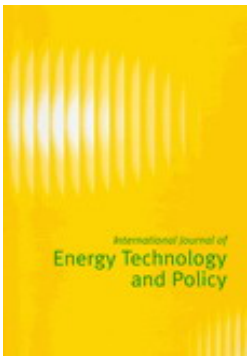

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Abstract: This paper investigates the challenge to improve Indonesia's domestic gas market and the remedy to alleviate the problems. Gifted with abundant natural resources, primary oil, and natural gas, Indonesia became a leading world liquid natural gas (LNG) producer. However, since 2001 there has been a shifting paradigm in gas policy from export – oriented to domestic market development. The implication is that Indonesia needs to find the balance between producer and consumer interests and at the same time has to deal with the geographical challenge of the country's archipelago. The new paradigm also requires that natural resources should promote economic growth instead of state revenue, therefore Indonesia must reform its gas policy to fulfil the multi objective of gas utilisation. This paper suggests ways to overcome these dilemmas.

Keywords: Indonesian gas market reform; Indonesian gas market regulation; institutional barriers Indonesian gas market.

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1 Introduction[1]

Indonesia has an immense natural gas reserve. This reserve has been exploited which led Indonesia to become a world producer of liquid natural gas (LNG). The geographical condition of Indonesia, which is a vast archipelago, forces Indonesia to focus on LNG as the primary mode of gas transportation, especially for the export market since the 1980s. Indonesia is facing difficulties in its implementation in recent years after the natural gas policy refocusing in 2001.

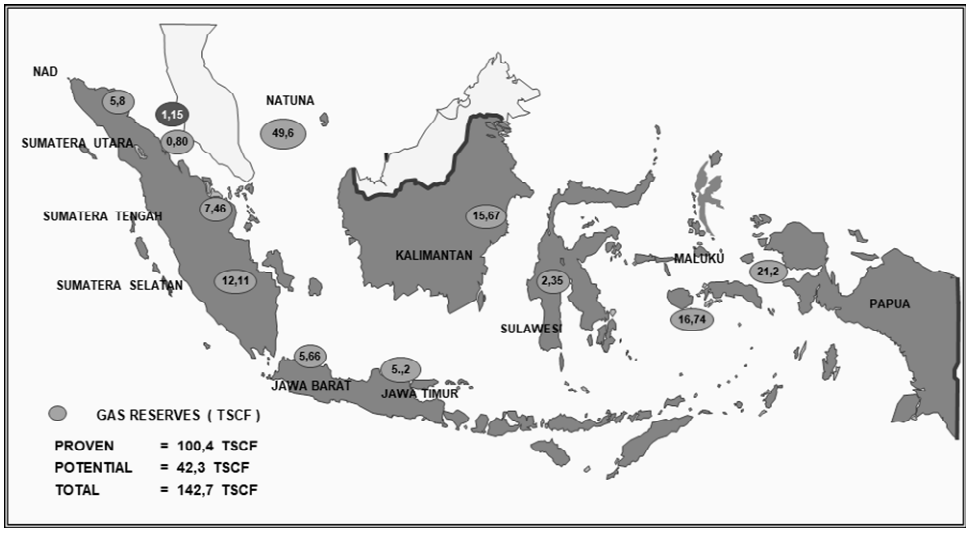
There are natural, institutional, and economic barriers that hinder Indonesia from optimising its gas market for national economic benefit (Hayden et al., 2003). The root cause is on the upstream side, where a lack of investment in exploration and exploitation restrains both the domestic and export markets from fully developing their potential.

Therefore, it is troublesome that Indonesia is trapped between natural resource possession and the inability to exploit it. However, in 2001 Indonesia refocused its natural gas policy with the idea of rebalancing export and developing more elaborate and mature domestic gas market. The reforms required a refocusing of reserve policy in favour of the domestic market, developing a domestic market, requiring adequate gas infrastructures, and a national gas price policy to allow the domestic market to grow and mature. The question is, did Indonesia succeed in the necessary gas policy reforms in favour of the development of its domestic gas market, and if not, what have been the core barriers?

This answer to the question is as follows. Section 2 briefly introduces some highlights of the Indonesian gas market. With this background information, Section 3 discusses Indonesian gas policy, the 2001 gas policy reform. Sections 4, 5, and 6 discuss the achieved results to date concerning reserve policy, gas prices, and gas infrastructure,

respectively, and discusses how Indonesia could manage the difficulties of the three barriers. Finally, Section 7 draws some conclusions.

