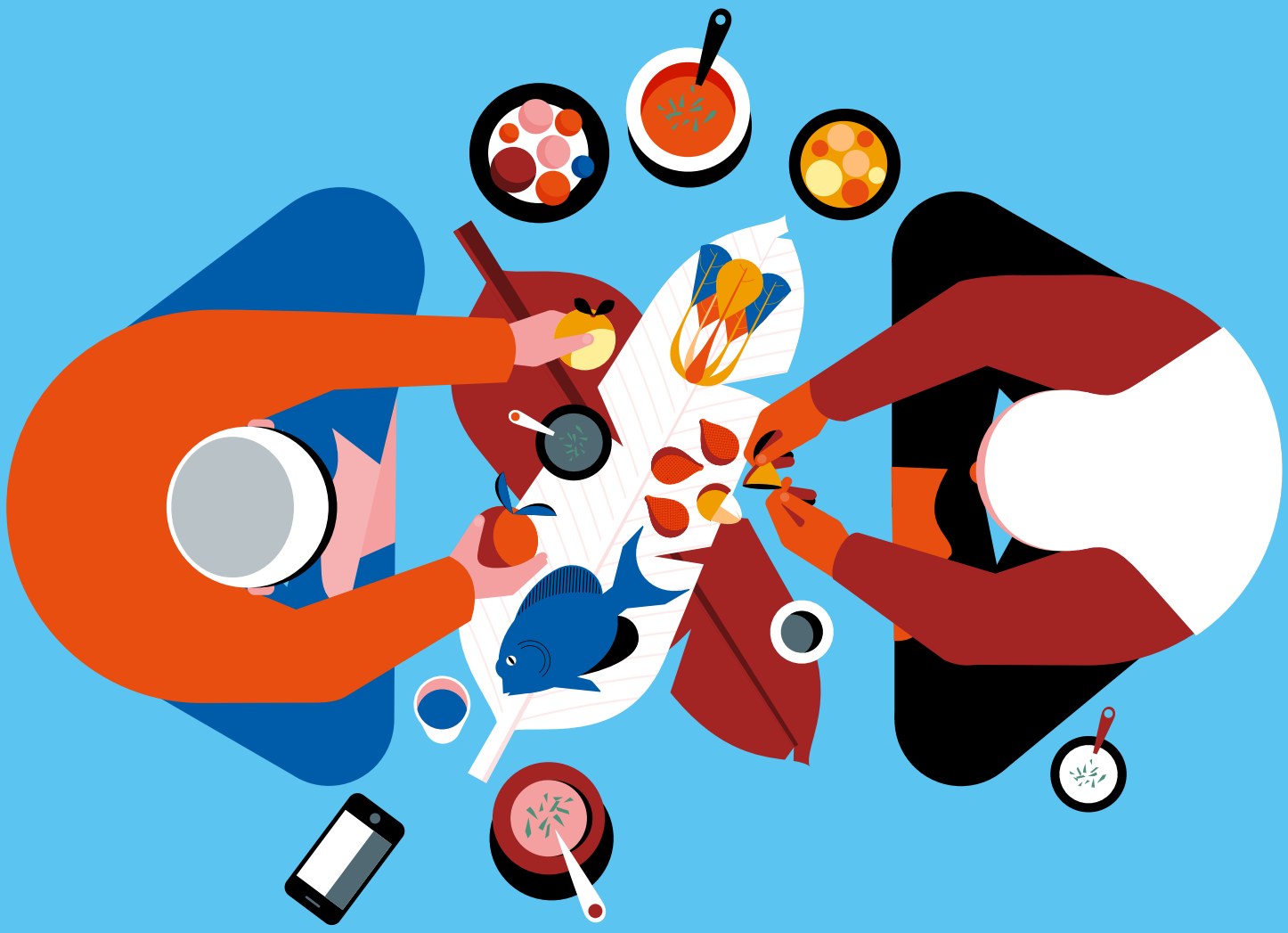

Healthy Diets from Sustainable Production: Indonesia

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Healthy Diets from Sustainable Production: Indonesia

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The Hoffmann Centre for Sustainable Resource Economy is based at Chatham House. Its mission is to accelerate the uptake of smart policies, technologies and business models that will reshape the world's demand for resources and transform the global economy.

Contents

Preface

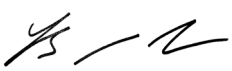
Unsustainable food production practices and the rise of unhealthy diets are major threats to the planet and its people. The UN estimates that one in nine people worldwide are hungry, with children among the most vulnerable, and some 2 billion people suffer from micronutrient deficiencies. Around 1.9 billion adults are overweight, of whom more than 650 million are obese.[i] At the same time, the food system exerts enormous environmental pressures, accounting for around 30 per cent of global human-induced greenhouse gas emissions and over 70 per cent of freshwater withdrawals. It is also the principal driver of deforestation and species loss.

To describe 'the food system' as a coherent whole belies the complexity of what are in reality inherently diverse food systems, in which food production and consumption are rooted in context and shaped by geography, culture, economics and politics. Indonesia is a case in point. Spanning over 17,000 islands and with a population exceeding a quarter of a billion people, its food system is not only vastly different to those of neighbouring countries, but is also made up of multiple overlapping and distinct systems within Indonesia itself. It is only by taking full account of the diversity of these dynamics at a national, regional and local level that food systems can truly be transformed.

This paper, outlining the steps Indonesia should now take to promote and safeguard healthier diets from sustainable production, marks the first of what we intend will be many such efforts to articulate the role that diets can play in tackling multiple health and environmental challenges at national level. Embedding the principles of healthy diets from sustainable production will be context-dependent, but taking action at country level while pulling together shared learnings across countries and regions can help support a global transition.

