Chapter 2

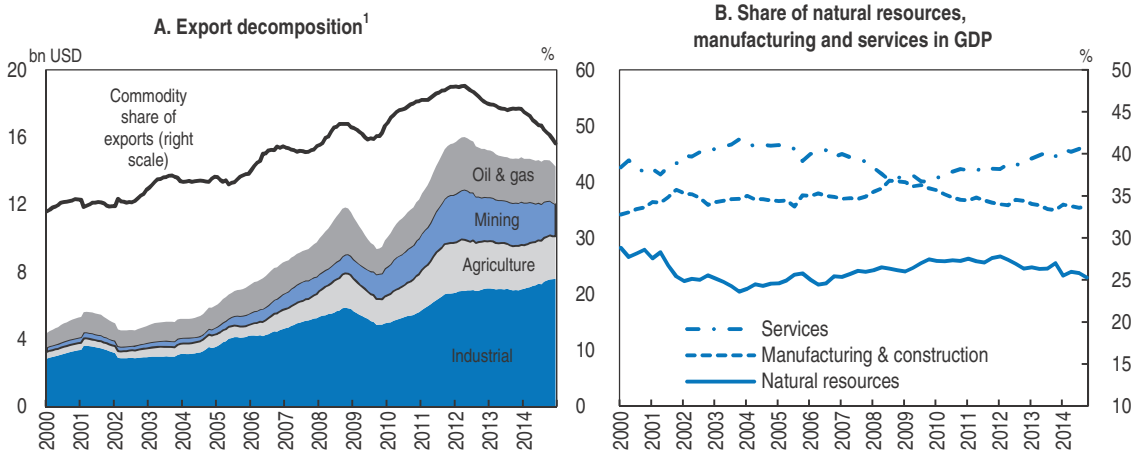
Making the most of natural resources

Indonesia abounds with natural resources. But the unique nature of its geography, coupled with the lack of transport infrastructure, makes their exploitation challenging. Moreover, a lack of investment, protectionism and an unwieldy regulatory environment are all inhibiting the sector from reaching its full potential. Agriculture has been held back by low productivity, under-investment, unclear property rights on land, ill-advised trade regulations, misplaced support for staples and restrictions on foreign ownership. By pursuing crop diversification, encouraging co-operation between smallholders and large estates and easing constraints on foreign investment, Indonesia could raise its farmers' productivity. Fossil fuels have become central to Indonesia's energy policy and its main source of export revenues. Growing environmental concerns, both domestically and internationally, combined with subsiding coal prices and the on-going shale gas revolution, call into question the sustainability of such a strategy. Indonesia should increase its energy efficiency and further develop gas to plug the gap until sufficient renewable energy, especially geothermal, comes on line. Government control over the oil industry via state-owned Pertamina should be gradually reduced. Clarifying, streamlining and publicising simple regulations in energy and minerals, especially regarding land rights and on-shore processing, and removing foreign-ownership restrictions will help bring much needed investment. The pressure on the environment that natural resource exploitation is creating should be addressed by increasing the share of gas and renewables in the energy mix, properly defining property rights and regulations regarding forest land, and implementing a positive implicit carbon price. More resources should be devoted to combating widespread illegal mining and deforestation.

Indonesia abounds with natural resources. It is the world's largest exporter of steam coal, refined tin and (until the enforcement of the export ban earlier this year) nickel ore. It is also a leading exporter of gold, bauxite, lead, zinc and copper. Its potential in renewable resources is also huge. It has become the world's number one palm oil producer and exporter. In addition, it is the second-largest producer of rubber, robusta coffee and fisheries products, and holds 40% of the world's geothermal energy reserves (IEA, 2008). Indonesia's top five exports are all commodities.

Commodities have served Indonesia well in the past decade and now represent more than half of its exports (Figure 2.1, Panel A). Natural resources still represents some 25% of GDP (Panel B).

Figure 2.1. **Natural resources in the Indonesian economy**



1. 12-month moving averages.
Source: CEIC.

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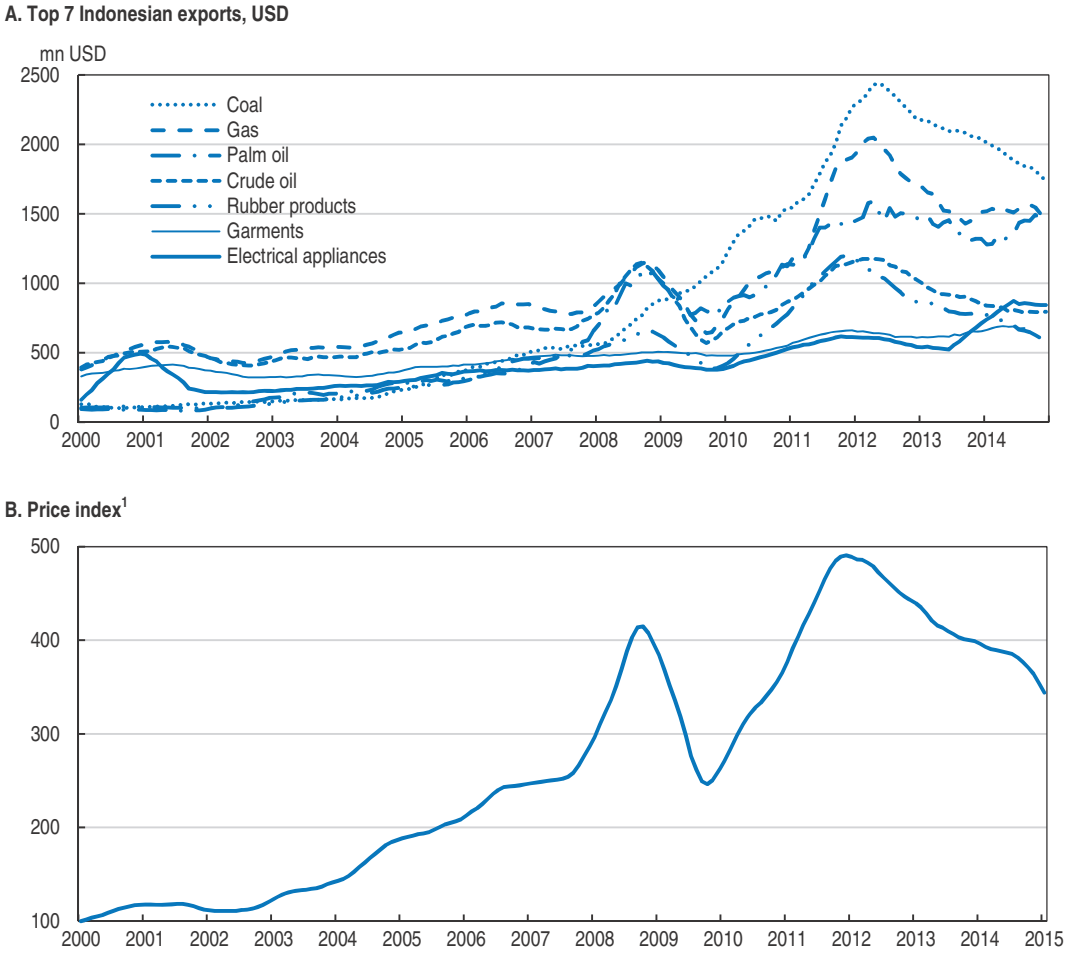
Despite those achievements, the natural resources sector faces several challenges. First, the rising share of commodities in Indonesian exports coincides with the rapid increase in commodity prices that took place between 2003 and 2011 (Figure 2.2). Now that prices have fallen significantly, the sustainability of the expansion is in question. As prices rose, the supply of many commodities rose (e.g. steam coal output more than quadrupled between 2002 and 2012), but production of others, such as oil, fell. For some commodities, especially palm oil and coal, expansion raised environmental concerns. Finally, the effect of rising commodity exports on employment is limited. Being highly capital-intensive, the employment content of the mining and energy sectors is traditionally low (1.9 million

Figure 2.2. **Top exports and commodity prices**



1. Unweighted price index (2000 = 100) of Indonesia's top 5 exports in value in 2012 (cf. Panel A).
Source: CEIC.

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people work in these sectors in Indonesia, about 1.5% of the labour force). As for agriculture, it still employs a massive 42 million people (in part due to modest job creation in industry), and productivity is low. These numbers are to be compared with the 15.4 million people employed in manufacturing, for instance.

A second challenge is that Indonesia's natural resources are spread over a vast scattered country, making their exploitation and marketing difficult. Indonesia is an enormous archipelago, made up of about 17 500 islands, 6 000 of which are inhabited, extending over 5 120 kilometres from east to west and 1 760 kilometres from north to south, and covering a land area three times larger than France. It is populated by 242 million people, speaking 742 languages and dialects.

Third, Indonesia's natural resources sector faces a number of regulatory challenges. After years of stable mining legislation, Indonesia overhauled the legal framework with Law 4/2009 on Minerals and Coal Mining, replacing Law 11/1967 and its widely used Contract of Work (CoW) scheme. Among the most controversial aspects of this new mining law were divestment requirements for foreign firms, the replacement of CoWs with a dual exploration and exploitation license system and a mineral ore export ban coupled with a

requirement for on-shore value added processing for most commodities. In agriculture, too, various trade restrictions and taxes have been implemented to foster onshore processing of raw commodities, while strict foreign ownership restrictions via Horticulture Law 17/2010 are hampering innovation and productivity growth. Both the law on Minerals and Coal Mining and the Horticulture Law came into force in 2014.

Finally, after decades of centralisation under Suharto's New Order, in the late 1990s Indonesia began a decentralisation process, giving the regions greater political autonomy and allowing resource-rich regions to retain a substantial share of the income generated. This increased the potential for inconsistent and incompatible regulations across levels of government and for associated corruption.

As a result the new regulatory environment for natural resources extraction is now less attractive to investors. In fact, under currently applicable Indonesian regulations, Indonesia's ranking in the Fraser Institute (2013) summary "Policy Potential" index is last out of 96 jurisdictions. On-going discussions regarding possible revisions to the legal framework and/or possible exemptions to the export ban are further increasing uncertainty for foreign investors. Yet, assuming industry best practises and no land-use restrictions, Indonesia would jump to 4th place in that ranking, ahead of Australia and Chile.

The next section describes Indonesia's resource endowment and assesses the role it plays in the economy. Then follows a discussion of ways by which productivity can be raised in agriculture and the benefits that may emerge from greater crop diversification, less focus on staple crops and self-sufficiency, and fewer trade restrictions. The next section assesses the challenges faced by Indonesia's fossil fuel industry and how that sector could benefit from a clearer, more streamlined regulatory environment. The final section discusses the environmental impact of natural resources exploitation and how a better utilisation of Indonesia's renewable energy potential could help it achieve its CO_2 and pollution reduction targets. Tourism and fisheries will also be briefly covered.

Natural resources in the Indonesian economy

A richly endowed country

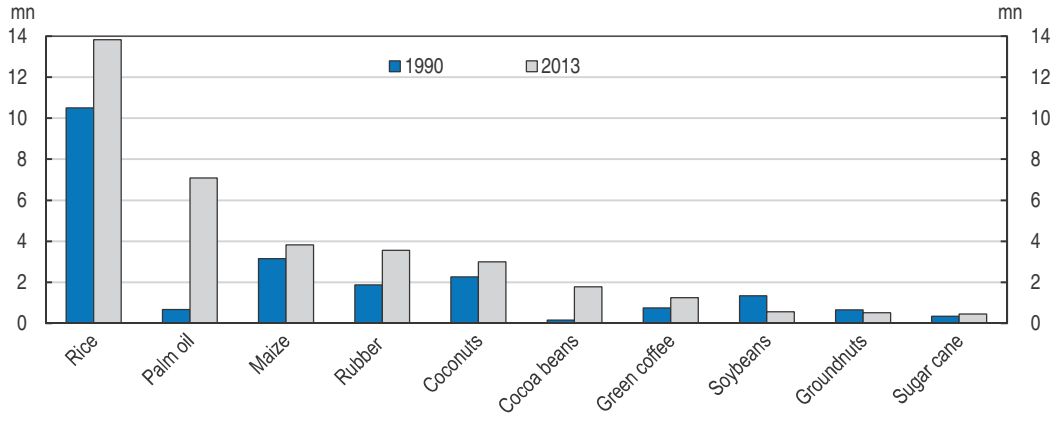
Indonesia possesses vast reserves of coal, mostly steam coal of medium calorific value used for energy production (and some small amounts of lower-end coking coal products). It also possesses huge reservoirs of natural gas and oil, and was until 2009 the only Asian country in the Organisation of Petroleum Exporting Countries (OPEC). In terms of minerals, Indonesia is the world's largest exporter of refined tin and (until recently) nickel ore, and a leading exporter of bauxite, lead, gold and copper. The Grasberg mine in Papua has the world's third-largest copper reserves and the world's biggest gold reserves.

In terms of renewables, Indonesia has the world's third-largest forest coverage (944 320 km^2, 52% of the land area) located mainly in Sumatra, Kalimantan and Papua. Agricultural land covers 536 000 km^2 (29% of the land area). It consists of arable land (44%), permanent crops (35%) and permanent pasture and meadows (21%). Rice occupies the most land, followed by palm oil, maize and rubber (Figure 2.3). Indonesia's climate pattern allows for multiple cropping during the year, in particular in Java and Bali where good climate and soil allow for up to three crops per year. Arable land per farmer is at 1 000 square meters, however, which is half the world average.

Water is abundant in almost every region. Renewable water resources of 8 500 m^3/capita/year are slightly less than the United States, but four times more than in China and

Figure 2.3. **Harvested area, 1990 and 2012**

Hectares



Source: FAOSTAT.

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eight-fold more than in India. About 72 000 square kilometres, 17% of crop land, was irrigated in 2009. However, around half of all irrigation systems suffer to various degrees from a lack of maintenance. With agricultural activities responsible for 82% of all water withdrawals, urban and rural areas experience substantial constraints on the quality and quantity of water available for domestic and industrial use (Amin, 2011).