Figure 1 Indonesian gas reserves location in trillion standard cubic feet (TSCF) in 2017



Source: Ditjen Migas (2018)

2 Natural gas and geographical condition

With a population of 240 million people, Indonesia is the largest archipelago in the world and consists of more than 17,000 islands mainly located on Java Island. This island is also the economic centre of the country. A substantial part of the country's landscape is tropical rainforest, positioning the country second after Brazil in rainforest coverage. Next to rainforest, Indonesia is also gifted with a wide range of natural resources, like coal, oil, and gas. Natural resource production was and still is, with the service sector, the primary source of the country's gross domestic product (GDP) (World Bank, 2011). However, the exploitation of natural resources is challenged by the geography of the country and the inaccessibility of many remote parts of the islanded country. For instance, the natural gas reserves are predominantly located onshore in deep sea parts belonging to the country.

The oil and gas industry in Indonesia started in 1,883 with a gas field discovery in North Sumatra, followed by other findings in South Sumatra and Kalimantan. Significant discoveries were made during the 1970s in Sumatra and Kalimantan, Natuna, Papua, and Moluccas (see Figure 1). According to IEA (2008), Indonesia has abundant gas reserves that are among the top ten in the world and second only in Asian Pacific Region. However, Figure 1 shows the scattering of gas reserves throughout the country's area. In Figure 1, the numbers in the blue circles refer to the size of the gas fields. These numbers show that the fields, in general, are relatively small and, therefore, rather expensive to exploit, apart from their accessibility due to the natural barriers. For that reason, Indonesia's gas infrastructure is dominated by standalone exploitation systems and

ship-based LNG transport. Therefore, the gas pipeline system is relatively underdeveloped in Indonesia (see Figure 2).

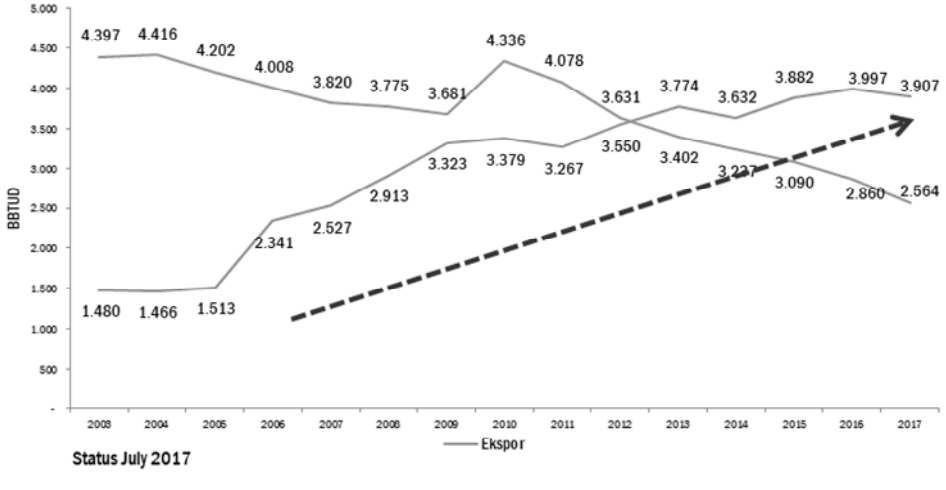
Figure 2 Indonesian natural gas infrastructures

Source: Ditjen Migas (2020)

The figure shows that only parts of Java are gifted with pipeline infrastructures and missing in almost all other parts of the country. This turns out to be a severe barrier to expanding the domestic market.

However, despite the inadequate gas pipeline infrastructure, Indonesia managed to rebalance domestic gas consumption and export over the years (see Figure 3). The ratio between export and domestic supply during 2000–2010 was 60% (Ditjen Migas, 2017), with most Indonesian gas going to Japan. Figure 3 shows a rather steep increase in gas supply for the domestic market since 2005, with the fertiliser industry and electricity production as the primary domestic consumers (Ditjen Migas, 2018).