The Leaders for Tomorrow's Diets initiative, co-convened by the Hoffmann Centre at Chatham House and EAT, aims to make a significant contribution to tackling and transforming unsustainable food systems globally. The groundbreaking EAT-Lancet Commission on Food, Planet, Health will deliver the first global scientific targets based on environmental and health boundary conditions that will be critical to achieving healthy and sustainable food systems. Building on this, Leaders for Tomorrow's Diets will translate these findings into an action agenda that puts dietary shifts at the heart of food system transformation at international and national levels. By identifying and developing policy tools, local and national champions and supporting narratives in selected countries, the initiative will help navigate the political economy of food systems and identify strategies for shifting diets on to healthier, more sustainable pathways.

Looking ahead to 2030, if the far-reaching Sustainable Development Goals are to be achieved, then the way food is produced and consumed globally will need to change radically. This is our moment of change, in setting a roadmap towards transformation of food systems to start delivering healthy and nutritious diets that are good for the planet as well as for its inhabitants.



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Foreword

In October 2017, working with EAT, Indonesia's Ministry of Health co-hosted the inaugural EAT Asia-Pacific Food Forum. One of the aims of the forum, and of follow-up events including an expert roundtable convened in February 2018, has been to define the priorities for Indonesia in promoting healthy diets from sustainable production. It is highly encouraging to now see the input from key stakeholders in this process – among them government ministries, the National Development Planning Agency (BAPPENAS), local governments, businesses and civil society organizations – informing this paper, which examines the pathways to achieving a healthier and more sustainable food system for our country. I enthusiastically welcome this work as a significant contribution in shaping the future of Indonesian people's health, as well as the conservation and restoration of our ecosystems.

As this paper highlights, Indonesia is suffering a double burden of malnutrition. More than 30 per cent of Indonesian children under five years of age are stunted, while the overweight incidence has increased from 12 per cent in 2007 to close to 25 per cent of adults in 2014. Indonesia has the sixth highest number of diabetes sufferers globally. The proportion of mortality caused by non-communicable diseases (NCDs), including diabetes, was 73 per cent in 2016. Furthermore, the country's natural ecosystems, on land and under water, have suffered the impacts of food production for export and will face growing pressure from domestic dietary demands.

Today's global food systems have contributed significantly to the rise of these problems. Yet there are promising opportunities to be harnessed from switching to healthier diets from sustainable production. Together, we need to implement a true 'food system approach' to meeting goals for food security, health, agricultural development and the environment in an integrated manner.

Indonesia's Ministry of Health is working to address some of these challenges, particularly through the strengthening of the healthcare and health insurance programme (JKN), and in emphasizing health promotion and disease prevention as critical pillars in its 'Healthy Paradigm' strategy. Aligned with this is the Healthy Living Community Movement (GERMAS), implemented by presidential instruction in 2017, which promotes physical activity, regular health checks, eating more fruit and vegetables, and improved sanitation and hygiene as integral to public health efforts. But there remains more to be done.

Indonesia is in a unique position to provide global leadership on fixing the food supply chain, from input suppliers all the way to the dining table. And as it embarks on the final five-year stage of the National Long-Term Development Plan (2005–25), this is Indonesia's time to jump ahead of the curve.

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Minister of Health, Indonesia; member, Eat Advisory Board

[i] FAO, IFAD, UNICEF, WFP and WHO (2018), *The State of Food Security and Nutrition in the World: Building Climate Resilience for Food Security and Nutrition*, https://cht.hm/2AEAyZZ (accessed 9 Jan. 2019).

Executive summary

Today in Indonesia, as in many other countries around the world, diets and dietary change lie at the heart of pressing public health and environmental challenges. Indonesia faces a double burden of malnutrition: while a high incidence of undernutrition, stunting and wasting persists, the prevalence of obesity and diet-related diseases such as type 2 diabetes is also growing. The country's natural ecosystems – among the most diverse in the world – have borne the impacts of food production for export, and will come under growing pressure from domestic dietary demands. As Indonesia's economic transition unfolds, the direction of dietary change will become an increasingly important determinant of the health of the country's environment. And if Indonesia follows a similar trajectory to other emerging economies, the country will struggle to feed its growing population from domestic production – a goal that lies at the centre of the government's long-term development strategy – and will put at risk its ambitious commitments under the UN Sustainable Development Goals (SDGs) and the Paris Agreement on climate change.

Yet Indonesia has an uncommon chance to take a different pathway, a course correction towards healthy diets based on sustainable production. While Indonesia ranks as a middle-income country, its dietary patterns remain far more typical of a low-income country: extreme dependence on a single staple (rice); low meat consumption; and obesity constituting a problem of the rich, not the poor. In other words, despite its relative wealth, Indonesia is at an early stage of the nutrition transition. This specific situation gives Indonesians the opportunity to bypass the negative trajectory of other emerging economies towards diets that are calamitous both for people and for their environments.

The key to unlocking this sustainable future will be to put into practice a true 'food system approach' to meeting goals for food security, health, agricultural development and the environment. Global and regional conversations around healthy and sustainable diets – what they look like and how they can be achieved across different geographical and socio-economic settings – are gathering pace. Yet the actions taken by most governments, both in the Association of Southeast Asian Nations (ASEAN) region and globally, tend to address consumption and production in isolation. With early action now, Indonesia could jump ahead of the curve, and provide leadership across ASEAN as well as globally on how to secure healthy diets for all from a sustainable food system.

I. A critical political window

There is now, for Indonesia, an important and identifiable time frame in which to influence the future trajectory of the population's health and that of its environment. The year 2020 will mark the start of the final five-year stage of the country's National Long-Term Development Plan (2005–25), and thus will present the last five-year window within which to achieve the stated target of delivering a nutritious and sufficient diet to all households. Meanwhile, governments and businesses alike will need to demonstrate progress on the SDGs, and all countries will be involved in ratcheting up ambition on addressing climate change in time for the resubmission of commitments to the 2015 Paris Agreement on climate change, due in 2020.