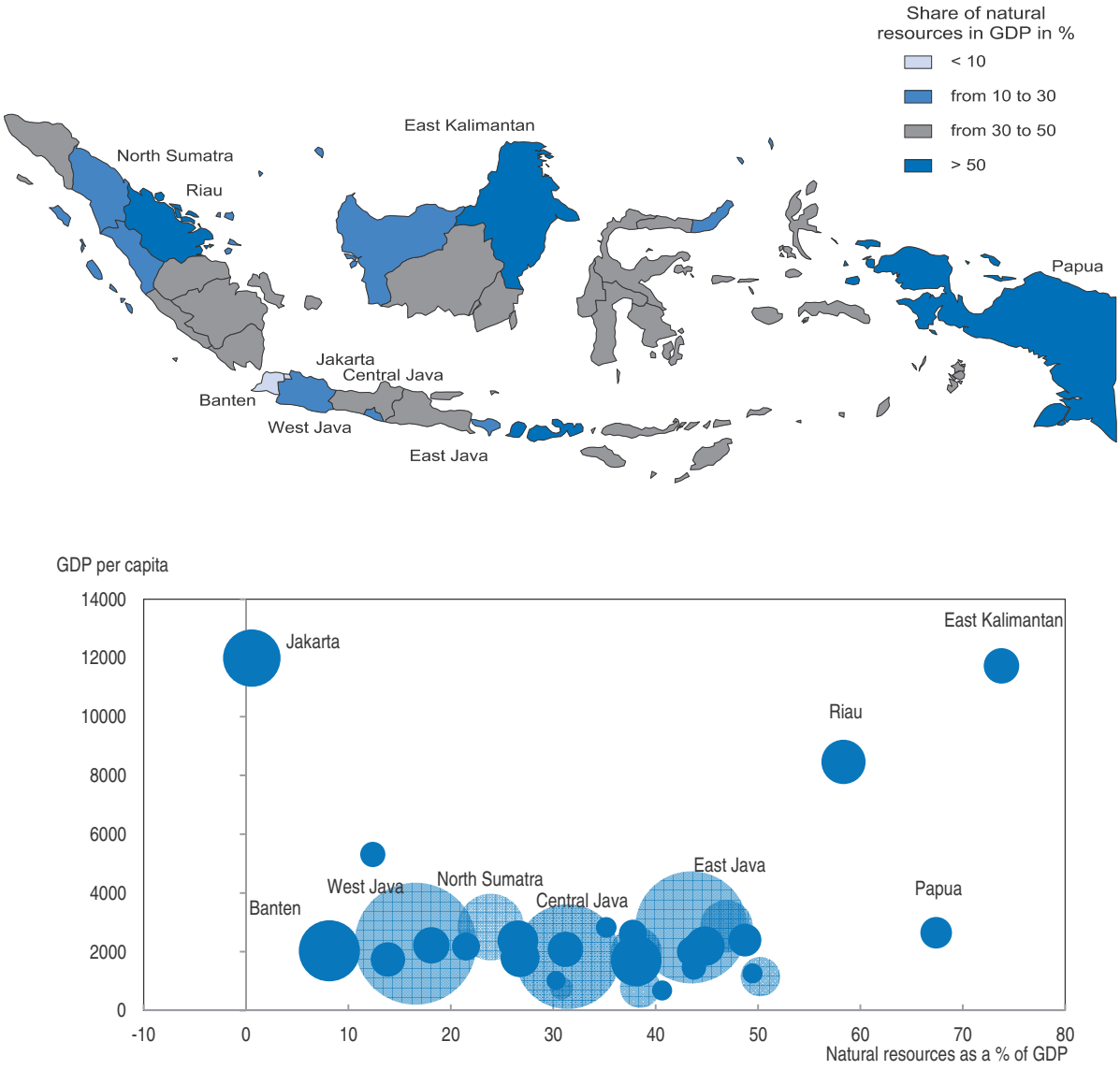
The regional distribution of natural resources is not uniform. At one extreme is Jakarta, whose economy is based almost entirely on manufacturing and services, and at the other is East Kalimantan, some 75% of whose GDP is derived from direct exploitation of natural resources, especially coal. Both regions enjoy the nation's highest standards of living (Figure 2.4). If one adds tourism to the picture, some provinces, such as Bali, generate substantial revenues from their natural beauty. The government, aware of each region's potential and comparative advantages, has put connectivity and specialisation at the heart of the Master Plan for Acceleration and Expansion of Indonesia's Economic Development 2011-25 (Box 2.1).

The benefits and risks of natural resource exploitation

Natural resources are particularly important in developing economies, accounting for an estimated 26% of total wealth in low-income countries, compared to 13% in middle-income countries and only 2% in advanced countries (OECD, 2009). When benefits flow to the community, the exploitation of natural resources provides a road out of poverty, as the revenues generated in the primary sector flow into the economy, increasing the fiscal take for the government. With the right policies, those revenues can help transform natural capital into physical, social and human capital. Chile and Botswana are recent examples of countries that have successfully harnessed their mineral wealth. Growth in agriculture too can help to reduce poverty by creating jobs often in poor and remote locations. According to the three most recent decennial agricultural censuses, incomes per rural Indonesian household increased by 56% in real terms during 1993-2003, compared with just 17% during 1983-93.

But a number of risks are associated with natural resource exploitation. Some countries are richly endowed but remain amongst the poorest in the world. First, resource-

Figure 2.4. **Natural resources and regional economies**[1]



1. In the second panel, the size of each circle represents its share of total population.
Source: CEIC.

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Box 2.1. **The Master Plan for the Acceleration and Expansion of Indonesia's Economic Development**

In 2011, the government announced a Master Plan for Acceleration and Expansion of Indonesia's Economic Development 2011-25 (MP3EI). The vision is for Indonesia to be one of the world's leading developed countries by 2025, taking GDP to USD 4.5 trillion and increasing per capita income from USD 3 000 to USD 15 000. The Master Plan aims at improving regional economic potential through the development of six economic corridors (Sumatra, Java, Kalimantan, Sulawesi, Bali-Nusa Tenggara and Papua-Kepulauan Maluku), optimising agglomeration advantages and strengthening national connectivity across those corridors. A subset of 22 economic activities will be promoted within each of the

Box 2.1. **The Master Plan for the Acceleration and Expansion of Indonesia's Economic Development** *(cont.)*

corridors. They were selected with reference to their natural advantages and to ensure development occurs across the archipelago.

Of these six corridors, all but Java have natural resources at the centre of their development strategy, illustrating the importance the government attaches to the sector. For instance, Kalimantan will become the "Center for Production and Processing of National Mining and Energy Reserves", while Bali-Nusa Tenggara will become a "Gateway for Tourism and National Food Support". Five of the 22 activities relate to agricultural production: palm oil, rubber, cocoa, food crops and animal husbandry. A common thread across the agricultural activities is to increase yields and stimulate further processing, e.g. increase planting with high-quality seeds, develop port capacity and establish research centres. With this plan, Indonesia aims to position itself as one of the world's main food suppliers, as a processing centre for agricultural, fishery and mineral resources and also a logistics hub.

The plan outlines IDR 4 000 trillion (USD 316 billion at the then current exchange rate) in investments to be made over the next 14 years, including in infrastructure. At the MP3EI launch, then-President Yudhoyono identified 17 strategic projects, such as hydroelectric and solar power plants, oil palm developments, a steel mill in East Java, new roads including toll motorways, mining projects, expansion of broadband internet, and nickel, cobalt and aluminium refineries. Mr. Yudhoyono also acknowledged that Indonesia must first overcome "five diseases that can make us fail", including slow bureaucratic processes, conflicting interests in regional government, obstructive regulations, broken promises to investors and "unhealthy" political factors.

In May 2014, the government claimed that IDR 838.7 trillion (about 20% of planned spending) had been spent, covering a total of 204 infrastructure and 174 other projects.

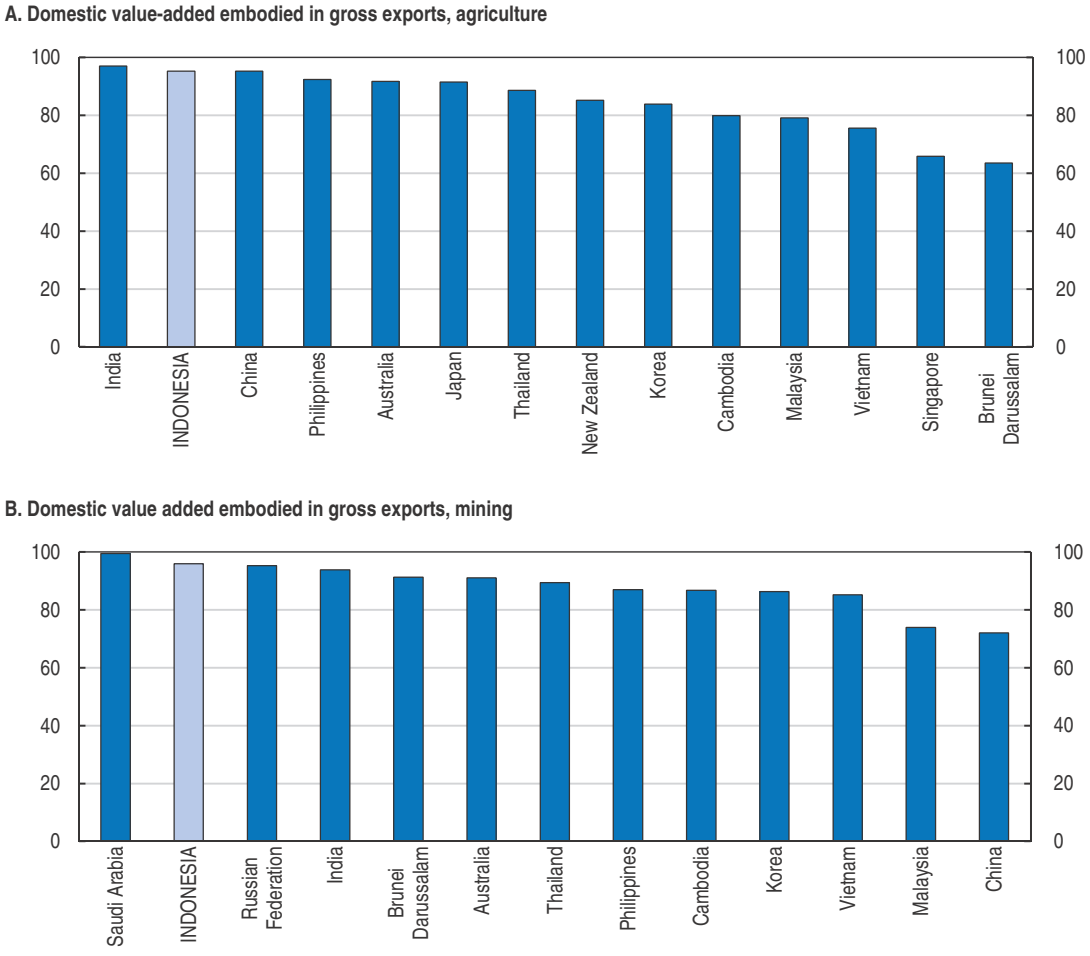
Source: BAPPENAS (2011), Master Plan for the Acceleration and Expansion of Indonesia's Economic Development 2011-25.

based economies are vulnerable to "boom and bust" (due to the low short-term price elasticity of supply for such products, while demand is relatively income elastic), which amplify their business cycles. Hence, when resource prices increase, typically the domestic currency appreciates to return to balance of payments equilibrium, which in turn crowds out other tradable sectors, an outcome known as "Dutch disease". In addition, extracting and selling raw commodities risks complacency, as it does not foster the development of high value-added industries. Possibly reflecting low levels of onshore processing, Indonesia has the world's second-highest domestic value added embodied in gross exports for both agricultural products and mining output (Figure 2.5). This suggests a lack of Indonesian involvement in global value chains in the resources sector.

Vast endowments of natural resources may also promote rent-seeking behaviour and corruption, rather than entrepreneurial and value-adding activities. The special characteristics of Indonesia's natural resources (such as unclear property rights, remote location and difficult access), in combination with weak institutions, give rise to special challenges, especially corruption of the agencies allocating property rights and licenses. Some other countries have managed to escape the curse, such as Botswana (Box 2.2). Furthermore, activities like mining can have a damaging impact on the environment via excessive water consumption, pollution, deforestation, subsidence and land alteration. In

Figure 2.5. **Domestic value added in gross exports of agricultural and mining products, 2009**

Per cent



Source: OECD-WTO Trade in Value Added (Tiva).

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Box 2.2. **Avoiding the "Resource Curse": The Case of Botswana**

Botswana is a sparsely populated, arid, landlocked country. At independence in 1966, it was one of the world's poorest countries, with per capita income of just USD 70 a year. In the first few years following independence, about 60% of current government expenditure consisted of international development assistance. There were only 12 kilometres of paved roads, and agriculture (mostly cattle farming for beef production) accounted for 40% of GDP. About 40 years later, in 2007, Botswana had 7 000 kilometres of paved roads, and per capita income had risen to about USD 6 100 (equivalent to USD 1 000 in 1966 prices and USD 12 000 at purchasing power parity), making Botswana an upper-middle-income country, comparable to Chile or Argentina.

Botswana's extraordinary growth was fuelled by minerals, particularly diamonds, but underpinned by good governance. The government established respect for property rights and the rule of law. It maintained a high degree of transparency, which was reinforced by continuing the Tswana tribal tradition of consultation. In addition, the first post-independence

Box 2.2. **Avoiding the "Resource Curse": the Case of Botswana** *(cont.)*

government made two key decisions: it passed a Mines and Minerals Act that gave all mineral rights to the state rather than to the tribal authorities and renegotiated a deal with the mining firm DeBeers in 1975, which allocated half of all net profits from diamond mining to the state. Also, Botswana did not adopt a policy of import substitution, nor did it expand the extent of state-owned producing entities.

The ensuing revenues for the government, primarily from diamond exports, were channelled into investments in education, health care and infrastructure, while tight fiscal control was maintained. A contributing factor has been the creation of a set of fiscal rules – a Sustainable Budget Index – to avoid deficits. In particular, government expenditure must stay in line with non-mineral fiscal revenues in order to make sure that key government functions can be kept up in case of a downturn in the commodity sector. A similar mechanism is in place in Chile.

Source: Lewin (2011), "Botswana's Success: Good Governance, Good Policies, and Good Luck", in *Yes Africa Can, Success Stories from a Dynamic Continent*, World Bank.