Figure 3 Domestic natural gas consumption 2003–2017



Source: Ditjen Migas (2017)

However, as indicated above, the development of the domestic market is hindered by the immature gas pipeline infrastructure in combination with the considerable distance between the production locations in the East and the gas demand locations in the west part of the country. The emerging rebalances between gas export and domestic gas market development started in 2005, four years after Indonesia changed its national gas policy. In 2012 gas export and domestic supply were in balance and since that year the annual gas supply for the domestic market grew further, whereas gas exports decreased. This would indicate the success of at least the rebalance ambition of the natural gas reforms of 2001. Before we go into this topic, the following section briefly discusses the 2001 gas policy reform and the gas policy preceding the reforms.

Table 1 Natural gas policy evolution

	Policy	*Pre 1992*	*1992–2001*	*After 2001*
1	Reserve utilisation	Big Reserves were used only for export and small reserves for domestic	Big reserves were used for export and small reserves for domestic	Big reserves were for domestic or export, small reserves for domestic.
2	Infrastructure development	The concept of Trans ASEAN Gas Pipeline (TAGP) was introduced	TAGP was used as reference and plan for Indonesian Integrated Gas Pipeline (IIGP) to support TAGP	Priority was given to IIGP as basis of natural gas infrastructure development instead of TAGP.
3	Domestic market obligation (DMO) implementation	There was no concept on DMO	Consideration of implementing DMO for gas	Implementation of DMO for gas (25% of PSC share)
4	'No flare' gas policy	There was no concept developed to handle the issue of flare gas.	Starting implementation of 'no flare' gas policy	'No flare gas' policy fully implemented
5	Domestic energy policy	Gas price was not supporting natural gas development	Gas price was not supporting natural gas development	Gas price was gradually adjusted to support utilisation of natural gas

Source: Ditjen Migas (2011a)

3 The 2001 natural gas policy reform in Indonesia

There are three stages of Indonesian natural gas policy evolution, pre-1992, 1992–2001, and post-2001, that consist of five dimensions: reserve allocation, infrastructure maturity, domestic market obligation (DMO), flare policy, and domestic gas price (Table 1). The year 2001 is the turning point of the Indonesian gas policy.

Before 1992, gas was prioritised for the export market to optimise state revenue, while the infrastructure was developed to support Trans ASEAN Gas Pipeline (TAGP) rather than domestic demand capacity.

With the introduction of the new law on oil gas in 2001, there was a significant amendment in gas policy, including the obligation to set aside 25% of producer share to fulfill domestic (DMO) and the prioritising of large gas reserves for the domestic market.

Figure 3 above shows that the ambition to increase the supply of natural gas to the domestic market has been successful. The domestic supply of natural gas has increased since 2005. A more recent ambition is to intensify the portion of gas utilisation up to 22% of the total energy mix of the country.

In 2011 the Directorate General of Oil and Gas provided an updated natural gas policy by addressing the following goals: ensuring implementation and governmental control of exploration and exploitation of gas fields, ensuring natural gas is available at an acceptable price that serves as a source of energy and as feedstock for industry, and to increase the contribution of natural gas to the national state revenues (Ditjen Migas, 2011b). From 2005 onwards, domestically supplied natural gas has been available for all industrial sectors and electricity production.

Despite the gas policy reforms in 2001 and 2011, the actual implementation of the changes and the realisation of the set of ambitions faced problems. One of the core problems is that Indonesia is bound by long-term agreements that need to be satisfied. This causes pain, because the current and future exploitation of gas fields cannot serve both export and domestic natural gas demand. This problem is aggravated by the immature development of (pipe-based) gas infrastructures onshore and offshore. The only feasible mode of transportation offshore is LNG shipping, but the availability of LNG terminals onshore and the corresponding gas pipeline infrastructure are still missing. One onshore LNG landing terminal became only operational in 2012, which means that Indonesia only has one onshore LNG terminal and three floating terminals. This is very limited considering the area of Indonesia that needs to be served by natural gas.

A third barrier is related to domestic natural gas price. For years, domestic natural gas price was relatively low due to the unpopular image of natural gas as an energy source. Natural gas, therefore, has been sold domestically under a fixed contract price. This kept the gas price at a relatively low level domestically. However, this unrealistic domestic pricing of natural gas ended after domestic demand increased. Prices went up but were heavily contested by the predominantly industrial domestic consumers. However, despite the price increase, domestic prices were still significantly lower than export prices. For that reason, gas producers preferred to export the gas over the supply to the domestic market. Consequently, the obligation of gas DMO (25% for domestic) was not kept leading to a deficit in domestic gas supply.