Indonesia has an uncommon chance to take a different pathway, a course correction towards healthy diets based on sustainable production.

II. Pathways for change

A coherent government strategy would enable national and local food systems to contribute to – rather than jeopardize – health, environmental governance and a food-secure population able to drive a resilient economy. The principles of this system-based approach include a strong focus on the food environment and choices available to children and adults in their daily lives; foresight and forward planning in preparation for known emergent risks to food security, health and the environment; and food security strategies that aim to maximize the population's nutritional status rather than simply maximizing the national breadbasket.

Dietary changes that could benefit both health and environment include the substitution of some refined rice by a wider variety of starchy or non-starchy foods; a higher intake of fruits and vegetables that have traditionally been grown in Indonesia; and higher intakes of fats and proteins among poorer people and undernourished children, coupled with a curbing of added sugars and oils in processed foods. A further priority is the promotion of sustainably produced animal foods from fish capture, aquaculture and land. All these changes would be best promoted by coordinated action across public sector spheres of agriculture, health, environment and industry.

Some of the ingredients for a successful government strategy in support of healthy diets from sustainable production are already in place in Indonesia, not least a strong set of national dietary guidelines. But a number of current high-level policies – including the government's flagship food security programme – are yielding perverse health and environmental outcomes.

Now, at the early stages of Indonesia's nutritional transition, decisive action by the government could pave the way towards a more sustainable and healthier future. Three areas of public policy action stand out as priorities in guiding future pathways:

- **Align high-level policies and strategies in support of a sustainable food future.** Indonesia's current strategy of achieving self-sufficiency in rice, maize, sugar, soy and beef through import restrictions and producer subsidies does not support the delivery of a diverse and high-quality diet to all Indonesians from a sustainable food production system. Reform of subsidies and land governance, the introduction of innovative incentives for diversified food production and environmental protection, and investment in increased productivity rather than in agricultural expansion would all provide major opportunities to secure dietary and environmental health without sacrificing agricultural jobs and output. Given the shift towards decentralization in many areas of governance, policy coherence across national, provincial, district and municipal levels will be key.

- **Ensure that the principles of a healthy and sustainable diet are embedded in wider policymaking.** Indonesia has in place a strong set of national dietary guidelines, but these could be far more widely applied. The key strategy here would be to bring the guidelines into the mainstream as a set of principles to specify government procurement, to guide social service provision (such as food vouchers and school feeding programmes), to set priorities in agricultural policy, and to regulate food processing, advertising and retailing.

- **Partner with food providers and local pioneers.** Indonesia is already home to a wealth of inspiring voluntary initiatives around local food systems, including on food safety, waste, public awareness of nutritional issues and access for low-income households to nutritious food. National and local government could empower these locally led initiatives to provide the spur for an Indonesia-wide agenda of healthy and sustainable diets that celebrate the archipelago's many unique food cultures.

Conversations on the relationship between agriculture and health are new in Indonesia. Moreover, working across multiple policy spheres to address the whole food supply chain is a huge agenda, and there will be challenges in addressing entrenched positions and powers. One realistic tactic may be to find a specific early entry point where the political economy challenges are more surmountable: sugar is an example of a potential entry point for Indonesia.

The time is ripe for setting in motion a bold new vision for a sustainable food system, both national and global, that supports healthy diets for all. Indonesia could lay the foundations for a more resilient and equitable development pathway that prioritizes its population's health and well-being, safeguards some of the world's most important ecosystems, and provides global leadership on how to take a food systems approach.

1. Introduction

The time is ripe for setting in motion a bold new vision for a sustainable food system, both national and global, that supports healthy diets for all.

In the coming decade, Indonesia will face a series of disruptions to food security, health and agriculture. Food self-sufficiency targets and policies, consolidated in the wake of the 2007–09 food price crisis, are likely to be subject to severe constraints in the effort to keep pace with the demands of a growing population with changing diets. Continued urbanization will intensify the landscape of food demand, placing stress on existing systems of food production and distribution. Obesity and non-communicable diseases (NCDs), currently the maladies of the wealthy, will also become privations of the poor, placing the strain of additional health expenditure on the public purse. Increasing inequality is likely to entrench undernutrition, with wide-ranging impacts on the economy. This double burden of malnutrition, the coexistence of rising obesity and diet-related diseases across the population with persistently high rates of stunting (low height for age) among children under five years of age, presents a critical challenge for the future of Indonesian public health. Extreme weather events due to climate change will put agriculture and food distribution systems at ever greater risk. Also at risk, given the current pathway of land expansion for plantation agriculture, are national commitments to the Paris climate change agreement, which are largely founded on reduced deforestation and on protection of the landscape. In addition, Indonesian diets will account for an increasing share of the country's unsustainable environmental footprint across marine, freshwater and land ecosystems. If current policy pathways are left to continue, these challenges will set in motion failures in household food security, declines in child nutrition, soaring public health costs, and an erosion of the resource base that underpins future food supply.

Between now and 2020, when the final five-year tranche of the 2005–25 National Long-Term Development Plan will begin, Indonesia has a clear opportunity to correct its course, however. The incidence of negative diet-related health outcomes, and the rate at which they are rising, remains considerably below those of other developed nations in the region; Indonesia's pathway to an unhealthier future is not yet beyond recovery. Similarly, while the role of agricultural expansion in driving forest loss and land conversion remains a concern, shifting patterns of domestic consumption are yet to substantially accelerate environmental degradation. Now is the time to act.

