question here is the case of new gas replacing other energy sources. If these other energy sources have low market shares there will be little room for substitution, for example if/when climate policy has radically reduced the use of coal in the power sector. Note that if there is limited scope for substitution with coal and oil, there would be more gas-to-gas competition.
	Supply capacity, infrastructure and new investments. In the short term fuel switching may be hindered by supply capacity constraints and other technical factors. The scope for substitution can become broader with new investments that broaden the market outlets for gas. A market in growth (e.g. Turkey) therefore has more scope for fuel substitution than a stagnant market. The maturity of the gas market adds to this, offering greater scope for replacing coal and oil if the gas market has a low level of maturity and therefore lower market share.

Summary of main data requirements for the assessment under this step:

1. Estimates in the economic literature on "cross-price elasticities" within each of the sectors to which new gas is supplied.
2. Market share of gas, historical and in the reference scenario, for each of the sectors to which new gas is supplied.
3. Investments in energy supply capacity in the reference scenario and utilization of this capacity.

Step 6: Estimate energy supply chain impacts

The following sub-steps are included here:

1. The new composition of energy supply by energy source is determined as a result of energy consumption impacts of step 5.

2. Changes in energy supplies by origin are determined based on what origins of supplies are considered “marginal” and high cost.
3. The emission factors for each energy source & origin are used for estimating total GHG emissions.

The energy sources in question are coal, oil and gas, and then for each a distinction is made between domestic and imported sources. The further division of imported sources (by origin) will normally be based on current energy trade statistics and existing information of new energy supply chains under planning and/or consideration. Once the detailed changes in supply by both source and origin are estimated, emission factors should be assigned to each of these fuel categories. Consideration on sources & origins and emission factor estimates are given below:

Step 6: Checklist of issues to be considered	
Sources & origins (primarily gas)	Marginal costs of sources & origins determine what supplies will be pushed out of the market by new supplies. For example, in the case of gas-to-gas competition, LNG gas imports may in the short term be more vulnerable to competition than gas transported through an existing pipeline system, due the lower variable costs of the latter. Contractual matters also need to be considered to assess what sources & origins will drop in response to new gas supplies.
Emission factors	Emission factors vary greatly by sources & origins, both because actual emissions vary but also because the literature shows large discrepancies for similar sources & origins. The SGC Study documented that this problem is particularly large for LNG trade and European imports of Russian gas. New research can be expected to improve the quality of emission factors. In addition there is a growing attention, at the corporate and political level, to the methane emission issue. This might lead to lower future emissions and, importantly in the context of the impacts studied here, an alignment in emission factors from different sources.

Summary of main data requirements for the assessment under this step:

1. Supply chain emission factors by sources & origins (e.g. gas imports from Russia, LNG gas imports, domestic coal, imported coal).
2. Data on energy supplies by source & origin historically and in the reference scenario
3. Data on supply costs of alternative source & origin of energy supplies and possible contractual terms, which determines what sources can and cannot be “swing suppliers”.

Step 7: Total impacts – Estimate energy supply chain impacts

The results of the quantitative analysis present estimates of end-use market and supply chain emission impacts over the relevant time horizon. Typically the emission reductions per annum will be less over time as the scope for coal-to-gas substitution diminishes. In addition, supply chain emissions may also decline if for example efforts are made (in the reference scenario) to reduce fugitive emissions in older gas supply networks. At some time, therefore, the new natural gas supplies may result in higher emissions than what can be reasonability expected in a scenario without the gas supplies.

The question to be addressed is whether the accumulated emission reductions and their time profile is sufficient to conclude whether *the emission reductions are higher than a commonly agreed threshold*, as called for in the Joint Methodology for Tracking Climate Finance. This *threshold* might be determined based on an assessment which takes into account the calculated short term emission reductions against considerations on the risks of long-term emission increases through lock-in effects.

Chapter 3
Concluding remarks

This note has explained the key steps and considerations made in the empirical analysis of GHG emission impacts of the Southern Gas Corridor investment and provided some input for development of a methodology for assessing GHG impacts of “greenfield” gas supply projects. Such a methodology might be used in the work of MDBs of tracking climate finance activities.

The steps and suggestions presented here are only elements of a methodology. Further work is needed to have a set of practical procedures and guidelines that can be used in the assessment of specific investments/activities. Compilation of relevant data, including typical price elasticities and emission factors would also be needed in order to have a tool ready for use.

An alternative to the approach discussed here is to estimate impacts by using a comprehensive energy-economic model framework with cost structures and price responsiveness of energy supplies by source and origin, and demand by energy source and sector. Such models exist and can be used for this purpose, but they may not have the details and flexibility required for analysing the specific case in question, and/or the time and resources required to implement necessary model modifications might be too large.

The more partial and linear analytical approach presented here lacks the consistency of economic behaviour built into a more complex model framework, but if offers flexibility and transparency into the causal relationships between assumptions and results.

As noted above, the GHG impacts and hence their eligibility for classification as climate mitigation finance can vary greatly from project to project and be very sensitive to key assumptions on developments in policy and market trends. A methodology needs to be rigorous enough to cater for this and at the same time be simple enough to provide results without too much effort dedicated to detailed empirical analysis.

This note has covered the case of “greenfield” gas supply projects based on a empirical analysis of the SGC pipeline investment. Bringing gas supplies to a market covers a number of other categories along the value chain of gas which may have different GHG impacts and would need other methodologies to assess their impacts. This will be explored by EBRD in a follow up activity.