These barriers show the paradoxical position of Indonesia concerning natural gas. The country has a vast number of reserves but cannot achieve optimal benefits from them. This raised the question of which routes are open for Indonesia to realise the ambitious natural gas goals of the country and to achieve optimal benefits from its natural gas resources. The following three sections analyse the options open for Indonesia to mitigate the three barriers: gas reserve policy, infrastructure development, and price policy.

4 Priority ranking of natural gas consumers to secure domestic market

Indonesia's proven reserves are assumed to provide natural gas for at least 48 years if all gas fields would produce (Ditjen Migas, 2020). However, not all gas fields are in production yet, and it requires considerable investments to have the areas producing. As indicated above, part of the problem is the scattered, remote offshore location of many of the proven relatively small gas fields. The site, as well as the composition of the gas, complicates exploitation and increases the investment and operational costs. Part of the

problem is the high CO_2 content of most of the Indonesian gas. For instance, the Natuna gas field is estimated at 51 trillion cubic feet (TCF) of natural gas (equivalent to 1,381 BCM recoverable reserves) with 71% of CO_2 content (Suhartanto et al., 2001). Exploiting of this enormous gas field requires additional massive investments to remove CO2, whereas the costs of development and operation are estimated around be US$ 8.145 billion and US$ 9.941 billion, respectively (Ditjen Migas, 2008). In the case of the Masela gas field (15 TCF), the complication concentrates on the LNG terminal technology for the exploitation of the field: floating or onshore. Both technological options require excessive investments, which are hard to earn back in an immature and uncertain domestic natural gas market, which Indonesia still is.

So, increasing domestic gas demand in combination with lagging production of gas fields has let Indonesia cope with natural gas scarcity by utilising priority setting in access to the scarce domestic natural gas. Other countries, like India (Jain and Sain, 2011) and Pakistan (Ministry of Petroleum and Natural Reserves, 2005) do the same to cope with resource scarcity.

Similarly, the Indonesian government stipulated a Policy about natural gas allocation in the form of Ministerial Regulation in 2010. The regulation prioritised the sectoral domestic natural gas consumption as follows (MEMR, 2010):

1 enhanced oil recovery (EOR)

2 fertiliser/petrochemical industry

3 electricity production

4 other industries.

This priority order said that the enhancement of oil production in oil fields would get preference in gas supply over the other mentioned sectors. The priority order also indicates that other industrial sectors have no priority in the domestic allocation of natural gas.

The logic of this priority ranking appears to be grounded in a mixture of considerations like

1 national energy policy ambitions

2 public interest

3 national gas balance (supply and demand condition)

4 infrastructure masterplan

5 market

6 economic feasibility.

These are quite different considerations, and for that reason, it does not help in understanding the underlying reasoning of the priority setting in natural gas allocation. There is also a reasoning about supporting energy resilience and social prosperity. But again, the why of the priority setting is unclear. The fundamental problem is that a gas priority ranking, grounded in solid analysis, is missing. It seems that economic reasoning is the main argument for the current priority ranking, which appears to go back to the gas policy reforms of 2001, when the government decided to rebalance the gas supply in favour of the domestic market. However, if the government really is aiming to maximise

the economic value of natural gas, then it needs to ensure that those economic sectors that will create the highest added economic value for the Indonesian economy, have priority in national gas allocation. And the question is if the current priority ranking is providing the highest economic value for Indonesia.

Table 2 Summary of finding

Indicators	*Finding*	*Rank of priority*
Macroeconomic effects (GDP, employment, consumption and investments)	Restriction of gas supply to other industries causes the worst impact concerning four macroeconomic indicators compared to other consumer sectors' curtailment GDP contracted by 7.8%, and the employment level dropped by 3%. The next worst impact is shown by gas restriction in petrochemical and followed by crude production and the electricity sector	Other industry Petrochemical Crude oil production Electricity
Sectoral output	The impact of gas supply restriction on other industries is consistent, with the macroeconomic impact with output drop by 4–15%, and the next rank of worst impact is shown by the petrochemical, crude, and electricity sectors, respectively. This result confirms the macroeconomic impact	Other industry Petrochemical Crude oil production Electricity
Energy consumptions	Gas supply restriction causes the other industry and electricity to substitute gas with HSD, while the petrochemical and petroleum sector switch to coal. However, energy consumption cannot be used as an indicator to rank the consumer because the differences in elasticity with electricity have the most flexibility of energy substitution	-