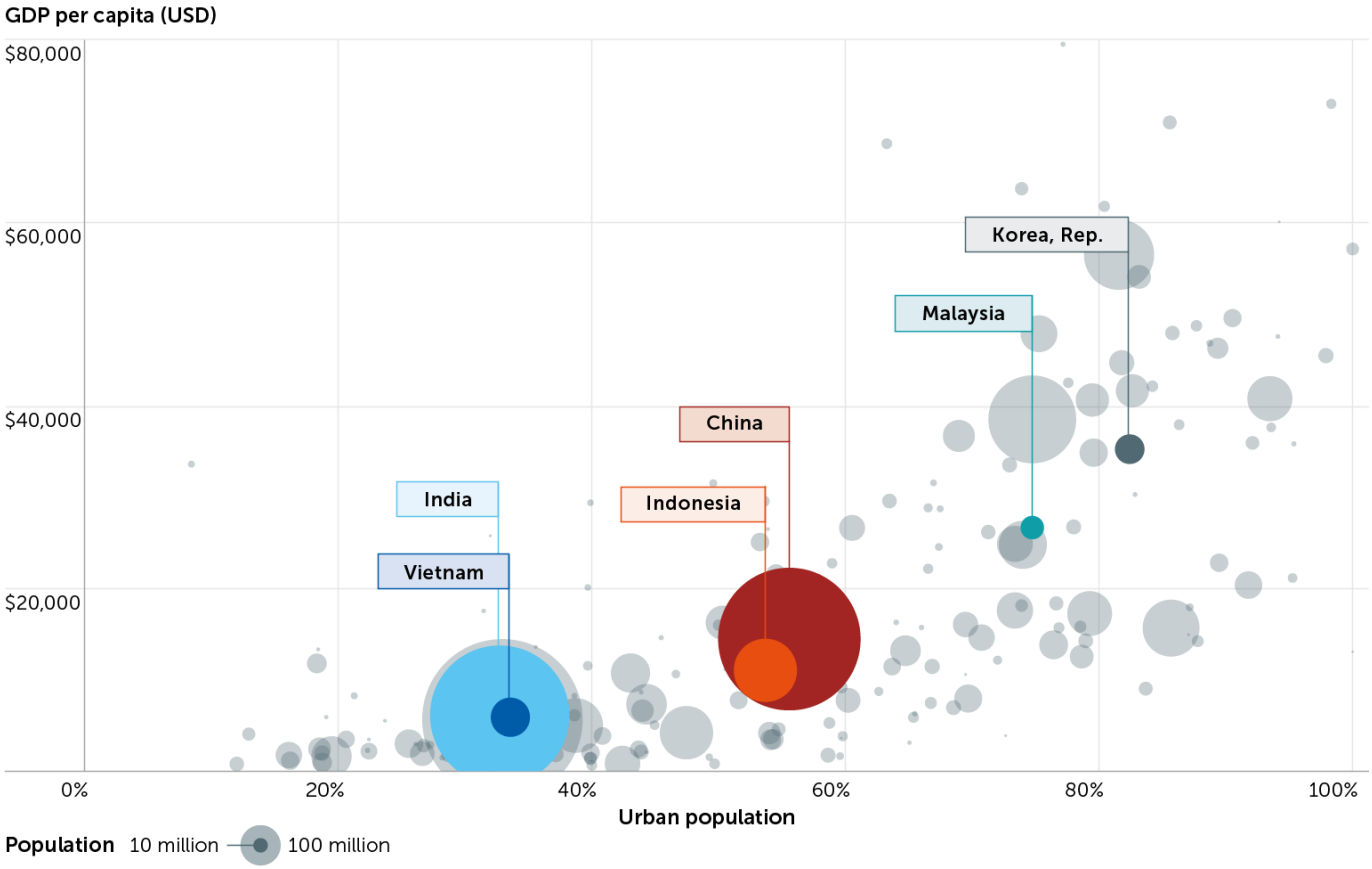
This paper is designed to inform that action. Section 2 provides a succinct overview of the current economic, demographic, structural, dietary and retail transitions under way in Indonesia, trends in diets across the archipelago, the outcomes of these diets for health, and the role of both Indonesian diets and export agriculture in driving environmental change. Section 3 examines how policies, markets, technology trends and decentralized governance both enable and hinder progress towards healthy diets from sustainable food systems. Section 4 identifies, from a public policy perspective, those interventions that offer the greatest opportunity for harnessing positive trends through smart policy design and cross-sectoral engagement. Section 5 then provides an example of how joined-up actions across the food system could work for one component of diets and agriculture: sugar. In conclusion, Section 6 provides a brief commentary on the current political window of opportunity for champions of healthy and sustainable diets in Indonesia who wish to build momentum to take forward this critical agenda for change.