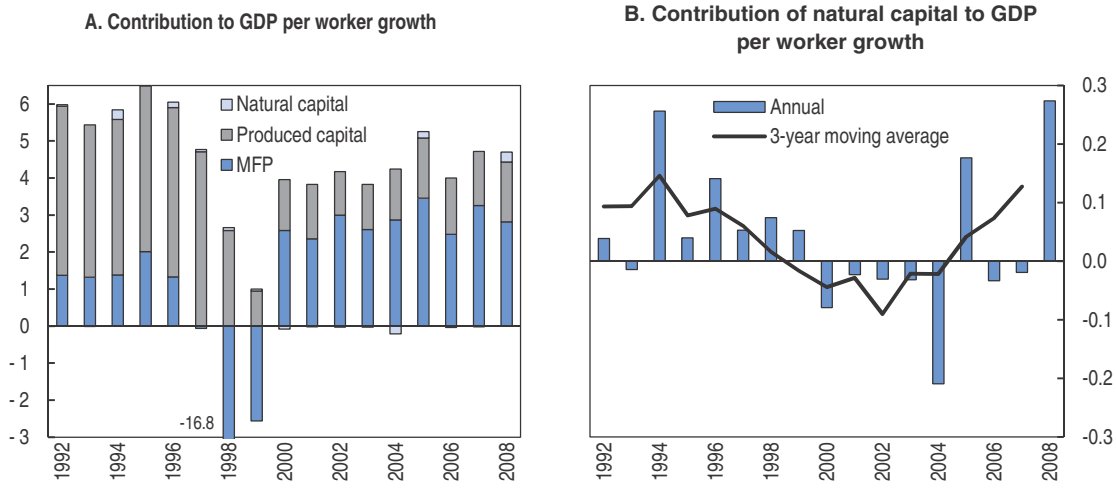
the end, good governance, strong institutions, effective regulation and rigorous environmental and social safeguards are needed to realise the potential contribution of natural wealth to growth and living standards.

Assessing the role of natural resources in Indonesian growth

The contribution of natural resources to Indonesian growth can be evaluated by incorporating the use of natural capital as a factor input into Indonesia's aggregate production function, alongside labour and produced capital. Such analysis, known as green growth accounting, also allows an assessment of the sustainability of natural resource development. Depleting natural capital can lead to higher growth for a while, but this can be sustained only if the revenues from resource extraction allow the accumulation of other assets, such as human and physical capital, to secure future economic growth when the possibility to use natural capital in production has been exhausted. Data on natural capital come from the World Bank (available until 2008). They are mainly focussed on sub-soil assets such as oil, gas, coal and various minerals. Some types of natural capital, such as water, soil or renewable resources (agriculture and fish in particular) are not included due to a lack of data. The methodology is detailed in Brandt et al. (2013) and covers the period from 1992 to 2008.

The results show that, except for the early 2000s, the net contribution of natural capital has been broadly positive but small (Figure 2.6). The negative contribution in the early years of the 2000s suggests overexploitation of natural resources as natural capital declined. This may be explained by dwindling oil and gas reserves. While exploitation of natural resources continued to increase in the second half of the decade, rapidly rising commodity prices helped bring the contribution of natural capital back into positive territory. Overall, the contribution is less than for countries like Chile, Canada, Australia and Norway (Brandt et al., 2013). Nevertheless, it is important to keep in mind that several natural resources are left out of the analysis, especially land (and thus agriculture), which represents a large share of the Indonesian economy.

Figure 2.6. **Growth accounting with natural capital for Indonesia**



Source: World Bank Database on Natural Capital and OECD calculations.

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Increasing productivity and crop diversification in agriculture

In 2012, of the world's 7.1 billion people, an estimated 1.3 billion (19%) were directly engaged in farming, yet agriculture represented just 2.8% of global income (Alston and Pardey, 2014). In Indonesia, agriculture accounted for around 12% of GDP in 2013, and employed about 42 million people, or 40% of the workforce (OECD, 2012b).

Since 2000, Indonesia has made some noticeable achievements by becoming a central player on the world stage for many key farm and food commodities. In addition to palm oil and rubber, the country is also the second-largest producer of fisheries products in the world after China (Box 2.3) and the third-largest rice and spices producer after China and India. Overall, it now ranks fifth, with 2.5% of the world's total agricultural output, after China (23%), the United States (10.1%), India (9.9%) and Brazil (6%) (FAOSTAT, 2015).

Box 2.3. **Fishing in Indonesia**

Indonesia is one of the largest fishing and aquaculture producers in the world. In 2011, total marine capture exceeded 5 million tonnes (the most valuable species being shrimp and lobsters), inland water catches were more than 347 000 tonnes, and aquaculture production was almost 7 million tonnes. The annual value of its aquaculture production alone is close to USD 7 billion; Indonesia has 8% of world aquaculture production, a distant second to China (61%).

A specific characteristic of the Indonesian fisheries is the importance of traditional management practices, which are based on unwritten agreements among coastal residents. These traditional management systems differ from one region and fishery to the next. Some include the closure of specific areas for one or two years, followed by limited fishing for a period of one or two weeks. Other traditional management measures include agreements on gear restrictions and fishing practices.

Traditional management measures are also applied to aquaculture. Pearl farms sometimes make informal arrangements with villages to lease a part of their fishing

Box 2.3. **Fishing in Indonesia** *(cont.)*

grounds. In Bali, plots of submerged land for seaweed culture are subject to informal administration and management systems.

Indonesia's fish stocks and aquatic habitats are in good condition. There is, however, little room for further expansion of the fishing fleet, since most stocks are fully or over exploited, especially in the West. Hence, further increases in production will be possible only after recovery of fish stocks through rationalisation of the fishing fleet.

Source: OECD (2013), *OECD Review of Fisheries, Policies and Summary Statistics*, OECD Publishing.

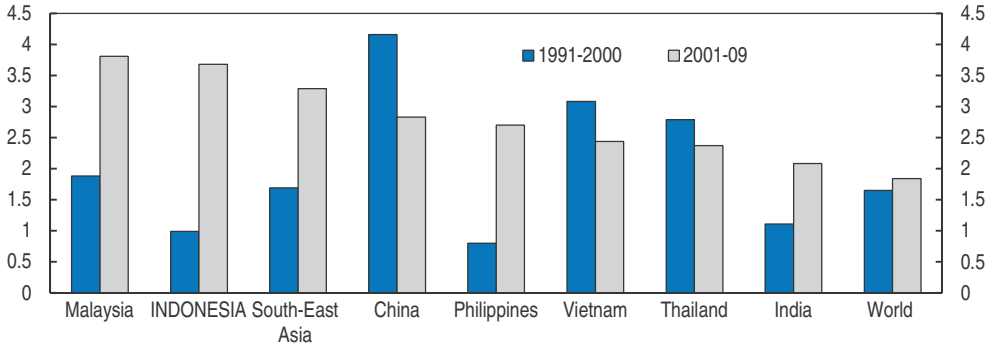
Given its vast endowments and strategic location, Indonesia could accelerate its transition to higher-productivity agriculture by encouraging investment and innovation, and pursuing consolidation and diversification into perennial and estate export-oriented crops. But Indonesian agriculture is being held back by issues such as poorly defined property rights, ill-advised trade restrictions, excessive focus on staple crops and self-sufficiency, and barriers to foreign ownership.

Increasing productivity in agriculture

Following a period of liberalisation, productivity growth in Indonesia's agriculture recovered significantly in the 2000s compared to its poor 1990s performance (Figure 2.7). Over 2000-06, multifactor productivity (MFP) growth in agriculture rose to rates as high as or higher than in the peak years of the 1968-92 "Green Revolution" (Table 2.1) and was even higher in agriculture than in the economy as a whole between 2001 and 2009-3.7% versus 2.1%. Adoption of improved technology and diversification into high-value commodities explain those results. Labour productivity gains in countries with the strongest growth, such as China in the 1990s and Malaysia in the 2000s, were due to both production increases and falling agricultural employment. This has not (yet) been the case in Indonesia where employment in agriculture has remained fairly constant. Raising productivity further will be crucial as Indonesia will find it increasingly difficult to expand agricultural land, given environmental concerns and increasing marginal costs of servicing

Figure 2.7. **Agriculture MFP growth in selected Asian countries**

Per cent



Source: Fuglie, K. (2012), "Productivity Growth and Technology Capital in the Global Agricultural Economy", in K. Fuglie et al. (eds.), *Productivity Growth in Agriculture: An International Perspective*, CAB International, Oxfordshire, UK.

StatLink http://dx.doi.org/10.1787/888933200408

Table 2.1. **Agriculture productivity growth decomposition**

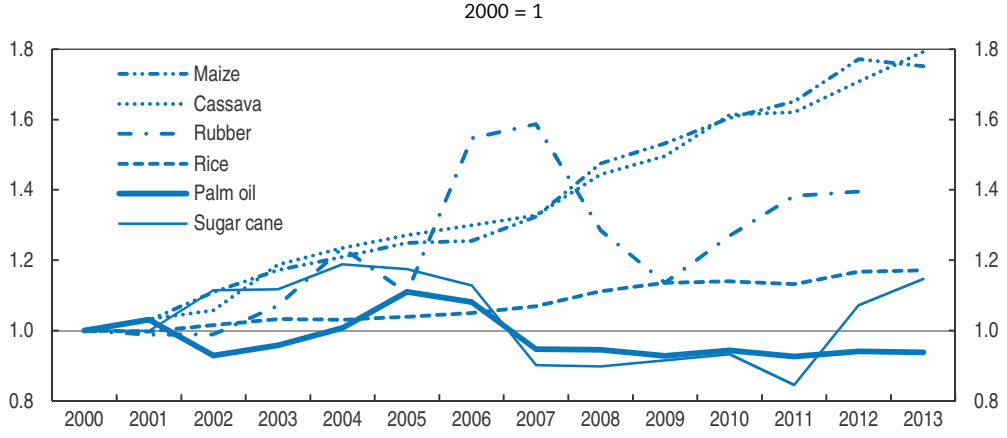
	Output	Input	MFP
1961-1970	3.66	0.96	2.70
1971-1980	3.78	1.67	2.10
1981-1990	4.74	3.54	1.20
1991-2000	2.16	1.18	0.98
2001-2006	3.86	1.43	2.43

Source: Fuglie, K. (2010a), "Sources of Growth in Indonesian Agriculture", *Journal of Productivity Analysis*, Vol. 33, pp. 225-40.

land. Given the magnitude of agricultural employment, raising productivity in the sector is also key to reducing rural poverty. As of March 2013, rural poverty (defined by the government as less than IDR 253 000 per capita per month, around USD 20) was 14.3% (17.7 million) of the rural population, down from 20.2% a decade ago (see Chapter 1).

Progress in boosting agricultural yields has varied widely across crops (Figure 2.8). Rice yields, for instance, rose from 2.5 tonnes per ha in 1971 to 4.4 tonnes in 1991. Ten years later yields were still at 4.4 tonnes/ha before climbing to 5.15 tonnes/ha in 2013, which compares favourably with Thailand (3.1 tonnes/ha), India (3.7 tonnes/ha) and Malaysia (3.8 tonnes/ha), but not well with China (6.7 tonnes/ha) and Vietnam (5.5 tonnes/ha). On the other hand, crude palm oil yields have declined. Since land dedicated to palm oil production has risen considerably (Figure 2.3), this shows that the huge growth in that sector is primarily extensive. There is, however, significant potential to increase palm oil yields through fertilisers, high-yielding varieties and improved harvesting and management practices.

Figure 2.8. **Selected crop output per hectare**



Source: FAOSTAT.

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From a regional point of view, recent productivity growth has been concentrated in the western and northern parts of the country (especially Sumatra and Kalimantan), where export commodities like cocoa have been booming. In contrast, MFP growth has been low or stagnant in Java and the eastern provinces. This contrasts with the "Green Revolution" when productivity growth mainly benefitted irrigated rice production, which is especially important in Java (Fuglie, 2012).

Among the factors that are restraining agricultural productivity is the scarcity of available land, at just 2 300 square meters per capita, and the lack of scale economies. This is reflected in small average farm size, from 3 000 square meters in Java to 14 000 square meters for irrigated land outside of Java. Smallholders occupy 87% of cultivated land, produce 90% of total rice and maize output and hold 75% of the 180 000 square kilometres in estate cropland (Jeon, 2013). With production methods largely inherited from the past and based on the small family-farm model, modern productive technologies are only slowly being implemented. However, next to these small farms there are large state-owned farms in Kalimantan and Sumatra whose average size is 26 square kilometres. As noted in OECD (2012b), this dichotomy is especially apparent in the rubber and palm oil industry. While small farms are not a problem *per se*, that feature generates farmers' limited financial capacity to upgrade production methods, as many of them see farming as just another source of income besides other non-farming activities. Indonesia should develop a long-term strategy for farm restructuring that aims at boosting average farm size, increasing economies of scale.

One way to achieve this goal is to further develop partnership arrangements between estates and smallholders undertaken within so-called "nucleus plasma" schemes over the last 30 years. These have provided large companies (the nucleus), both private (such as Unilever) and state-owned, with subsidised capital and long-term leases for public lands for estate crop production, on condition that these companies provide technical and marketing services to neighbouring smallholders (the plasma). Such arrangements can be conducive to small farmers and boost productivity by providing training and technical assistance to (otherwise technology-poor) farmers on important inputs such as rice varieties, seeds, tools and machinery. Such partnerships have already contributed to bridge the yield gap between smallholders and large estates for palm oil, sugar cane and cocoa. The productivity gap remains large for tea and rubber, however. In the latter case, this may partly result from lower tree density per unit of land, as smallholders practice mixed cropping (which can have environmental advantages). This contrasts with monoculture-based cropping on large estates (Fuglie, 2010b).

As pointed out in OECD (2012b), the problem of small average farm size is exacerbated by the issue of land rights. Land rights in Indonesia are very complex with ample scope for drastic simplification. The Basic Agrarian Law of 1960 (BAL, 1960) required that all land rights be registered, but no time limit was given at the time of its promulgation. Land registration (titling) is still ongoing, and during the last four decades the National Land Agency (BPN) has managed to register only around one-third of privately owned plots. Thus, most rural households have unregistered land rights usually acquired through inheritance. Although Article 56 of the Law recognises the continuing validity of rights, the right of the new holder cannot be fully recognised by the State until a new certificate is issued confirming that the land is not State land (USAID, 2010). The slow progress in land registration therefore creates an important barrier to consolidation in the sector, but also to accessing credit, which is indispensable to capital and technology improvements, as farmers are required to provide collateral to meet bank lending requirements. Despite further efforts to implement the BAL, existing ambiguity over land rights remains one of the reasons for land conflicts. In 2012, the office of the President recorded 8 305 land disputes, 2 002 of which are likely to turn into violence (Jakarta Globe, 2012). The land tenure system should thus be clarified (Box 2.4), and the registration of land rights to

Box 2.4. **Land rights in Indonesia**

The 1945 Constitution stipulates that all land, water, air space and natural richness are controlled by the State and must be used to assure the people's welfare. The most important piece of legislation regulating land rights is Law 5/1960, known as **the Basic Agrarian Law** (BAL) (Winoto, 2009). Under the BAL, land controlled by the State on behalf of the people is available for distribution to all citizens under various forms of land tenure.