Source: Hutagalung et al. (2018)

This issue has been criticised by Industrialists (Tempo, 2012) and energy experts. Pri Agung Rakhmanto, Executive Director of Reforminer Institute (2015), is questioning that the purpose of the natural gas allocation is solely to boost state revenue from oil production, instead of maximising economic benefit (Rahkhmanto, 2015). Hutagalung et al. (2018) addressed this problem by conducting an economy-wide impact analysis with the methodology of a computable general equilibrium (CGE) model to simulate the economic impact of different priority rankings in natural gas allocation. They analysed the effects with the help of three output indicators: Macroeconomic marks (change of GDP, employment absorption, consumption, and investments), sectoral output growth, and energy utilisation (see also first column Table 2). Their analysis came to a different priority ranking than the one used by the national government (see the last column of Table 2). Based on the economic modelling analysis aiming at maximising economic value, the priority ranking in natural gas allocation in Indonesia should be:

1 other industries

2 petrochemical industry

3 EOR

4 electricity production.

In the middle column of Table 2, this priority order is explained. It also shows that two of the three output indicators have the same priority ranking (macroeconomic effects and sector output). The output indicator "gas consumption" did not result in a clear priority ranking.

The priority position of other industrial sectors is not surprising since these sectors have significant economic linkages with other sectors and induce multiplier effects in the national economy. The same holds for the petrochemical industry with its significant production of fertilisers, which are badly needed for agricultural production. It further showed that oil production has the less economic significance than the governmental priority ranking assumes. The same is true for electricity production because this sector can easily switch to other fuels and therefore does not need a high-priority ranking.

The Hutagalung et al. (2018) paper clearly shows that solid economic analysis is badly needed to maximise the economic contribution of natural gas for Indonesian welfare. The national government should account more for this kind of grounded analysis in its national gas policy.

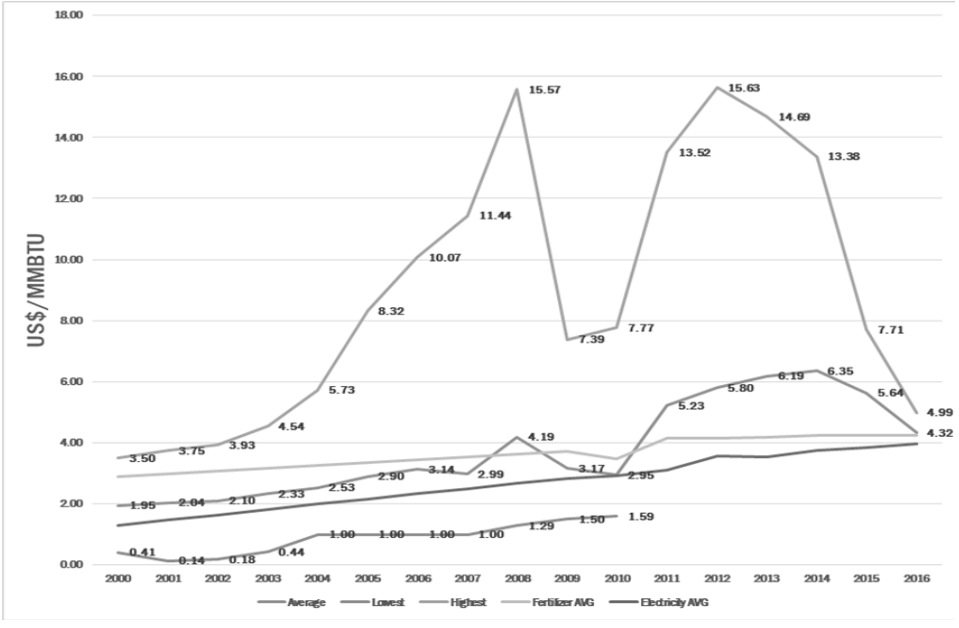
5 Setting the domestic gas price

Purchasing power in the national gas market is one of the barriers to balancing the producer and domestic consumer interests. The gas price is strongly regulated by the government for social reasons, but at the same time, this hinders an adequate price setting which allows suppliers to recover costs. Now domestic gas prices are often set on levels that are only as high as one-third of the gas export price (see Figure 4). These price levels do not provide any incentive to gas suppliers to serve the domestic market instead of exporting natural gas. It has been suggested to balance the economic and social policy objectives in determining domestic gas prices (Embassy of USA, 2006). However, to date, Indonesia did not manage to reflect both policy objectives in domestic gas prices. The reason is that the Indonesian government wants to prevent price shocks for domestic gas consumers, however, another reason is that domestic gas prices are still subject to negotiations between producers and consumers, with the government approving the agreed price.