2. Food systems, diets, health and the environment

2.1 Five transitions that are key to Indonesian food systems

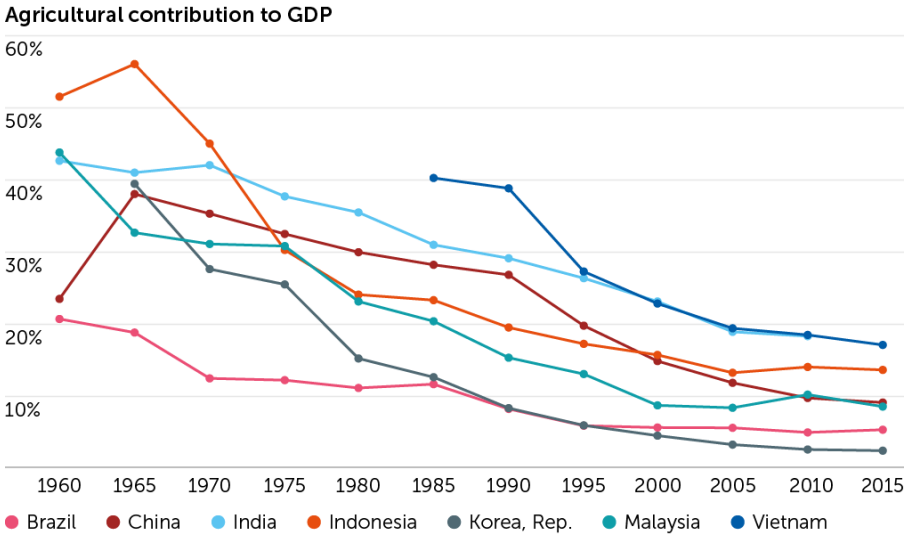
Indonesian food systems are at the early to middle stages of five simultaneous transitions: economic, demographic, structural, dietary and retail (*Figures 1a, b, c and d*). An emerging middle-income country, Indonesia's economic growth has been uninterrupted since the 1998 Asian financial crisis.[1] Poverty rates have been halved,[2] and Indonesia is Asia's fourth largest economy in terms of total gross domestic product (GDP). Agriculture accounts for a falling share of GDP (14 per cent in 2016)[3] and employment (33 per cent in 2015),[4] which places Indonesia midway along a path of structural transformation that is commonly associated with poverty reduction and improved food security.[5] Urbanization has increased in step with economic development, with over half of Indonesians now living in urban areas. A projected 70 per cent of the population will live in cities by 2050.[6] Across Indonesia, diets are shifting towards greater consumption of energy, fats, animal products and processed foods. This change is occurring most rapidly in urban areas,[7] but is doing so behind the global curve; a high dependence on rice remains the norm. A transition towards modern retail methods is under way, driving change across the whole supply chain from farm to consumer – albeit much more slowly than elsewhere in Asia, as traditional wet markets (pasars) remain important.

1a. Economic and demographic transition
Urbanization against GDP per capita, 2015



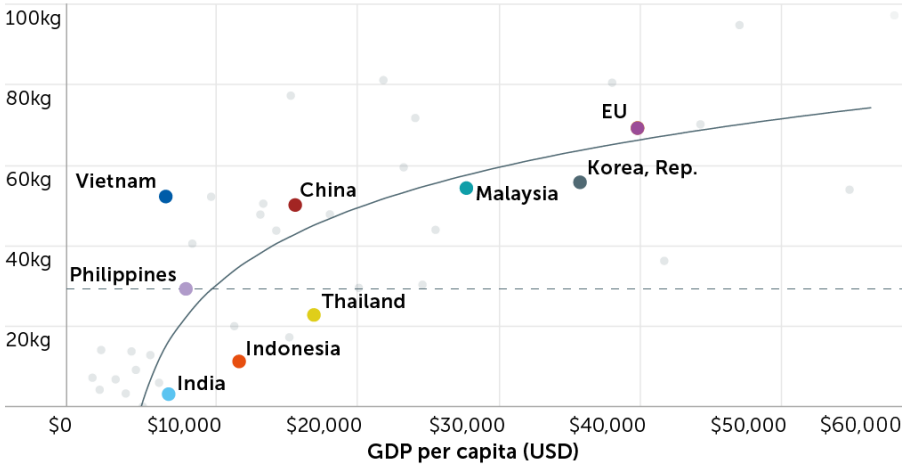
Sources: World Bank (2018), Urban Population (% of Total) | Data, https://cht.hm/2NglcCI (accessed 10 Aug. 2018); World Bank (2018), GDP per Capita, PPP (Current International $) | Data, https://cht.hm/2PGY5yP (accessed 10 Aug. 2018); World Bank (2018), Population, Total | Data, https://cht.hm/2NNHpoJ (accessed 10 Aug. 2018).

1b. Structural transition
Agricultural contribution to GDP, 1960 - 2015



Source: United Nations (2018), UNdata | Record View | Agriculture, Value Added (% of GDP), https://cht.hm/2Q3DPbx (accessed 10 Aug. 2018).

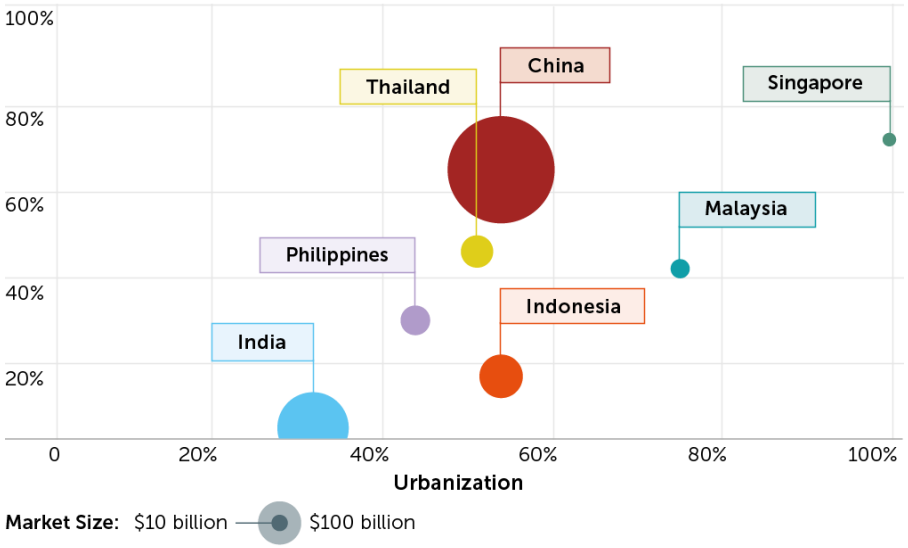
1c. Dietary transition
Meat consumption against GDP per capita, 2016



Sources: OECD (2017), Agricultural Output - Meat Consumption - OECD Data, https://cht.hm/2PDYsdg (accessed 10 Aug. 2018); World Bank (2018), GDP per Capita, PPP (Current International $) | Data, https://cht.hm/2PGY5yP (accessed 10 Aug. 2018).