Established in 1988, **the National Land Agency** (*Badan Pertanahan Nasional*, BPN) was responsible for the administration of all non-forest land. Activities of the BPN were grouped under four areas stipulated in the BAL: land reform, use, titling and survey/registration (Heryani and Grant, 2004). Under Law 22/1999, land affairs were devolved to local governments (USAID, 2010), but BPN was maintained as a central agency with a role limited to legislation, performance standards, uniform land registration procedures, training and the provision of some land-related services (Heryani and Grant, 2004; Hendriatiningsih et al., 2009).

The BAL defines the fundamental **types of land rights** that may be held by both private individuals and entities and describes the role of the State in regulating and implementing these rights (USAID, 2010). While foreigners are not eligible for the right of land ownership (*Hak milik*), they can be granted some other types of land use rights as described below. The main objective of the BAL was to remove the legal dualism between colonial law over land and customary rights to land (*Hak ulayat*) based on communal land rights, and land rights exercised by individuals with the consent of the community (Penot et al., 2002). *Hak ulayat* law principles vary widely across regions (USAID, 2010). The BAL explicitly acknowledges that Indonesia's agrarian law is derived from *Hak ulayat*. However, to obtain *ulayat* rights, several conditions must be met: *ulayat* must not conflict with national interests or other regulations set out in the BAL; the land must be under the ownership of a recognised traditional community (*adat*), and its boundaries must be well defined and understood; *ulayat* rights can be registered and certified only after having been rendered into one of the types of formal land rights recognised in the BAL.

The BAL sets seven forms of land rights that can be registered, including the rights, restrictions and responsibilities of the tenure holder. These land rights can be primary titles derived directly from the State or secondary titles granted by other title holders (BAL, 1960).

- ***Hak milik (right of ownership)*** is the strongest land right. It is unlimited in time and can be sold, gifted, exchanged, bequeathed and mortgaged. Only Indonesian citizens and special bodies designated by the government, e.g. government banks, co-operatives and religious and social bodies, can hold this right. The right must be registered, and the holder is given a certificate as proof of title. Subsequent government approval is not necessary for sale or mortgage of land if the buyer is an Indonesian citizen. However, this approval is necessary if the buyer is a legal entity. In all cases the State retains the right to regulate the use of land in accordance with any authorised regional or local development plans.
- ***Hak guna-usaha* (right to cultivate)** is the right to exploit the land directly controlled by the State for the purpose of agriculture, fisheries or cattle breeding. It can be granted on land whose area is at least 5 ha. Only Indonesian citizens and corporate bodies incorporated under Indonesian law and domiciled in Indonesia are eligible. It is transferable and can be used as collateral. It can be granted for a maximum period of 35 years and extended for a further 25 years.
- ***Hak guna bangunan* (right to build)** applies to rights to construct and own buildings on land. Only Indonesian citizens and corporate bodies incorporated under Indonesian law

Box 2.4. **Land rights in Indonesia** *(cont.)*

and domiciled in Indonesia are eligible. It is transferable, can be used as collateral and can be granted for a period of up to 30 years and extended for a further 20 years.

- ***Hak pakai* (right to use)** is the right to use and to harvest from land that is directly controlled by the State or belonging to other persons. It is transferable under certain conditions. Its eligibility is wide and includes Indonesian citizens, foreign citizens domiciled in Indonesia, corporate bodies incorporated under Indonesian law and domiciled in Indonesia and foreign corporate bodies having representation in Indonesia. The use right is granted for a definite term or for as long as the land is used for a specific purpose.
- ***Hak sewa untuk bangunan* (right to lease for buildings)** represents the entitlement to use land owned by another party for the purposes of building construction. The user of this right is obliged to make rental payments to the owner of the property. There is no fixed term for this type of land right. The eligibility is the same as for the "right to use" and includes Indonesian citizens, foreign citizens residing in Indonesia, corporate bodies established under Indonesian law and domiciled in Indonesia and foreign corporate bodies having representation in Indonesia.
- ***Hak membuka tanah* and *Hak memungut hasil hutan* (right to clear land and right to collect forest products)** can be held only by Indonesian citizens. There is no private or community land ownership or land rights for forest areas, only forest concessions. BPN becomes involved in forest land areas only when it is converted to non-forest use.

Source: OECD (2012b), *OECD Review of Agricultural Policy*, Indonesia.

facilitate access to credit for smallholders should be accelerated. Creating a unique and dedicated agency to accelerate land rights registration should be a priority.

Another reason for subdued productivity growth is the low level of investment. The share of agriculture in total realised investment, at 10.7% on average in the last 10 years, is lower than its share in GDP, imports, exports and employment. Promoting investment in agriculture is crucial to bridge the productivity gap between staple and export crops. Investment in agriculture should be encouraged via subsidised loans, but also by removing restrictions on foreign ownership in large-scale horticulture businesses, warehousing and cold storage, which are hampering growth in agriculture (cf. below).

Encourage further diversification

Diversification away from traditional crops is another avenue for productivity growth. Upgraded marketing channels, and shared market-based information on which crops are attracting the highest prices, would help farmers make the best crop-choice decisions. But diversification has been limited by institutional factors: public agricultural extension services (advice to farmers), research and agriculture education are indeed deeply rooted in traditional agricultural crops, especially rice. For example, in the area studied by Jeon (2013) the most commonly planted crops were staples, which are highly regulated by government. The dominance of staple crops in some regions means that farmer groups and the supporting agricultural agency receive comparatively little guidance on cash crops or high-value specialised crops. This is detrimental to farmers' income prospects. The focus on staple crops is misplaced and should be abandoned in favour of more diversification. At the same time diversification efforts should be complemented with better market-price information for farmers. Smallholders should also be better linked to

local and national markets to make the most of their diversification efforts. This requires better transport infrastructure, improved market-price information for farmers, and phasing out export and import restrictions (see below).

In addition to diversification, insurance schemes can help farmers to deal with income variations caused by price and output fluctuations, thereby encouraging them to take more risks. A well-developed insurance scheme against adverse climatic or price developments would thus discourage farmers from returning to the safe option of government-regulated staple crop production for (own) consumption. Trials of insurance programmes for rice and cattle have been carried out in some areas. These pilots should be assessed and, if successful, made available in other districts and extended to a range of commodities outside the area of government interest in order to encourage diversification. In the long term sound insurance schemes would allow for a more stable policy framework and reduce the need for one-off support payments to farmers. The short-term challenge is to demonstrate to farmers the value of having insurance and overcoming the domestic barriers that have prevented the private provision of such schemes to farmers. In this regard, a temporary subsidy for insurance purchase to "jump start" the market may be justified.

The government has in place programmes to encourage greater fertiliser use to improve productivity. Nitrogenous fertiliser is the most widely used (64% of total consumption in nutrient terms in 2008), followed by potash (27%) (FAOSTAT, 2014). With little livestock, most farmers do not apply manure. Among food crops, the highest application rates per hectare are for rice, maize and soybeans (OECD, 2012b). Indonesia's fertiliser application rates averaged 98 kg/ha in 2007-09, which is higher than in the Philippines (69 kg/ha) but remains much lower than in such countries as China (427 kg/ha) and Vietnam (233 kg/ha). In an attempt to stimulate fertiliser use, the government has set up a subsidy programme which includes: planning of the quantities requested and produced, setting a ceiling price (HET), fixing the amount of subsidies to cover the costs of provision at the HET, and distributing subsidised fertilisers to eligible farmers. Around 75% is distributed at subsidised prices and subject to strict regulations, and 25% is sold at market prices in village kiosks (Pandin, 2008).

Currently, there are five fertiliser producers. All are state-owned, and in 1997 they were combined into a single holding company, PT Agro Kimia Indonesia. The current system, however, is inefficient. The lack of competition, insufficient gas supply and obsolete technologies (most factories are more than 20 years old) are major reasons for low capacity utilisation, around 20-30% below potential, and high production costs. Moreover, field surveys indicate that subsidised fertilisers are not available in required quantities, deliveries are often delayed, and only 40% of fertiliser subsidies reach smallholders (OECD, 2012b). These subsidies, which cost 1.3% of total government expenditure on average over the last three years (Box 2.5), should be phased out. The savings could be used to finance vouchers that could be used by farmers to purchase any inputs leaving them free to decide how to use those funds. Privatising the five producers and reducing import and export restrictions for fertilisers would raise efficiency in the sector. Privatisation could also be useful to launch the voucher reform.

Indonesia has made improvements in agricultural productivity when viewed over the longer term, helping to place downward pressure on food prices. For example, crop yields have risen, including in staples. This, along with economic growth has contributed to falling rates of undernourishment: its prevalence is currently estimated at 9% of the

Box 2.5. **Government financial support to agriculture**

Government financial support to agriculture is growing. The PSE (Producer Support Estimate as a share of farmers' gross receipts) increased to 19% in 2010-12, on par with the OECD average, due to higher domestic prices compared with those on international markets (OECD, 2014c). PSE was only 3.4% in 1995-97 and 9% over 2006-10 (with some significant fluctuations), which was then far below the OECD average of 22% (OECD, 2012b). As for the Total Support Estimate (TSE), it was at 3.4% of GDP in 2010-12 (up from 1.9% in 2006-10), well above China (2.25%), the OECD (0.8%), Brazil (0.49%) and South Africa (0.22%) (OECD, 2014c). This high TSE figure is also due to agriculture's relatively large share in GDP. Market price support is the dominant form of support. It reflects border protection for certain agricultural commodities, subsidies on inputs, such as fertilisers, and output price support for rice and sugar. In 2010, support for rice alone represented one-third of the total PSE.

population, half of what it was only a decade ago. Food security remains high on the policy agenda. This takes various forms such as rice reserves, priority to domestic production, price support, delivery of rice at subsidised prices to poor households (RASKIN), and export and import restrictions and licenses. These policies have severe drawbacks: the domestic price of rice was 60% higher than the international reference price in 2010-12 compared to 8% in 2000-02, and simulations show that these policies would increase the rate of undernourishment under various risks scenarios (OECD, 2014c). In addition, according to the FAO, at 13.1% the cereal import dependency ratio is already one of the lowest in the region and has not moved much since 1998. It is on par with Thailand (12%) and Vietnam (13.4%) but much lower than wealthier countries such as Malaysia and Japan both at 80.7% (2011 data, three-year average) (FAOSTAT, 2015). By removing trade restrictions (see below) and phasing out price support, Indonesia could lower prices for both domestic and imported food, making costly self-sufficiency policies less necessary and improving well-being, especially for the poor.

As an alternative to RASKIN, which does not always reach its target population and suffers from high administrative costs, food vouchers or cash transfers would improve diversity and be more cost effective (Hidrobo et al., 2014). They would also further encourage crop diversification. In order to reduce food poverty through trade, export and import restrictions should be eliminated over time, in co-ordination with other ASEAN members. Import restrictions, especially in areas where Indonesia has no comparative advantage, are especially burdensome. For instance, import quotas on raw sugar are forcing the country's 11 refineries to operate below capacity, despite fast-rising demand.

Reducing trade restrictions

Since 2005, the value of Indonesia's agro-food exports has been consistently more than twice the value of agro-food imports, and their share in total exports increased from 12.5% in 2000 to 23.3% in 2011. Asian countries are the main export destinations, with their share rising from around one-half in 1990-92 to two-thirds in 2011-13 (China alone accounted for 12.4% of the total in 2013). Major agricultural imports include wheat, cotton, soybeans, dairy products, sugar, tobacco and beef. The United States and Australia are the most important suppliers, with market shares in 2008-10 of 19% and 17%, respectively (OECD, 2012b). This pattern of trade reflects Indonesia's comparative advantages in producing perennial tropical crops such as crude palm oil and rubber, which fit its land and

Box 2.6. **Palm oil in Indonesia**

Indonesia is now the world's largest exporter of palm oil, and more than 70% of its production is destined for export. About 70% of production is in Sumatra, and small producers provide 42% of it. The main export markets in 2012 were India (27.5% of exports), China (14.8%), Malaysia (7.5%), the Netherlands (7.1%) and Singapore (5.1%) according to CEIC data. Partly due to increased labour costs in Malaysia, another major palm oil producer, its companies have shifted plantations to Indonesia, which explains the large palm oil share exported back to Malaysia.

Besides its role as a cooking oil in Asia, palm oil is used in the production of margarine, sauces, soaps, detergents, cosmetics and household care products, and applied in the leather, textile, metal and chemical industries. Palm oil can also be burned directly as fuel and used as a raw material for biodiesel production.

There are major environmental issues related to the increase in palm oil production, especially deforestation (cf. last section below).

climate well, and importing cereals or livestock for which Indonesia does not have a comparative advantage (Box 2.6).

Still, Indonesia is restrictive regarding farm trade compared with other Asian emerging countries. For instance, back in 2010 the government initiated several policies limiting the export of unprocessed agricultural commodities. It imposed export tariffs on raw cocoa beans and crude palm oil in order to encourage the development of higher value added agricultural activities and ensure that local industries do not lack affordable raw materials. In 2012, Indonesia also banned the export of raw and semi-finished rattan in an effort to induce businesses to export furniture instead.

As for imports, they are subject to many licensing requirements. For instance, livestock producers are supported through border protection keeping domestic prices above international levels, in particular for poultry and beef (OECD, 2014c). In August 2013, Indonesia adopted two ministerial regulations on the importation of horticultural products, requiring importers to obtain three permits: a Registered (or Producer) Importer permit from the Ministry of Trade; an Import Recommendation of Horticultural Products from the Ministry of Agriculture; and an Import Approval from the Ministry of Trade. Import approvals and recommendations are valid only for six months and come with many additional administrative requirements attached (USTR, 2014).

The Horticulture Law 13/2010 has now come into force. It restricts foreign ownership to large-scale horticulture businesses by capping it at 30%, down from 95% previously. The deadline for compliance was 2014 for all companies, including those in the business before the law was passed (no grandfathering). Similarly, a plantation bill setting stricter rules on foreign ownership in that sector (especially palm oil) is currently being drafted. By limiting foreign equity, the law is hindering innovation and restricting the inflow of qualified experts. Such ownership restrictions should be removed to accelerate productivity growth in the face of growing demand for food. Similarly, border protection should be removed to let farmers take advantage of international trade and comparative advantages. Onshore value adding should indeed be encouraged, but by attracting domestic and foreign investment, rather than taxing the export of raw commodities.

Recommendations to manage agricultural resources better

Encourage further diversification

- Encourage diversification into specialised cash crops by reducing institutional support to staples.
- Provide better information for farmers on market prices for crops and an insurance system to help them take more risk.
- Better link smallholders to local and national markets by improving transport systems and access to information and communication technologies.