The negotiated gas price is problematic because parties have their ideas about how prices should be determined. The producers/suppliers use international/export gas prices as a benchmark, while the consumers want to keep prices as low as possible. The government, on the other hand, wants to achieve multiple objectives with the gas price: optimal state revenues from gas sales, developing the domestic gas market to support economic growth, and social purposes. As a result, the domestic gas price level always reflects a trade-off between the different positions.

This problem has been the subject of contentious debate not just between producers and consumers but also between government officials. The Ministry of Energy and Mineral Resource (2012) argues that most of the gas supply is exported because price disparity does not give enough incentive for the producer to develop the gas field. On the contrary, the Ministry of Industry (2012) refutes that domestic industry could not afford international prices because it will lower industrial competitiveness.

Figure 4 Indonesian gas price



Source: Ditjen Migas (2016)

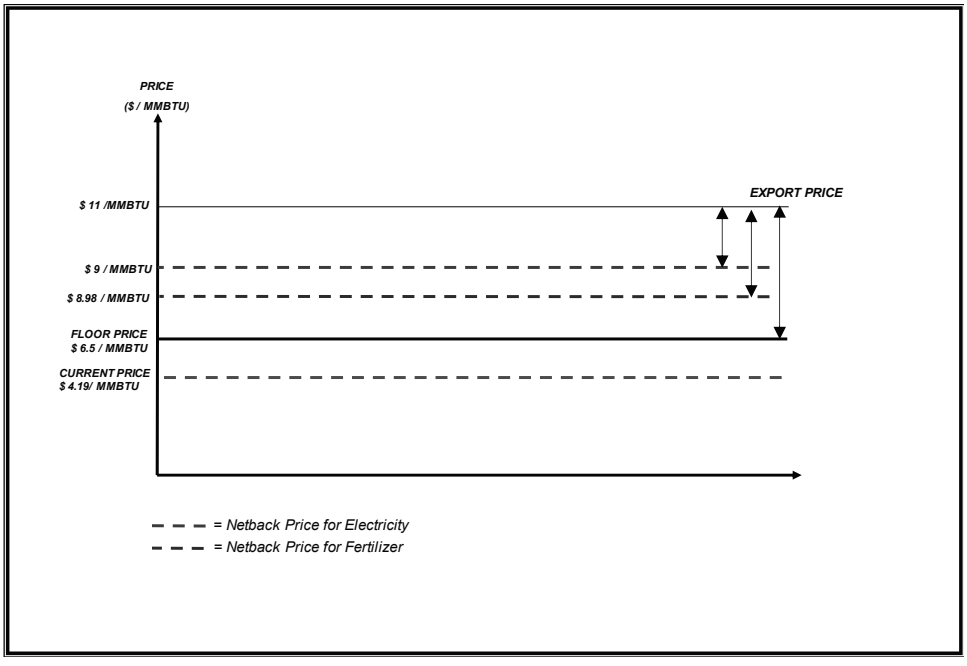
The question is how Indonesia could determine domestic gas prices more adequately Starting point should be the idea that in developing or emerging countries, energy prices, in general, and gas prices are intended to serve multi-objectives, i.e., economic efficiency, state revenues, fairness, and guarantee of supply (DeLucia and Leseer, 1985; Julius and Mashayekhi, 1990). At the same time prescribes standard economic theory that energy prices should be set at marginal costs to maximise welfare. This is called first-best pricing (DeLucia and Lesser, 1985) instead of second-best pricing, when prices reflect a trade-off between economic performance and social purposes. In the past, the gas price in the Indonesian domestic market was predominantly reflected social objectives and no actual costs considerations. Over the last couple of years, the Indonesian government has tried to rebalance the economic efficiency considerations with the social goals in the price setting in the domestic market.