* *Annual per capita intake of meat (beef, pork, and chicken, but also including eggs) considered a healthy level. Calculated on the per capita daily consumption levels in Stehfest et al (2009) - including losses at household, food service and retail level - which is based on the Harvard Medical School's Healthy Eating Pyramid (Willett 2001).*

1d. Retail transition
Urbanization against modern grocery retail penetration, 2016



Sources: World Bank (2018), Urban Population (% of Total) | Data, https://cht.hm/2NglcCI (accessed 10 Aug. 2018); DBS Treasures (2017), 'Asean Grocery Retail: Will online grocery retail take off in ASEAN?', https://cht.hm/2LQQiMp (accessed 10 Aug. 2018).

2.2 Indonesian diets

Indonesia's average dietary pattern, characterized by extreme dependence on a single staple and low consumption of meat and fat, is more typical of a low-income country than of a middle-income country. It has among the highest energy intake shares from grains – specifically rice – in the world, exceeding those of India.[8] The share of non-starchy foods in total dietary energy consumption is 30 per cent, substantially lower than the global average of 50 per cent.[9] Protein sources are varied, and include fish (of which Indonesia has one of the world's highest consumption levels)[10] as well as a diversity of high-protein soy products such as tahu (tofu) and tempeh. Meat and dairy consumption are low by global standards, but vary among cultural groups and are growing with rising incomes.[11] Rates of fruit and vegetable consumption are less than half of the nationally recommended daily intake (see Table 1) and are declining; consumption of vegetables decreased by over 5 per cent, and fruit by just over 3 per cent, between 2012 and 2016.[12] Diets are relatively low in fats and oils, with these accounting for around 20 per cent of total calories compared with 30–50 per cent in European countries.[13]

Table 1: Dietary gap
Indonesia's current dietary intake measured against intake recommended in Indonesia's national dietary guidelines

Food group	Recommended daily intake				Actual daily intake, 2016
	minimum intake	maximum intake	in kcal[a]	in g	in g
Cereals and tubers	3 portions	4 portions	525–700	300–400	300
Vegetables	3 portions	4 portions	100	300–400	122
Fruit	2 portions	3 portions	100–150	100–150	92
Protein foods, incl. legumes, meat, fish, eggs, milk	2 portions	4 portions	200–400[b]	approx. 70–140	43 legumes (incl. tofu) 52 fish, 31 meat + some eggs, milk, etc.
Added sugar		4 dessertspoons	150	40	>50
Added oil		5 dessertspoons	250	200 coconut milk or 25 palm oil	>30

[a] *Total kcal presented does not equal recommended daily allowance due to grouping of 'prepared food and beverages' in data.*
[b] *Protein portion is broken down as e.g. 100 g tofu, 35 g beef, 40 g fish or chicken, 1 egg or 1 200 ml glass of milk; depending on type of food, a portion has 50–150 kcal.*
Source: Food and Agriculture Organization of the UN (2014), 'Food-based dietary guidelines – Indonesia', https://cht.hm/2Cp4AEi (accessed 10 Aug. 2018).

[1] World Bank (2017), Indonesia | Data, https://cht.hm/2Nhzkvd (accessed 10 Aug. 2018).
[2] World Bank (2018), Indonesia Overview, https://cht.hm/2NOWK8z (accessed 24 Nov. 2017).
[3] World Bank (2018), Agriculture, value added (% of GDP), https://cht.hm/2wFWxgm (accessed 24 Nov. 2017).
[4] World Bank (2018), Employment in agriculture (% of total employment), https://cht.hm/2NhAo2b (accessed 24 Nov. 2017).
[5] Timmer, C. P. (2017), 'Food Security, Structural Transformation, Markets and Government Policy', *Asia & the Pacific Policy Studies*, 4 (1): pp. 4–19, doi: https://doi.org/10.1002/app5.161 (accessed 10 Aug. 2018).

Diets vary across Indonesia, reflecting geographical, sociocultural and economic diversity. Income, geographic location, increasing urbanization and also rising levels of female participation in the workforce are all identified as significant influences on patterns of household food consumption.[14] With over 300 local languages and some 17,000 islands, Indonesia has a multitude of dietary patterns rather than one 'Indonesian diet'. For example, people in rural Bali eat more than 12 g of meat per day on average, compared with under 1.5 g per day in rural Maluku. Indonesians have rich culinary cultures, with a wide array of healthy foods and local specialities. Wealthier people eat higher quantities of most foods other than rice, and the consumption gap between the highest and lowest income groups has been widening. The gap in vegetable consumption between the top and bottom income decile rose from 35 to 62 per cent between 2012 and 2016.[15] Consumption of protein is considerably higher among wealthier social groups. In Maluku, for example, the richest quintile consumes on average 74 g of protein per day while the poorest quintile consumes 31 g. In all provinces, the richest quintile meets the recommended daily protein consumption of 60 g (or 70–140 g of protein foods). In general, poor people are vulnerable to deficiencies of protein-rich and fat-rich foods, as well as of fruits and vegetables. Food costs also diverge along rural and urban lines, with rural households spending over 60 per cent more of their relative share of income on cereals and tubers as well as on rice in comparison with those in urban settings.[16] There are also striking asymmetries in levels of food insecurity among provinces and districts across Indonesia; in general the worst affected are the outer islands of Maluku, Papua and offshore Sumatra.[17] As is typical of many emerging Asian countries,[18] there has been a marked increase in consumption of processed foods in Indonesia. Some 30 per cent of monthly food expenditure, and 21 per cent of calories, are accounted for by 'prepared food and beverages', which includes shop-

With over 300 local languages and some 17,000 islands, Indonesia has a multitude of dietary patterns rather than one 'Indonesian diet'.

[6] United Nations (2014), *World Urbanization Prospects: The 2014 Revision: Highlights*, https://cht.hm/2LZqr4O (accessed 10 Aug. 2018).