Ease constraints on investment and encourage consolidation

- Clarify and simplify the land tenure system, and develop a long-term strategy for farm restructuring.
- Increase farmers' access to credit by accelerating land titling.
- Expand partnership agreements between smallholders and large estates to provide technical assistance and training.

Gradually remove producer support and allow more market-based mechanisms to operate

- Phase out fertiliser subsidies and privatise fertiliser producers to raise efficiency.
- Lower food prices by decreasing trade restrictions.
- Phase out market price support, including replacing RASKIN with more cost effective cash transfers or food vouchers.

Indonesia's reliance on fossil fuels poses policy dilemmas

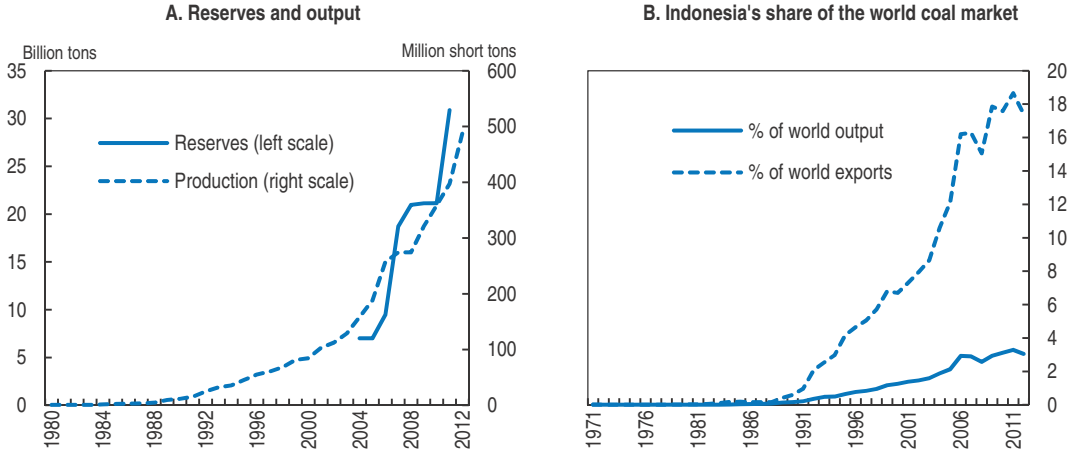
Fossil fuels, whether for domestic consumption or export, are central to Indonesia's economy. Coal is both the country's main source of electricity generation and its first export by value (Figure 2.2, Panel A). Even though its output has been declining for years, oil is still an important (and until recently heavily subsidised) component of Indonesia's energy mix. Indonesia's ramping up of its natural gas capacity, both as a way to replace oil domestically and to meet growing demand from its neighbours, will contribute to lower its CO_2 emissions.

The expansion of coal production is reaching its limits

Indonesia has abundant proven reserves of steam coal (Figure 2.9, Panel A) with its share of the world's output and exports rising fast (Panel B). It is thus well placed to take advantage of growing coal demand as the five biggest coal importers in 2013 were all in Asia: China (327.2 Mt), Japan (195.6 Mt), India (179.9 Mt), Korea (126.5 Mt) and Chinese Taipei (68 Mt), all of them buyers of Indonesian coal (Figure 2.10). In 2013, Indonesia produced 485 Mt (million tonnes) of coal, placing it fourth for output but first for exports, as in 2011 and 2012 (Figure 2.11). Indonesia's coal is mostly steam coal used for heat and energy production (Box 2.7).

With 400 million people still without electricity, ASEAN countries will rely increasingly on coal as a cheap way to generate electricity. It is hard to know, however, how long Indonesia will be able to take advantage of that growth, given talk of an Indonesian ban on low calorific value coal exports and the staunch commitment of the new Chinese government to more efficient, sustainable and environmentally friendly growth. In

Figure 2.9. **Indonesia and the world coal market**



Source: IEA Database and Ministry of Energy and Mineral Resources.

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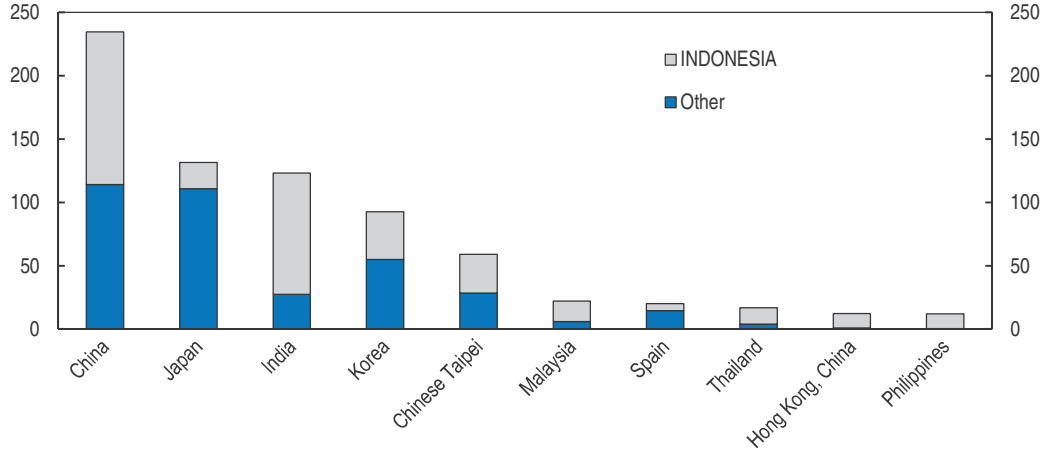
Figure 2.10. **Coal import sources, selected countries, 2012**

Million tonnes



Source: IEA Database.

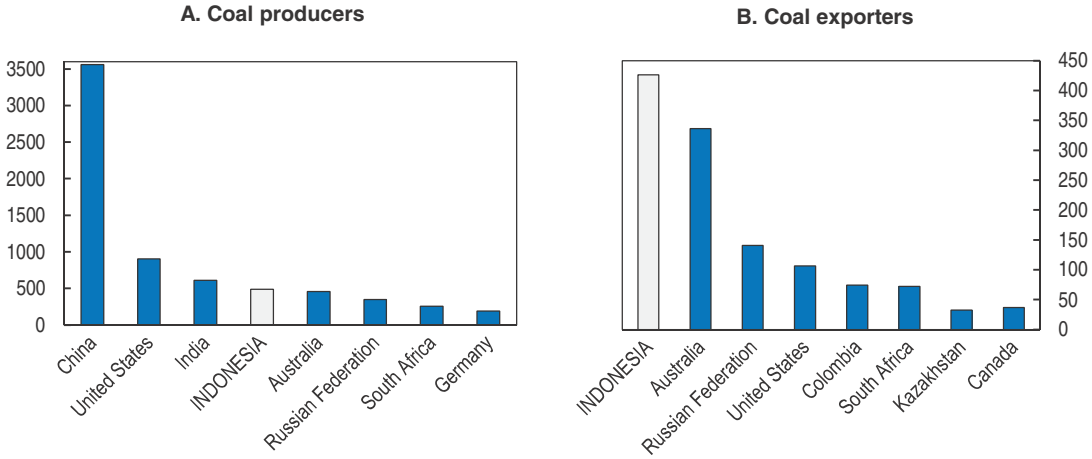
StatLink http://dx.doi.org/10.1787/888933200429

addition, the transition of the US economy towards shale gas and light tight oil is taking place at the expense of coal, whose share in US power generation has collapsed. Given that the United States was until recently the second biggest consumer at 1 000 Mt per year, this change in the US energy market will reduce its demand for coal and increase its exports.

In Indonesia, more electricity generators are shifting to coal. Indeed, coal remains a cheaper option than gas for generating electricity in many provinces. However, Indonesia's coal-fired electricity generation efficiency is still lagging both by world and Asian standards (Figure 2.12). The efficiency of coal-fired plants (measured by the ratio of the energy services delivered, i.e. electricity and useful heat, to the fuel input) depends on a range of factors including the technology employed, the type and quality of coal used, and the operating conditions and practices. Given the share that coal-fired electricity is going to play in its energy mix, improving energy efficiency should be a priority for Indonesia as it offers both significant fuel savings and lower CO_2 emissions, as coal-fired plants are

Figure 2.11. **Main coal producers and exporters, 2013**

Million tonnes



Source: *IEA Database* and IEA (2014), *Coal Information* 2014, OECD/IEA Publishing.

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Box 2.7. **Types and uses of coal**

Coal is the world's most abundant fossil fuel resource and its fuel for electricity production. It represents 28.8% of the world's primary energy supply, behind oil at 31.5% but ahead of natural gas at 21.3%.

Coal is commonly classified by its rank (degree of alteration from the original plant source), its calorific value or its carbon content, which are loosely related, with higher ranked coals generally being less polluting. In decreasing order of transformation, from high to low rank, there is anthracite, bituminous and sub-bituminous coal, lignite and peat. A common distinction is between hard and brown coal. Hard coal corresponds to anthracite, bituminous and sub-bituminous coal, which includes coking (or metallurgical) coal for steel-making purposes and steam (or thermal) coal used to produce heat and electricity. Brown coal corresponds to lignite and peat. Hard coal has a higher carbon and energy content.

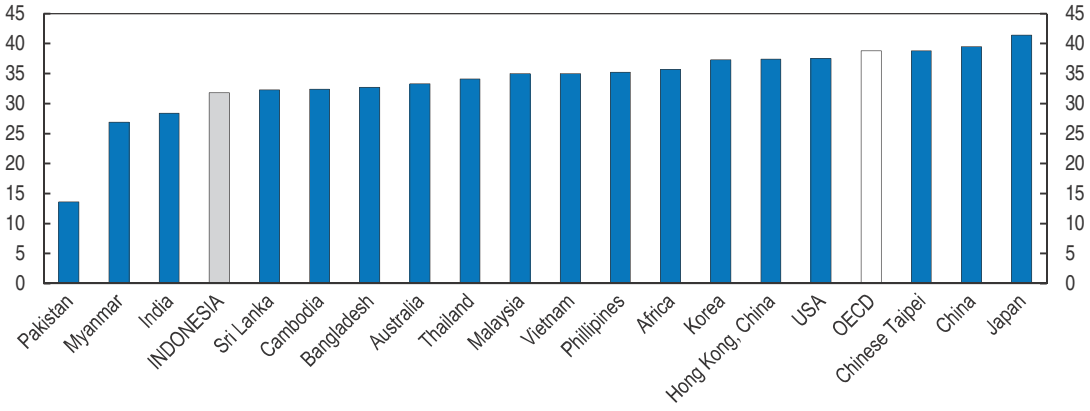
Unlike oil, coal is primarily a domestic fuel: 85% of it is consumed in the same country where it is mined. Coal is primarily used for electricity production (41.3% of worldwide electricity production in 2011). While a cheap source of energy, coal has many environmental drawbacks. It is the fossil fuel causing the largest amounts of greenhouse gas emissions, and burning coal causes considerable amounts of air and water pollution. Moreover, the lower the rank the more the air pollution. Default carbon emission factors measured in tonnes of carbon per terajoule (tC/TJ) are: 15.3 for gas, 16.8 to 27.5 for oil products, and 25.8 to 29.1 for primary coal products.

where the largest potential gains lie. For instance, coal and other non-gaseous fossil fuels can be converted into electricity in combined gas cycle if the fuel is gasified in advance. Encouraging FDI in the sector will be key to helping Indonesia alleviate such constraints and make the most of its coal endowments while containing its emissions.

The future of coal mining in Indonesia is also looking steadily towards low-rank, lignite-grade coals. This shift in quality means that the amount of tonnage being mined, trucked and barged will increase over time to maintain existing energy-equivalent levels. Given that all these operations are diesel-powered, the amount of diesel consumption in

Figure 2.12. **Coal-fired heat and electricity generation efficiency, 2011**

Per cent



Source: IEA (2013a), *Coal Medium-Term Market Report*, OECD/IEA Publishing.

StatLink http://dx.doi.org/10.1787/888933200446

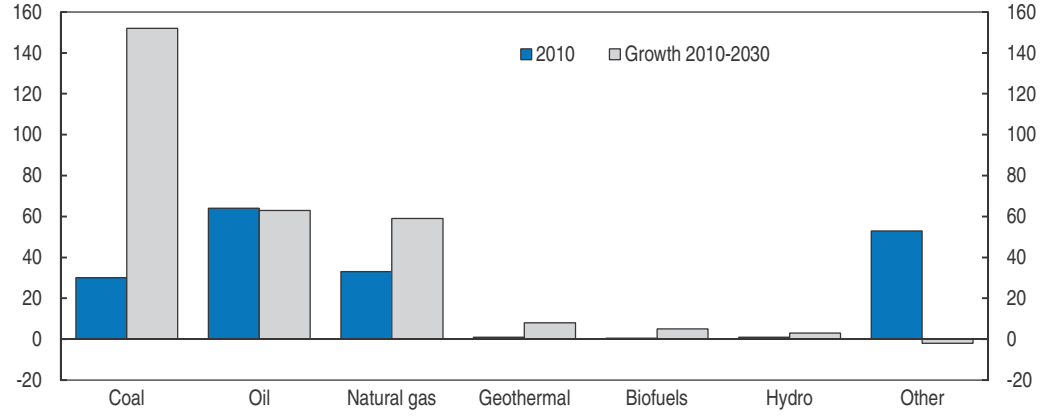
mining is expected to climb, exposing the industry to volatile fuel prices (Lucarelli, 2010). More and more mining companies are contemplating producing electricity on site via coal-fired power plants. There are then physical, economic and environmental limits to the amount of coal Indonesia can mine, burn at home and supply to the world.