Looking at the Ministerial Decree of 2016 with the gas price regulations, it shows that Indonesia aims to reflect multiple objectives in the domestic gas price: economic feasibility of gas reserve exploration and exploitation, international gas price developments, the added value of gas utilisation, purchasing power of gas consumers and the substituted fuel price. However, there is one problem in this price-setting approach, being the gap between the cost recovery for the gas producer and the purchasing power of the domestic gas consumer. If producers cannot recover their costs by supplying natural gas to the domestic market, they will continue selling the gas in the export market. So, Indonesia can only achieve its objectives in gas price policy if the prices reflect costs as much as possible and consumers can pay for the gas without negative implications for the economic development of the country. The question is if there is a margin in Indonesia to

adjust the domestic natural gas market price so that the ambitions of the gas price policies become more balanced.

Hutagalung et al. (2020) analysed the macroeconomic implications of different domestic gas price levels in combination, with the effects of price levels on the cost structure of consumers in two economic sectors, the electricity and fertiliser sector. Figure 5 summarises the results of these analyses.

Figure 5 Conceptual of price structure from macro- and micro-level perspective



Source: Authors calculation

Figure 5 shows different price levels with the purple dotted line reflecting current domestic gas price levels and the straight black line at the top of the graph as the current export price. Both lines show a price margin of USD 8/MMBTU. Considering the cost structure analysis (netback), for the fertiliser and electricity sector, Figure 6 shows that gas prices can be increased to USD 8.98/MMBTU and USD 9/MMBTU respectively, without any negative implications. Therefore, there is still plenty of room to adjust the price for consumers. These findings align with the current price policy in Indonesia with a gradual upwards adjustment of domestic gas prices.

6 Investments for gas infrastructure

A mature domestic gas market requires the technical infrastructure to transport natural gas. Above, we have clarified that the geographical conditions, in combination with the stranded location of the gas reserve, put additional challenges on the technical gas infrastructure. At the same time, the ambition is to have an increase in domestic gas consumption of 23% in 2025. Facilitating this ambition requires massive investments in

new technical gas infrastructure. The problems are enormous, since gas pipelines can only be a transportation technology on the island of Java, where the more significant part of the economy and the population is concentrated. For the rest, transport needs to be LNG based, which requires ships/trains and landing facilities.

Recognising these challenges, Law 22 of 2001 concerning oil and gas initiated the liberalisation of the downstream domestic gas market in combination with the announcement of a national master plan for developing the technical gas infrastructure in Indonesia. This master plan became the reference of infrastructure investment planning and the development of the domestic gas market. It allowed private investors to enter the infrastructure segment and the gas distribution sector. It also regulated third-party access to the technical gas infrastructure. However, to date, these reforms has not been successful yet. Investments in the technical infrastructure have taken place yet, because of a lack of natural gas supply for the domestic market. Therefore, the reality is that about 80% of the gas pipeline infrastructure is still controlled by the state-owned company PGN with hardly any private companies having access to the grid. For that reason, some private companies active as gas suppliers on the domestic market invested themselves in point-to-point gas pipelines, which made these infrastructures de facto a private monopoly, which is not in line with the deregulation and liberalisation ambitions of 2001. For that reason, the government issues Degree No 4 in 2018 (MEMR, 2016, 2018), to stimulate investments in gas infrastructures to facilitate the further development of the domestic gas market.

Currently, gas infrastructure in the form of pipelines is only available at 20% of the total planned, and its growth has stagnated since 2006 (Ditjen Migas 2011b), no new infrastructure tenders for transmission nor any additional interest in infrastructure investment from private companies.

The downstream industry conditions show conditions that are not conducive to ineffective commercial activities. Problems such as multilevel sales without added value by trader business entities without facilities occur and cause industry or consumer failure to obtain competitive prices (UGM, 2023). Investment in infrastructure development is minimal and primarily due to the absence of an adequate investment guarantee scheme (UGM, 2023).

The ambitions formulated in the roadmap of gas infrastructure require massive investments but minimal financial resources. The Indonesian government assumes the private sector to provide for the needed investments, but this is not a realistic position given the investment risks involved. In Indonesia, these risks are very high, due to the uncertainties in gas supply, causing high uncertainties concerning the investments. The question is why the Indonesian government does not consider public investments, whereas these investments are promoted in the economic development literature. This literature reflects agreement on the idea that economic growth and job creation improvement need stimulus in the form of public investment (Syrquin, 1988; World Bank, 1993; Collier, 2006; Breisinger and Diao, 2009). Moreover, Agenor and Moreno-Dogson (2006) and Fouire (2006) point out that infrastructure projects are so impactful because they can reduce the cost of production and increase employment during the construction period.