[7] BPS Statistics Indonesia (2016), *Consumption of calorie and protein of Indonesia population and province*, https://cht.hm/2CfIWCI (accessed 24 Nov. 2017)

[8] Behrens, P. et al. (2017), 'Evaluating the Environmental Impacts of Dietary Recommendations', *Proceedings of the National Academy of Sciences*, 114 (51): pp. 13412–17, doi: https://doi.org/10.1073/pnas.1711889114.

[9] Global Food Security Index (2017), 'Global Food Security Index', https://cht.hm/2CkqiJS (accessed 26 Nov. 2017).

[10] Behrens et al. (2017), 'Evaluating the Environmental Impacts of Dietary Recommendations'.

[11] Santoso, B. (2016), 'Indonesia's Growing Appetite for Animal Protein', DBS, https://cht.hm/2NJZ8NC (accessed 26 Nov. 2017).

[12] BMKG (2017), 'Food Security Monitoring Bulletin – Indonesia', Vol. 8, https://cht.hm/2Q4Koud (accessed 26 Nov. 2017).

[13] Behrens et al. (2017), 'Evaluating the Environmental Impacts of Dietary Recommendations'.

[14] Isdijoso, W. et al. (2015), 'Food and Nutrition Security in Indonesia: A Strategic Review. Improving Food and Nutrition Security to Reduce Stunting', The SMERU Research Institute, https://cht.hm/2ChNoR7 (accessed 26 Nov. 2017).

[15] BMKG (2017), 'Food Security Monitoring Bulletin – Indonesia'.

[16] BPS Statistics Indonesia (2016), *Executive Summary of Consumption and Expenditure of Population of Indonesia*, https://cht.hm/2MPjJ73 (accessed 24 Nov. 2017).

[17] Indonesian Food Security Council/Indonesian Ministry of Agriculture/World Food Programme (2015), *Food Security and Vulnerability Atlas of Indonesia 2015*, https://cht.hm/2MPkZHj (accessed 24 Nov. 2017).

[18] Baker, P. and Friel, S. (2014), 'Processed foods and the nutrition transition: evidence from Asia'. Obesity Reviews, 15(7): pp. 564–77, doi: https://doi.org/10.1111/obr.12174 (accessed 10 Aug. 2018).

bought processed foods and meals from catering services.[19] Just under 5 per cent of expenditure is for fruits, and just over 7 per cent for vegetables.[20] Consumption of wheat – predominantly for use in processed instant noodles, bread and bakery goods – is also rising, with imports having increased 46 per cent between 2010–16 and average annual wheat consumption now standing at 25 kg per head.[21] While consumption of processed foods – and consequently of added fats and sugar – is highest in urban areas, availability and purchasing rates are increasing even in remote rural areas and the outer islands.

Low income levels and high consumer prices restrict access to healthy diets. A 2017 study by the World Food Programme (WFP) found that, on average, 36 per cent of the national population cannot afford what the agency terms a 'staple-adjusted nutritious diet' – i.e. the least expensive diet that meets World Health Organization (WHO)/UN Food and Agriculture Organization (FAO)-recommended levels of energy, protein, fat, vitamins and minerals.[22] In certain provinces, this proportion is much higher: for example, 68 per cent of people in Nusa Tenggara Timur cannot afford this diet.[23] Consumer prices for rice are critical to dietary diversity. Since 2010 rice prices have been between 50 and 70 per cent higher in Indonesia than in neighbouring countries.[24] Purchase of rice accounts for 8 per cent of all household spending and almost one-fifth (18 per cent) of all food expenditure, rising as high as 35 per cent of food expenditure among the poorest.[25] This affects dietary diversity; for instance, an 11 per cent increase in rice prices reduces rice consumption by less than 0.01 per cent, but cuts fruit and vegetable consumption by 3–4 per cent.[26]

On average, 36 per cent of the national population cannot afford a 'staple-adjusted nutritious diet'

2.3 Diet-related health outcomes: status and trends

The global challenge of a double burden of under- and excessive nutrition is stark in Indonesia. Child stunting is a chronic problem across the country. More than a third of Indonesian children under the age of five are stunted, including 29 per cent of the wealthiest quintile, with little change in the past decade. These numbers are more than 10 per cent above the global average, and translate into the third highest incidence of childhood stunting in Southeast Asia[27] and the fifth highest number of stunted children globally.[28] Prevalence is high across much of Java and central Sumatra, and very high in parts of the eastern islands of Sulawesi and Nusa Tenggara.[29] The incidence of wasting (low weight for height) also remains very high across Indonesia, at 13.5

[19] BPS Statistics Indonesia (2016), *Consumption of calorie and protein of Indonesia population and province*.

[20] Ibid.

[21] Rittgers, C. et al. (2018), 'Indonesia Grain and Feed Annual Report 2018', USDA Foreign Agricultural Service, https://cht.hm/2Nfp32U (accessed 10 Aug. 2018).

[22] World Food Programme (2017), *The Cost of the Diet Study in Indonesia*, https://cht.hm/2CtjJVx (accessed 10 Aug. 2018).

[23] Ibid.

[24] World Bank (2016), *World Bank – Indonesia Economic Quarterly: Pressures Easing*, https://cht.hm/2CdOjCa (accessed 24 Nov. 2017).

[25] Ibid.

[26] Ibid.

[27] International Food Policy Research Institute (2016), 'Global Nutrition Report 2016: From Promise to Impact: Ending Malnutrition by 2030', https://cht.hm/2NhSJfy (accessed 24 Nov. 2017).

[28] Ibid.

[29] National Institute of Health Research and Development (NIHRD) and Ministry of Health Indonesia (2013), *Indonesia Health Profile 2013*, https://cht.hm/2ChV31P (accessed 10 Aug. 2018).

per cent.[30] Global studies demonstrate that childhood undernutrition has far-reaching consequences, being associated with slower cognitive development, lower educational attainment and reduced economic productivity in adulthood.[31] Addressing wasting and stunting will continue to be the key priority for food- and nutrition-related policy in Indonesia.