Indonesia's coal bias harms its environment

Coal combustion will be by far the main source of rapidly rising electricity production in Indonesia, followed by oil and gas (Figure 2.13). The role played by fossil fuels is not peculiar to Indonesia but rather applies to a number of developing countries, especially in ASEAN, where non-fossil energies such as hydro and nuclear power are marginal, if not non-existent (Figure 2.14). In Indonesia the trend has long been reinforced by an implicit negative carbon price for all types of fossil fuels due to Indonesia's fuel and electricity subsidy system. While petrol subsidies are about to be removed completely, the heavy use of coal in electricity production is going to challenge Indonesia's commitment to

Figure 2.13. **Indonesia's future energy mix**

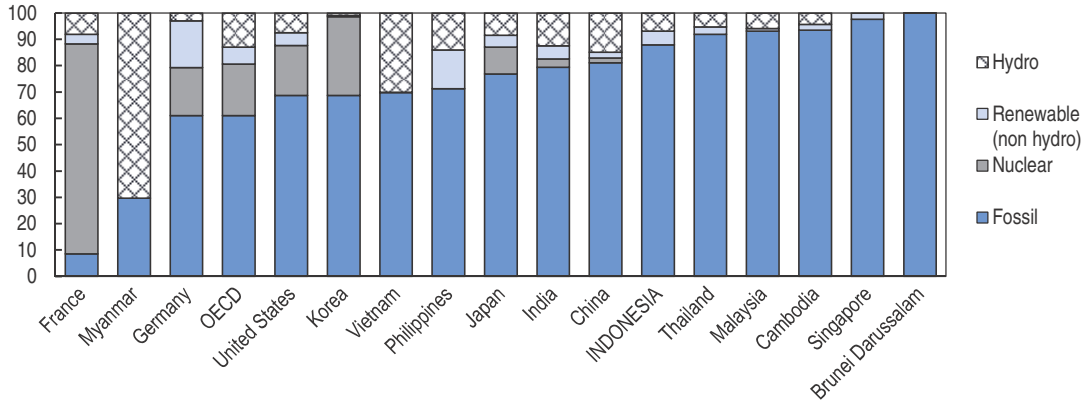
Million tonnes of oil equivalent



Source: McKinsey Global Institute (2012), *The Archipelago Economy: Unleashing Indonesia's Potential*.

StatLink http://dx.doi.org/10.1787/888933200459

Figure 2.14. **Sources of electricity production, selected countries, 2011**



Source: OECD (2014b), *Toward Green Growth in Southeast Asia*, OECD Publishing.

StatLink http://dx.doi.org/10.1787/888933200462

greenhouse gas (GHG) reduction. In order to reduce demand for fossil fuels, the implicit carbon price of electricity in Indonesia should be brought back to positive levels by phasing out electricity subsidies.

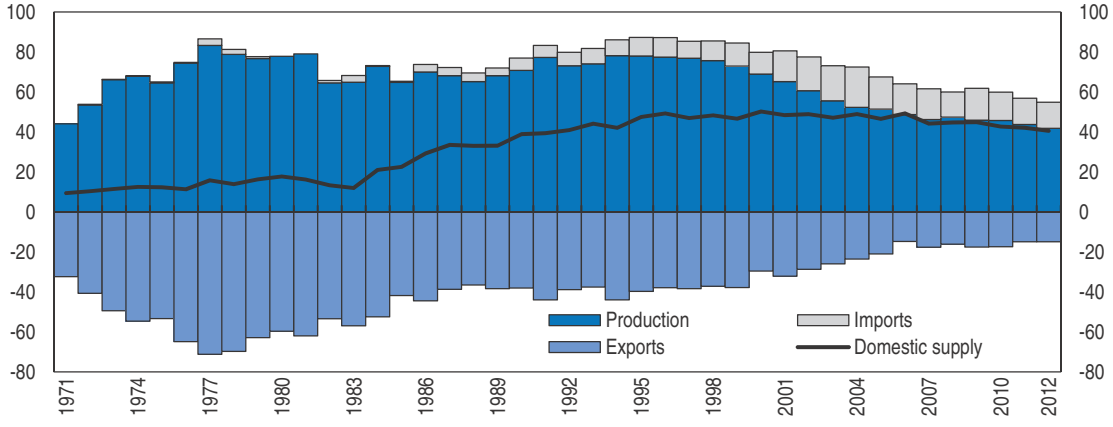
Revitalising the oil sector

Crude oil, together with natural gas liquids, refinery feedstocks and additives as well as natural gas, generate about one-fifth of Indonesia's consolidated budget revenue in the form of taxes, royalties, revenue-sharing contracts and the profits of the state-owned oil producer Pertamina. Yet, Indonesia is in dramatic need of an overhaul of its exploration and exploitation policy, as output and FDI have been falling. The critical oil sector is at risk of falling behind.

Indonesia has been active in the oil industry since 1885, when oil was first discovered in North Sumatra. It switched to become a net oil importer in 2006 (Figure 2.15) due to growing domestic demand (4% annual growth over the last 15 years) alongside declining domestic output. Output has indeed been falling since the late 1990s in the face of

Figure 2.15. **Indonesia's oil balance**

Million tonnes

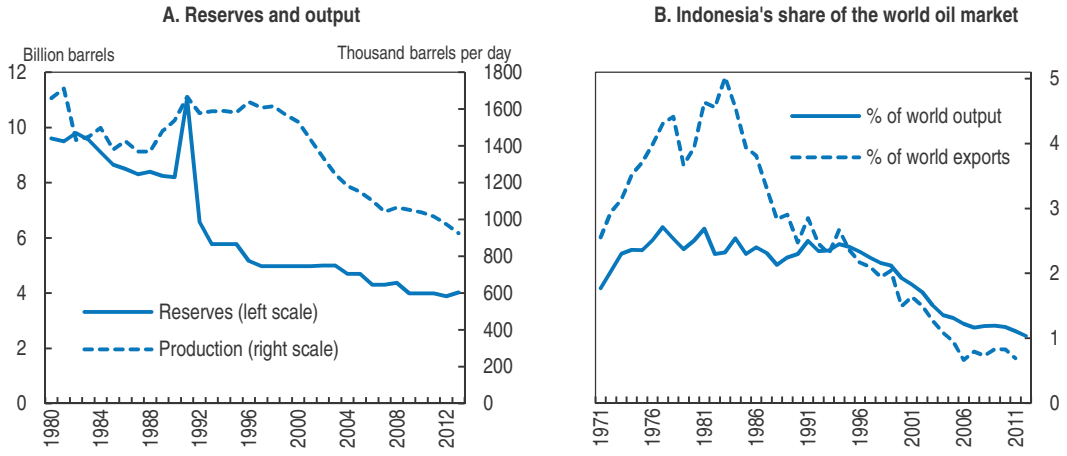


Source: IEA Database.

StatLink http://dx.doi.org/10.1787/888933200474

maturing oil fields and decreasing exploration and investment (Figure 2.16). The required increase in imports, together with skyrocketing prices in the mid-2000s, has been highly detrimental to Indonesia's economy, including contributing to the blowout in the current account deficit between mid-2011 and 2013.

Figure 2.16. **Indonesia and the world oil market**



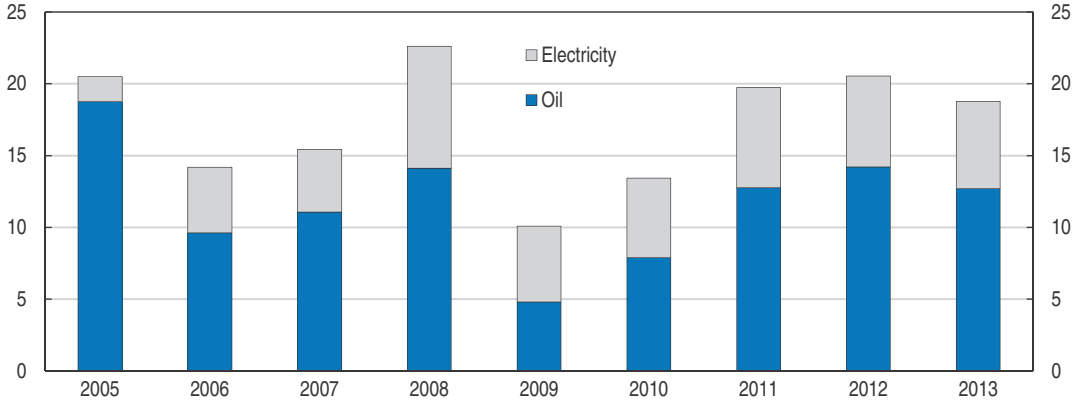
Source: US Energy Information Administration (EIA) and *IEA Database*.

StatLink http://dx.doi.org/10.1787/888933200488

Until now, Indonesia had been subsidising fuel and electricity to keep energy affordable for the poor and to raise household purchasing power. In recent years fuel subsidies had been absorbing over 20% of government spending (Figure 2.17). But the subsidies did not work as intended, as 40% of subsidy benefits went to the top income decile and less than 1% to the poorest (World Bank, 2014a). Subsidies also had unintended consequences in the form of increased demand, traffic congestion and environmental damage, whose deadweight loss has been estimated at USD 4-8 billion annually (Davis, 2014; see also OECD, 2014d). Declining production from maturing oil fields (requiring more

Figure 2.17. **Energy subsidies as a percentage of government expenditure and GDP**

Per cent of total government expenditures



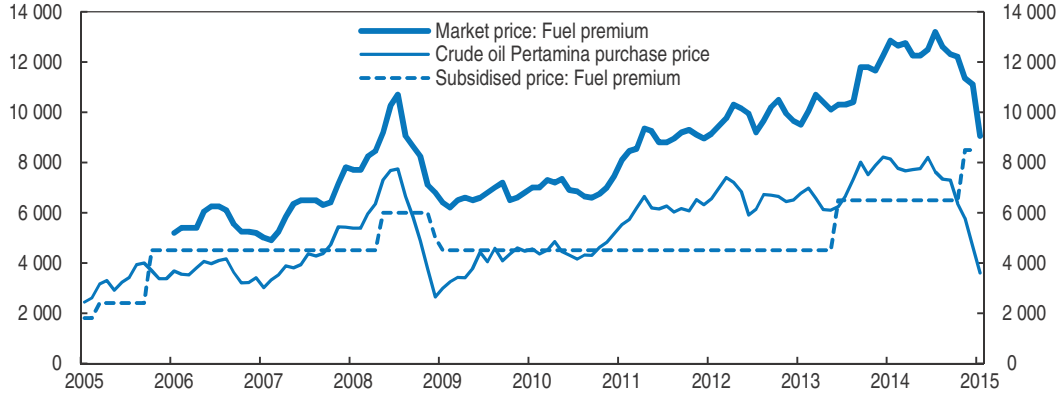
Source: CEIC.

StatLink http://dx.doi.org/10.1787/888933200495

imports) add to the problem. Fuel subsidies were reduced in June 2013 and again in November 2014, bringing subsidised fuel prices closer to market prices (Figure 2.18). Then, at the beginning of 2015, the government grasped the opportunity offered by falling world oil prices and scrapped its existing petrol and diesel price-setting regime. Both domestic petrol and diesel prices are now linked directly to world prices, with only diesel getting a fixed subsidy of IDR 1 000 (USD 0.08) a litre. The 2015 budget originally contained fuel subsidies worth more than 13% of total government expenditure, but this has now been whittled down to only 1%.

Figure 2.18. **Prices for oil and petrol**

IDR/litre



Source: CEIC.

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Additional measures have recently been taken. For instance, in 2012 the government banned cars and vehicles used in mining and plantation operations from buying subsidised fuel. In 2007, it introduced a gas conversion programme to reduce the burden imposed by subsidies to diesel and petrol, involving the development of natural gas infrastructures as well as the distribution of free gas converter kits for public transportation (Andadari et al., 2014). This kerosene-to-liquefied natural gas programme should be expanded, as gas is abundant and cleaner.

Electricity subsidies remain an issue, and because most generation capacity takes the form of coal- and oil-fired power plants, this is indirectly a fossil fuel subsidy. Electricity subsidies amount to around 8% of total government expenditure. The ongoing reforms in this area should continue, including gradual price reforms until electricity pricing fully recovers the ongoing costs of maintaining and improving Indonesia's electricity system.

Indonesia should embrace an ambitious oil (and gas – see below) revival programme. It is well placed to take advantage of growing regional and world demand, but it needs to change the way it operates in the oil sector, as it is looking steadily less attractive to exploration companies. In addition to legal uncertainty following the controversial 2009 Mining Law, Indonesia's oil industry also suffers from excessive government control via Pertamina and overlapping regulations. The resulting lack of incentive to explore and develop upstream oil production capacity (increasingly located in the east and offshore) has contributed to falling output and revenues. In a series of interviews conducted with Indonesian policy makers and ministries Boyd et al. (2010) noted that resource nationalism, corruption (Indonesia ranks in 107th place out of 175 countries surveyed on

the 2014 Transparency International Corruption Perceptions Index) and decentralisation have all contributed to the decline of Indonesia's oil industry. The recent reform of the Mexican oil energy sector and its corporate governance, including the establishment of autonomous regulators for licensing, safety and environmental protection and the fostering of greater competition, could be used as a model (OECD, 2015).

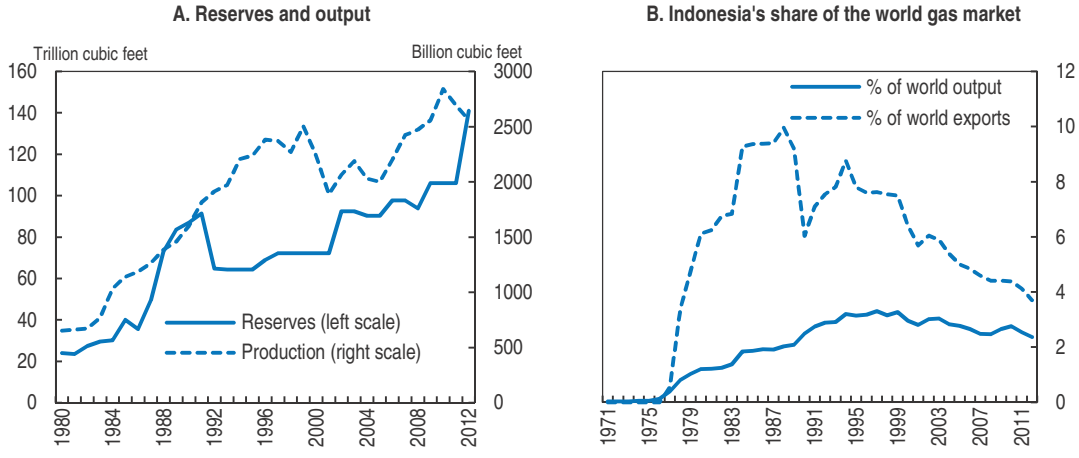
Greater use should be made of private-sector expertise in exploration, exploitation and refining. Similar to agricultural development, it is imperative for Indonesia to simplify land titling and resource licensing, and to better protect private investors' interests. It should streamline and advertise simple guidelines and, when involved, limit the number of interlocutors for private companies by creating, for instance, a one-stop shop that would handle the entire process. In the meantime greater co-ordination among the government agencies involved in the licensing process should be encouraged. The alternative is for Indonesia to become increasingly dependent on foreign oil at a time of rapid and sustained growth in demand. Indonesia's fuel deficit is forecast to rise 5.3% to 640 000 barrels a day in 2015, to be compared to a domestic output of about 825 000 barrels a day (Bloomberg, 2014).