These findings are confirmed for Indonesia by Hutagalung et al. (2017), who show that investment in gas infrastructure with public spending will trigger economic activity in Indonesia. The study analysed the impact of three different financing scenarios of gas infrastructure investment: foreign loans, re-allocation of gasoline subsidies, and re-

allocation of government revenues from oil and gas production. The long-term economic effects of the different financing options for investments in gas infrastructure are summarised in Table 3. The first column of the table lists the five macroeconomic indicators used in the analysis, within the first row, the three financing scenarios (A = foreign loan; B = reallocating subsidies, and C = reallocating oil and gas revenues).

The cells of Table 3 show the effects of the three scenarios on the five macroeconomic indicators. The impact is positive, as shown by all macro indicators in every scenario. GDP stepped up gradually, which is caused by the expansion of gas-intensive consumer sectors, industry, and electricity. It also shows that in all three scenarios, investments increase as well as private consumption. Scenario B, investment finance by reallocation of current energy subsidies, has the highest effect on the five macroeconomic indicators.

Table 3 The impact of infrastructure financing

Indicators	*Scenario A*			*Scenario B*			*Scenario C*		
	A1	*A2*	*A3*	*B1*	*B2*	*B3*	*C1*	*C2*	*C3*
GDP	0.10	0.18	0.34	0.14	0.25	0.43	0.10	0.18	0.33
Household consumptions	0.05	0.12	0.27	0.14	0.27	0.50	0.05	0.11	0.25
Investment	0.16	0.34	0.72	–0.04	–0.04	0.03	0.19	0.40	0.84
Export	0.20	0.31	0.48	0.19	0.31	0.49	0.34	0.61	1.07
CO_2 emission	0.21	0.36	0.60	–0.13	–0.26	–0.42	0.20	0.34	0.57

Source: Hutagalung et al. (2017)

The results confirm the initial assumption that publicly financed gas infrastructure investments can be beneficial for economic development and energy resilience. This finding supports the discourse that fuel subsidies should be reallocated for more effective spending. Of all three scenarios, Scenario C has the most positive impact on sectoral performance, followed by Scenario A. Moreover, foreign aid availability is beyond the Indonesian government's control. The findings also conclude that the private sector can help to improve the economic gains as well in the form of foreign direct investment.

7 Summary and conclusions

In this paper, we analysed three implications of the gas policy reforms of Indonesia initiated in 2001. In that year, Indonesia refocused its natural gas policy with the idea to rebalance export and development of a more elaborate, and mature domestic gas market. The reforms required a refocus of reserve policy in favour of the domestic market, the development of a domestic market, requiring adequate gas infrastructures and a national gas price policy to allow the domestic market to grow and mature. Our analysis was guided by the question if Indonesia succeeded in the required gas policy reforms in favour of the development of its domestic gas market and what the barriers are that need to be taken.

Our analysis showed that Indonesia has a high gas market development potential due to its voluminous natural gas reserves. However, harvesting this potential is a tremendous challenge due to the offshore and isolated location of some gas fields. Exploiting the gas

fields requires massive investments in infrastructure, which can only be LNG based. However, our analysis also showed that the barriers Indonesia is facing in benefiting economically more from its natural gas reserves are manageable if the right decisions are taken based on solid economic analysis (Hutagalung et al., 2018, 2017, 2020; Hutagalung, 2014.

We could show how Indonesia could proceed in its gas market development. First, we showed that the priority ordering of economic sectors in the domestic gas allocation policy has room for improvement to increase the economic gains of natural gas. Second, our analysis showed that the current gas price policy has room for improvement. Here too, about the solid macroeconomic analysis, we showed that the current policy of gradual increase of domestic gas prices does not imply any risks for the macroeconomic development of the country. Finally, we showed that the Indonesian economy could benefit from publicly financed investments in the technical gas infrastructure of the country to facilitate the further development of the domestic gas market.

Improvement in these three aspects of the Indonesian gas policy is badly needed to alleviate the many challenges of exploiting the gas out of the fields and to develop its domestic gas market. Change might take time in a country like Indonesia, but it will be necessary if Indonesia wants to maximise the economic value of natural gas for the country's prosperity.

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Notes

1 This paper is partly based on Chapter 2 of Hutagalung, 2014.