Using gas to bridge the gap until more renewable energy comes on line

Natural gas is set to become one of the three major sources of world energy, with a market share expected to double from 17.3% in 2000 by 2035, thanks to its widespread availability, competitive supply costs and environmental advantages over other fossil fuels (it releases about half as much carbon as coal). As of 2012, Asia represented 46% of global international gas imports, ahead of Europe (45%) for the first time in history. Currently the world's 10th largest gas producer and holding the largest reserves in Asia (Mujiyanto and Tiess, 2013), Indonesia is advantageously positioned to profit from Asian demand growth. China is now its fifth biggest market, and 8.1% of its imports come from Indonesia. Gas represents only 5% of China's primary energy mix at the moment (still far below coal's share of about two-thirds) but its use is rising sharply.

However, the output of Indonesia's gas industry has steadily fallen from its 2010 peak, accelerating the trend decline in its share of world output and exports (Figure 2.19). This fall reflects domestic hurdles to increasing production, such as delays in field development

Figure 2.19. **Indonesia and the world natural gas market**



Source: US Energy Information Administration and *IEA Database*.

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or regulated domestic prices being too low to attract new investment. In 2012, Indonesia saw a decrease in both production revenues and volumes (-5% for the latter), yet demand increased by 1.5%. So Indonesia's oil and gas sectors face the same issues. The development of new production and export facilities should be accelerated by removing administrative barriers and hurdles. While Indonesia has been among the largest exporters of liquefied natural gas (LNG) for many years, it completed its first LNG importing facility in 2012 (the West Java floating storage terminal and regasification unit) and began to import LNG in 2013.

The future of Indonesian LNG exports is uncertain, however, due to competition from Asian countries with vast unexploited reserves, such as China (Aguilera et al., 2014), or from countries with a well-established gas industry, such as Russia. For instance, Russia and China have sealed a deal that would see Russian Gazprom supply China National Petroleum Corporation with 3.75 billion cubic feet a day for 30 years starting in 2018. China's current demand is about 16 billion cubic feet a day and rising fast. And there is more than 7 billion cubic feet a day of Australian LNG capacity due to come on-stream by 2017 (*Wall Street Journal*, 2014). Due to limited scope for pipeline development in the region, additional liquefaction and export terminals should be developed.

Indonesia will soon find it increasingly difficult to allocate its gas output between growing domestic and international demand. It will probably have to boost its supply, perhaps using unconventional sources such as horizontal drilling with hydraulic fracturing (fracking). However, given Indonesia's mixed record in terms of environmental protection, the development of fracking should be carefully monitored and tightly regulated. Five companies have actually already delivered a joint study regarding shale gas potential in northern Sumatra, and around 70 proposals to drill exploration wells have been submitted (IEA, 2013b). While the risk for the environment is high, developing shale gas could help plug the gap until renewable energies gain in importance.

Recommendations relative to the energy sector

The recommendations from the previous section regarding land rights also apply to the exploration and exploitation of fossil fuel energies. In addition, a series of specific measures should be taken:

Coal

- Increase the energy efficiency of coal-fired power plants in order to limit their harm to the environment.
- Further develop transport infrastructure, especially in the form of port and rail freight capacity, which will also benefit the rest of the economy.

Oil

- Continue phasing out fuel and electricity subsidies (and compensate the poor, as necessary) to allow a reprioritisation of government spending programmes, and communicate on the many benefits to be expected from their removal.
- Expand the kerosene-to-LNG conversion programme to switch demand from oil to gas.

Recommendations relative to the energy sector *(cont.)*

Gas

- Consider developing shale gas as a transitional fuel. Accelerate development of new production from conventional sources.
- Due to limited scope for pipeline development in the region, develop additional liquefaction and export terminals.

Restoring a favourable environment for mineral extraction and processing

Given its ample mineral endowment and assuming no land use restrictions and best practices, Indonesia ranks fourth out of 96 jurisdictions in the "Policy/Mineral Potential index" in the Fraser Survey of mining companies. Despite its potential, no clear uptrend can be observed in mineral output, as most of the value gains have come from rising prices rather than volumes. Moreover, while Indonesia attracted 3-5% of global mineral exploration funding in the 1980s and 1990s, its recent share has been less than 0.5% (Castle, 2013). Mineral exploration investment is quite low by comparison: it was only USD 80 million in 2011 (*Energy and Mining Journal,* 2012), in contrast with USD 2.9 billion in Australia (Australian Bureau of Statistics, 2014). The causes of this disappointing performance are numerous: restrictive legislation on land use, uncertainty concerning the interpretation (or enforcement) of existing regulations, fairness regarding legal processes and corruption.

To understand the current situation, it is important to step back in time. According to the 1945 Constitution, all resources belong to the central government, which enjoys the exclusive right to manage and license their exploitation. While not necessarily a problem, as seen in the case of Botswana, this can reinforce nationalistic views and deter foreign investors. In the 1960s, eager to attract foreign investment, President Soeharto's government introduced Law 1/1967 on Foreign Investment and Law 11/1967 on the Basic Provision of Mining. It established a new legal structure, the Contract of Work (CoW), which was a contract between the government and a foreign mining company that set out the company's rights and obligations including all taxes, royalties and fiscal charges. Under a CoW, the company retained management control and responsibility for all its activities (PricewaterhouseCoopers, 2010). Importantly, CoWs provided competitive and stable royalty rates compared to neighbouring countries. Absent private ownership, the CoW proved successful in attracting investment and developing the sector, which was then dominated by foreign companies. After the 1997-98 crisis, CoWs went through a series of changes (or "generations", eight in all) reinforcing the position of the government, shortening the contract period and raising the percentage of equity to be held by domestic interests beyond simple majority ownership.

CoWs were finally abandoned in the 2009 Mining Law, which came into force in 2014, in favour of mining business licenses, or *Izin Usaha Pertambangan* (IUPs). With this new regime, exploration and exploitation rights are now separated, meaning that the right to develop a deposit is not automatically granted to the exploring entity that found it. In addition, the 2009 law no longer protects companies from changes in royalty rates (Gandataruna and Haymon, 2011). This uncertainty adds to investment risks in the mining sector. Also, the fact that the maximum timeframe for mineral exploitation of 30 years is now a decade shorter than under the 1967 law might also be dissuasive. The government

should reconsider the 2009 Law in favour of best practices regarding mining contracting. In particular, it should suppress the dual-licensing system by moving back to a unique exploration and exploitation license in order to create the right incentives for foreign mining companies. Divestment requirements should also be removed and replaced by attractive terms of operations for both Indonesian and foreign companies.

The law also requires that all IUP and CoW holders add value to their mining products via onshore processing and refining. By value, approximately 40% of total mineral exports are currently processed, but the government aims to raise domestic value added. In May 2012, the Ministry of Energy and Mineral Resources (MEMR) issued Regulation 7/2012 asking producers to formulate smelting plans and imposing a ban on the export of raw mineral ores. While mineral ore exports such as nickel and bauxite are now banned, exports of so-called mineral concentrates (copper, iron, manganese, lead and zinc) will be permitted for the next three years under a new regulation taxing semi-processed mineral exports at 20-25% of sales revenues (to rise to 60% by 2016) (World Bank, 2014a).

Such import-substitution strategies have been used elsewhere, although with mixed effects. If successful, they can launch new growth engines. Airbus successfully entered the world aircraft market thanks to strong support from European governments. In Indonesia the tax on crude palm oil (CPO) exports succeeded in keeping it as an affordable input into many domestic industries rather than being exported at high prices. In all instances the global context needs to be taken into account. In Airbus' case, it penetrated an uncompetitive market characterised by high monopoly rents, making the rationale for government support stronger. In the case of the ore export ban, the net benefits may well depend on the details of the extraction and refining processes, however. For instance, about 96% of copper's market value is derived from the first step of concentration, with only 4% of final value generated in copper smelting (World Bank, 2014a). Copper mining in Indonesia is dominated by two major companies, Freeport McMoran and Newmont Mining, and both already process their copper ore into concentrates and supply part of it to the only smelter in the country, P.T. Smelting (USAID, 2013). But for nickel, refining generates more value.

For most minerals, the purification process is highly capital-intensive and subject to significant economies of scale. It also requires reliable and affordable access to water and electricity. For copper, lead and zinc, additional investments in processing appear unlikely to be economically viable under current conditions, given low margins from global overcapacity in smelting and refining (World Bank, 2014a). That said, some companies are going ahead with these investments, such as the Chinese firm Hongqiao, which has recently been building several alumina refining plants in Indonesia. In the end the government should facilitate the provision of infrastructure, skills and other fundamental inputs, as well as ensuring efficiency and well-functioning institutions and factor markets (see Chapter 1). With these in place, domestic value added may well be viable without having to resort to export bans and other distortionary measures.

In the meantime, the ore ban will have costs as the mineral extracting sector, and the tax revenues it provides, will be hurt because of falling exports. The production of bauxite, for instance, was only 2.8 million tonnes during the January-August 2014 period, versus 58.7 million tonnes throughout 2013. In the copper sector Newmont has faced sharply reduced sales since the ban took effect in January, halted mining operations in June, but

operations have resumed after it agreed to an increase in royalties to 3.75% (from 1%) for gold, to 4% (from 3.5%) for copper, and to 3.25% (from 1%) for silver. It will also scale down its mining areas in eastern Indonesia by almost a quarter and pay a deposit bond amounting to USD 25 million as a guarantee that the company is serious about building a smelter. Earlier Freeport also came to a similar agreement with the government. Indonesia should also consider moving away from its current tax regime based on royalties, which is distortionary, and implement a tax on profits instead (Box 2.8).

Box 2.8. **Taxing mineral rents**

Indonesia derives rents from its mineral wealth. In recent years, the mining sector has contributed approximately 5% to GDP. This is significant and raises the question of how best to tax the rents. Royalties are based on the amount of resource extracted (either quantities or production revenues) and are therefore easy to collect. But they drive a wedge between the world price and the price that producers receive for each unit of output, decreasing the quantity supplied to below the efficient level. By contrast, a resource-rent tax (or profit tax) extracts a portion of the rent and ideally has no effect on output. But it usually requires the government to pay out cash to the private company in years of financial losses and get a positive profit share in years of profit. Because cash payments by government are unpopular, they are usually replaced by delayed taxation, which is more complex to implement. In Indonesia, IUP holders are required to pay *ad valorem* royalties, with rates varying between 2 and 7% of revenue depending on the mineral. There are also land taxes based on the surface area mined. Royalties and land taxes are deductible from taxable income, which is subject to the standard 25% corporate income tax (Arnold, 2012). Indonesia should eventually do away with royalties and move to taxing profits directly.

The Decentralisation Law 22/1999, which came into force in 2001, resulted in a transfer of authority and responsibility from the central to regional governments. This law contributed to blurring the governance picture by handing additional powers, notably of taxation, to regional authorities eager to increase their revenues but lacking the capacity to handle their new responsibilities. As a result too many licenses were granted to unqualified businesses as a quick way to raise revenues. It also contributed to the development of illegal mining, as control by the central government diminished (Box 2.9). While decentralisation should be consolidated, more focus should be placed on regional capacity building in order to train local governments as to mining rights (IUPs) allocation and ensuing responsibilities. Regional governments should also be made liable for any negative externalities stemming from a lack of proper vetting and regulation of licence holders.

Box 2.9. **Illegal mining in Indonesia**

Illegal mining in Indonesia is known by the name of PETI (*Penambangan Tanpa Izin*, "Mining Without Permits"). Illegal coal mining is widespread in Kalimantan, while Java and Lombok host many illegal gold mining operations.

Prior to the introduction of reforms in 1999, the government exercised tight control over the nation's mining operations. It made it difficult for illegal mining operations to develop, despite the government's longstanding push towards smaller-scale mining ventures as a

Box 2.9. **Illegal mining in Indonesia** *(cont.)*

way to spread the mineral wealth. Since the end of the Soeharto administration, the government has been faced with the spread of illegal mining operations. As the 1997-98 crisis forced many laid-off workers back to their home provinces, looking for work in agriculture or mining, the shift to decentralisation at about the same time introduced several inconsistencies between central- and local-government policies and left holes in the mineral resource management framework, which were exploited. As illegal miners started to spread, they formed alliances with landowners, support contractors, suppliers of mining equipment and transporters (basically every link in the supply chain). They soon became politically influential, challenging the concessions given to larger, authorised companies. Local government officials often benefit from those operations by getting a share of their profits, receiving royalty payments and reclamation fees and absolving miners from environmental responsibility (Lestari, 2007). Importantly, demand for illegal mining products is fuelled by lower informal prices, up to 40% below the official market price in the case of coal, for example.

In the case of open-cast mining operations, when the government and a mining company reach an agreement over a concession, the latter is legally required to follow guidelines regarding the setup of operations, including operating and clean-up protocols. They include carefully clearing the land of any forest cover or vegetation, removing and storing the topsoil for use during the post-mining land-rehabilitation procedure, and, when the soil is replaced, restoring the land's original fertility characteristics. Once the topsoil is removed, the overburden is cleared away exposing the coal seams below, and dumped in the mined out areas at the back of the active pit. Like the topsoil, the overburden is typically reused during land reclamation after mining operations are terminated (Lestari, 2007).

None of these operations is conducted by illegal mines, which create a lot of damage. In addition to not following guidelines imposed on official mines, illegal mining produces degradation of its own: logging or burning the forest to clear the land (resulting in serious smoke haze); abandoned open pit sites filled with acidic run-off leaking into the surroundings and poisoning water bodies; and illegal coal-loading ports built with no regard for environmental safeguards (coal destined for domestic consumption is barged from one island to another).

It was estimated that illegal coal mining amounted to 20 million tonnes in 2010 (Lucarelli, 2010). In the case of gold, while also difficult to estimate, BaliFokus (an Indonesian environmental organisation) estimates that 65 to 100 tonnes of gold were illegally produced in 2012 by small-scale gold miners, to be compared with a legal production of 60 tonnes. This represented as many as 850 gold mining and production areas across the archipelago in 2013, up from about 575 in 2006. In addition to environmental damage, studies done in other regions of Indonesia, including work by the University of Mataram, showed elevated mercury levels in people processing gold, and dysfunctional motor skills among local children (*New York Times*, 2014).

Recommendations to get the most out of mineral extraction

- Adopt best practices regarding mining contracting such as a fully stable mining regime and competitive taxation, while ensuring that a large share of the rents from extraction benefits the Indonesian people.
- Revise the blanket mineral export ban based on a careful evaluation of the costs and benefits of onshore processing for each mineral.
- Eliminate the dual-licensing system by moving back to a unique exploration and exploitation license. Raise the threshold on foreign ownership restrictions.
- Build capacity at the regional level to allow local governments to better handle mining rights (IUP) allocation and revenue collection.

Protecting the environment through regulations and control of illegal extraction

Rapid economic growth combined with rising urbanisation has led to pressures on the environment. The joint ADB-ILO-IDB Environmental Performance Index positioned Indonesia 134th of 163 countries in 2010 and only 12th among the 13 Southeast Asian countries in terms of environmental sustainability and performance (OECD, 2012b). One major issue is the growing role that fossil fuels are playing in Indonesia's energy mix. Other pressing environmental concerns relate to deforestation (which is Indonesia's main source of CO_2 emissions), particle pollution coming from transport and fuel combustion, and water pollution coming from industry and illegal mining. Palm oil sustainability is also considered a major agro-environmental issue. Its rapid expansion since 1990 (Figure 2.3) has often taken place at the expense of natural forests. It also contributes to increased carbon emissions and has endangered biodiversity, not to mention the impact of haze-generating forest cover burn-off on neighbouring countries.

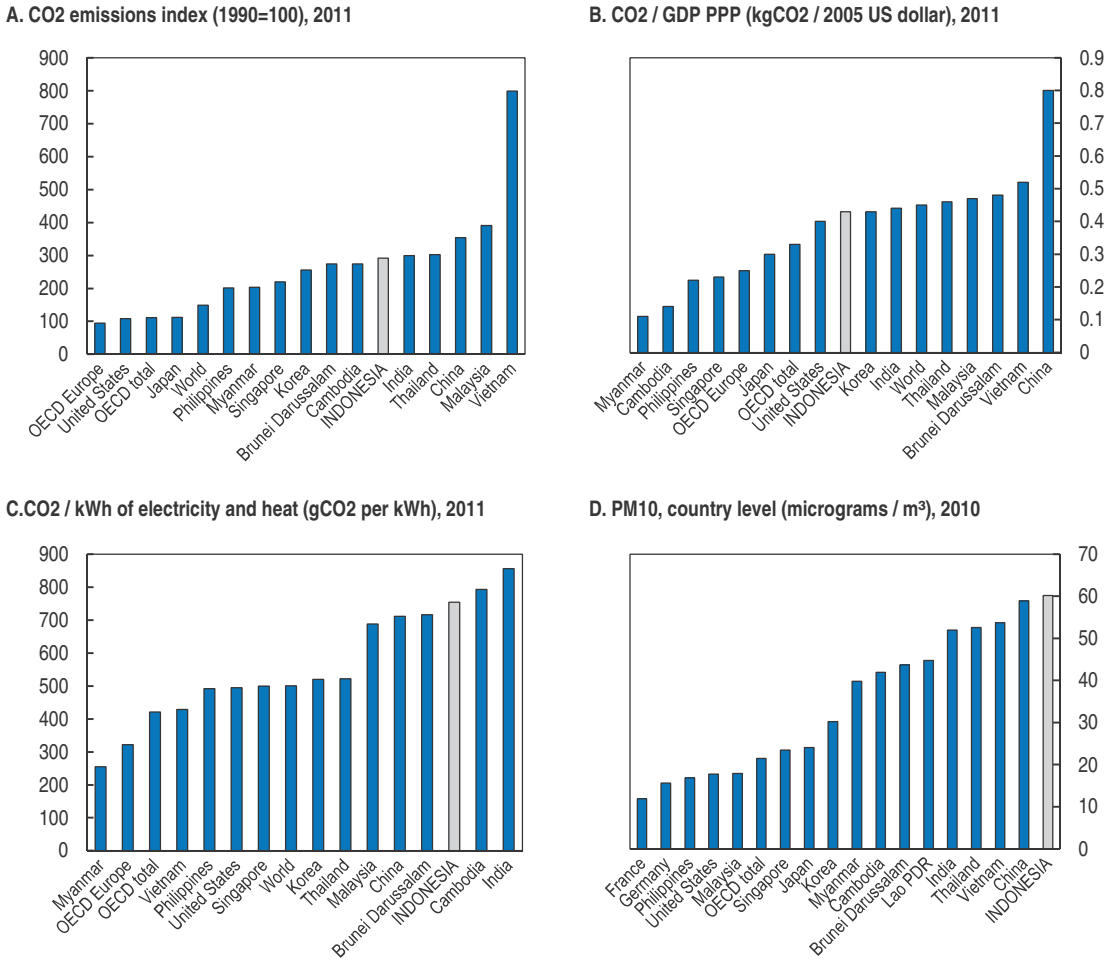
Indonesia's record regarding GHG emissions and pollution is poor

Given the large and increasing role played by fossil fuels in Indonesia, it is not a surprise to see that its GHG emissions doubled to 1.9 billion tonnes (bt) in 2012 up from 1.1 billion tonnes in 1990, making Indonesia the fifth biggest GHG emitter among OECD and key partner countries. China ranks first (10.8 bt) ahead of the United States (6.7), India (2.7) and Russia (2.5). While CO_2 emissions per unit of GDP (at PPP) is about average for Asia (but quite high compared to OECD countries), its record regarding CO_2 emissions per kWh of electricity and heat is poor, reflecting the dominant role played by coal. As for the PM_{10} index (Particulate Matter up to 10 micrometres in size), Indonesia ranks last among ASEAN countries, with ensuing negative impacts on human health and life expectancy (Figure 2.20).

At the 2009 G20 summit, the Indonesian government committed to reducing the country's carbon emissions by up to 26% by 2020 against a business-as-usual trajectory. Indonesia's energy strategy is laid out in the National Development Plan 2010-14, which supports an increased utilisation of renewable energy, including geothermal, generating electricity from phasing in solar power, micro-hydro and nuclear power. Following the Presidential Regulation on the National Energy Mix Target 2025, policies are also geared towards reducing carbon emissions through energy diversification and conservation.

Activities like mining also contribute to environmental degradation, mostly through water pollution and damage to the ecosystem. As a result, Indonesia's record regarding

Figure 2.20. **Pollution indicators**



Source: OECD (2014b), *Toward Green Growth in Southeast Asia*, OECD Publishing.

StatLink http://dx.doi.org/10.1787/888933200525

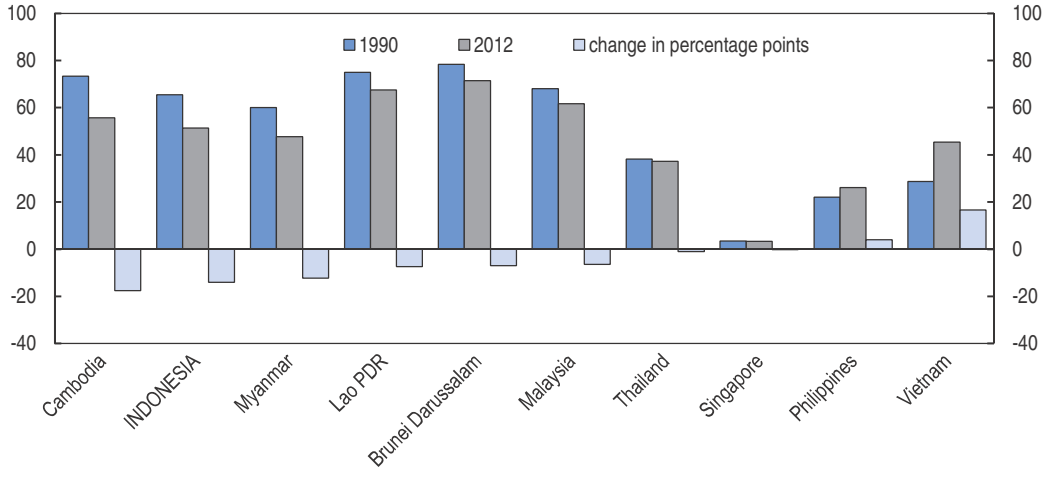
organic water pollutants (measured by the amount of oxygen that bacteria in water will consume in breaking down waste) is also poor (OECD, 2014c). For instance, most coal mining operations are open-cast and carried out in remote, pristine areas, increasing the risk of environment damage. The Indonesian Coal Mining Association, an organisation comprising 130 of the country's most influential miners, has set out a plan to ensure that all coal mining operations are conducted responsibly. Several large coal mining companies, such as Adaro Energy, are pursuing rehabilitation programmes, which aim at restoring the environment to a state as close as possible to that which existed before mining activities started. But a lot of the mining-related pollution actually comes from smaller, often illegal mines that do not have the willingness or the means to repair the harm they do (Box 2.9). Of the 3 922 permits for coal exploration, 1 461 are listed as not clean and clear, according to the Ministry. Better monitoring of illegal mining and stricter enforcement of existing regulations should be pursued. The requirement that mining companies deposit funds to ensure they carry out rehabilitation and reclamation program should be a pre-requisite to starting operations.

Deforestation should be reversed

In Indonesia, forest cover as a share of land area shrank by more than 10 percentage points from 1990 to 2011, on a par with Cambodia and Myanmar (Figure 2.21). Forests function as carbon sinks and help reduce greenhouse gas emissions. Deforestation makes Indonesia the world's fifth largest emitter of greenhouse gases and leads to loss of biodiversity, peat fires, soil erosion and flooding, and also affects local communities whose existence depends on forest resources. Illegal logging, conversion to agricultural land, deliberate forest fires and mining are the primary causes of deforestation. In addition, a number of regulatory and institutional issues have facilitated deforestation during the last 20 years. Specifically: unclear roles and responsibilities of different levels of government following decentralisation; land tenure and access issues putting local communities against private firms; inappropriate land pricing and rents; and weak enforcement of existing laws and protocols at the national and local levels (OECD, 2012b).

Figure 2.21. **Change in forest coverage**

Per cent of area



Source: World Bank, *Development Indicators 2015*.

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In reaction, in 2009 Indonesia established the Reducing Emissions from Deforestation and Forest Degradation (REDD+) agency as part of the government's 2020 emissions reduction commitment. Its programmes include the one-map initiative (a single, all-encompassing map of Indonesia containing all relevant information regarding forest licensing and land-use claims) and the implementation of the Measurement, Reporting and Verification (MRV) system to monitor carbon flux and estimate the size of carbon reservoirs. In addition, Indonesia is trying to directly increase forest restoration by 500 000 hectares per year. However, many challenges remain, given weak monitoring of the forest sector. For instance, the Corruption Eradication Commission said that 89% of the nation's 128 million hectares of forest were under no regulation or permit, making them difficult to protect. The government should then make sure that every hectare of forest, whether private or government-owned, has well defined property rights and is under clear regulations in order to prevent illegal activities. It should increase the resources devoted to reforestation and combatting illegal logging, and punish illegal deliberately set forest fires more severely. A well-resourced and powerful agency should also be created to actively combat illegal logging and mining. New agricultural activities should be authorised only on scrub land and abandoned cultivated land.

Indonesia should tap its unique renewable energy potential

Indonesia's renewable energy potential is huge and can contribute to energy access in off-grid areas. Given the role of agriculture in Indonesia and the scattered population, developing biomass is a first option. Basically any agricultural by-product that people currently cart away is biomass that can be used to generate power. Potential liquid biomass includes biodiesel from palm oil and bioethanol from sugarcane and cassava. Yet, both carry threats to biodiversity and the forest. Potential solid biomass can come from palm shells from palm oil, coconut shells and fibre, bagasse from sugar refining, rice husks and corncobs. Several initiatives have already taken place, such as the recent signing of a memorandum of understanding between state-owned energy firms and General Electric for the development and deployment of biomass gasification systems.

In addition to biomass, Indonesia boasts an estimated 40% of the world's reserves of geothermal energy, an energy source that is expensive to develop, but clean, abundant and not subject to supply (and therefore price) volatility. Currently, Indonesia utilises less than 5% of its estimated potential (Mujiyanto and Tiess, 2013). In August 2014, the House of Representatives approved a revised geothermal law allowing for the exploitation of geothermal sources in the country's conservation forests. It also returns the power to issue permits or conduct tenders related to geothermal energy exploitation to the central government. As the new regulatory environment becomes operational, the government should accelerate the exploration and tendering of new geothermal projects. In order to attract investors the ceiling price for electricity generated from geothermal power plants should be raised. Other renewable energies include hydropower, the largest resources being located in Papua. Wind energy potential is limited due to the lack of wind along the equator. But its location makes solar resources significant, though it is still underdeveloped and appears mostly in the form of solar roof-panel systems. The rise in CO_2 emissions should be limited by reducing the share of coal in energy production and increasing its efficiency, and by increasing the share of gas, geothermal and other renewables in the energy mix as part of the push for more and better infrastructure. Nuclear power should also be considered.

On the investment side, restrictions on FDI in Indonesia are less severe for green investment than for the average sector (OECD, 2014b). It is also much lower than in other ASEAN countries (Table 2.2). While this favourable regime should be maintained, more support should be provided to international companies willing to enter the market. Rather than ad hoc ministerial decrees, a comprehensive and attractive regulatory framework for renewable energies should also be created (GIZ, 2012). Indonesia also promotes organic farming and the transition away from chemical to organic fertilisers. For more than 30 years the government has sought to encourage greater fertiliser use by farmers as a way to enhance agricultural productivity. The gradual reduction of chemical fertiliser subsidies in favour of their organic counterparts would be appropriate.

Table 2.2. **FDI restrictions in renewable energy**

Per cent of foreign ownership permitted in greenfield FDI and mergers and acquisitions

	Biomass	Hydro	Solar	Wind
Indonesia	**95**	**95**	**95**	**95**
Malaysia	30	30	30	30
Philippines	100	100	40	40
Thailand	49	49	49	49

Source: Golub et al. (2011), adapted from *World Bank Investing Across Borders Database*, 2010.

Recommendations to protect the environment from resource extraction and develop renewable energies

- Create a strong regulatory environment to encourage investment in renewables, especially geothermal, solar and biomass. Construct more energy-efficient coal-fired power plants, and gradually phase out old ones.
- Better monitor illegal logging and mining, and create a well-resourced and powerful agency to strictly enforce regulations.
- Limit the rise in CO_2 emissions by reducing the share of coal and oil in energy production and increasing those of gas, geothermal and biomass but also of nuclear and solar power.
- Start ambitious reforestation programmes in areas that have been damaged, and ensure that every hectare of forest has well defined property rights, whether private or government-owned, and is under clear regulations.
- Bring the implicit carbon price from electricity use back to positive levels by phasing out energy subsidies.

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