Micronutrient deficiencies persist in Indonesia, most importantly of iron and zinc. While the prevalence of anaemia has decreased over the last 20 years, it remains a moderate public health problem for children under 12 years and among women of reproductive age.[32] Iron is therefore a key consideration in providing healthy diets to children and women of reproductive age, suggesting a need for enhanced provision of iron-rich foods such as green leafy vegetables and animal products (e.g. red meat, poultry and fish, particularly including offal) among these groups.

The incidence of overweight people in Indonesia increased from 12 per cent in 2007 to 21 per cent in 2010,[33] with most recent data suggesting a rate of closer to 25 per cent,[34, 35] with obesity at 6 per cent.[36] In part driven by dietary shifts, the incidence of NCDs has risen significantly in the past decade. According to WHO estimates, the share of mortality caused by NCDs has risen from 45 per cent in 1990 to 73 per cent in 2016.[37] Indonesia ranks sixth globally in terms of the total number of diabetes sufferers, with some 10.3 million people aged 20–79, or 6.3 per cent of the adult population, diagnosed as at 2017.[38] Collectively, the NCD burden, including diabetes, cancer and heart disease, is projected to contribute to losses of $2.8 trillion from 2012–30 from healthcare costs and lost workforce, equivalent to three times Indonesia's GDP in 2014.[39] Obesity rates are currently higher among higher-income social groups in Indonesia,[40] as is typical of lower-income countries. This pattern is likely to undergo a transition in the coming years, as has happened in higher-income countries, shifting the bulk of the obesity and NCD burden to poorer segments of the population. Among other impacts, this may drive increased public health costs, as the burden of poor health is borne increasingly by those less able to access private healthcare.

Addressing wasting and stunting will continue to be the key priority for food- and nutrition-related policy in Indonesia.

[30] International Food Policy Research Institute (2016), 'Global Nutrition Report 2016: From Promise to Impact: Ending Malnutrition by 2030'.

[31] Victora, C. G. et al. (2008), 'Maternal and child undernutrition: consequences for adult health and human capital', *The Lancet*, 371 (9609): pp. 340–57, doi: https://doi.org/10.1016/S0140-6736(07)61692-4 (accessed 10 Aug. 2018).

[32] Barkley, J. S. et al. (2015), 'Anaemia prevalence over time in Indonesia: estimates from the 1997, 2000, and 2008 Indonesia Family Life Surveys'. *Asia Pacific Journal of Clinical Nutrition*, 24(3): pp. 452–5, doi: https://doi.org/10.6133/apjcn.2015.24.3.22. (accessed 10 Aug. 2018).

[33] IRIN News (2013), 'Indonesia's growing girth takes health toll', https://cht.hm/2NdIgBY (accessed 13 Dec. 2017).

[34] Aizawa, T. and Helble, M. (2016), 'Socioeconomic Inequity in Excessive Weight in Indonesia'. Tokyo: Asian Development Bank Institute, https://cht.hm/2PBo4r3 (accessed 13 Dec. 2017).

[35] Badan Penelitian dan Pengembangan Kesehatan (2013), 'Pokok-Pokok Hasil Riskesdas Provinsi Riau Tahun 2013', https://cht.hm/2wHhxnJ (accessed 10 Aug. 2018).

[36] OECD (2017), *Obesity Update*, https://cht.hm/2Cpamps (accessed 13 Dec. 2017).

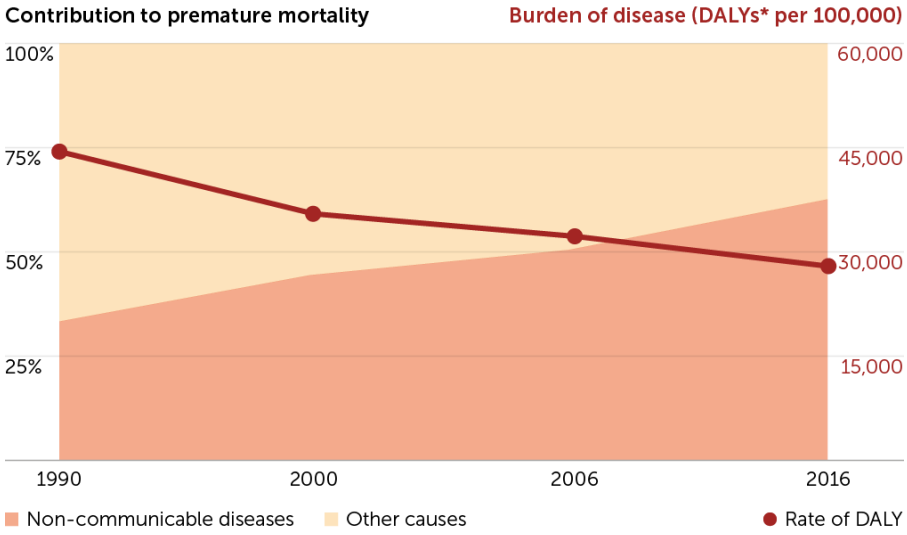
[37] Global Burden of Disease Study (2016), Disability-Adjusted Life Years and Healthy Life Expectancy 1990–2016 | GHDx, https://cht.hm/2N9jJ11 (accessed 10 Aug. 2018).

[38] International Diabetes Federation (2017), *IDF Diabetes Atlas: Eighth Edition*, Brussels: The International Diabetes Federation, https://cht.hm/2PyhAtd (accessed 3 Sept. 2018).

[39] Fountaine, T. et al. (2016), 'Tackling Indonesia's diabetes challenge: Eight approaches from around the world', McKinsey & Company, https://cht.hm/2LWATdp (accessed 10 Aug. 2018).

[40] Rachmi, C., Li, M. and Baur, A. L. (2017), 'Overweight and obesity in Indonesia: prevalence and risk factors – a literature review', *Public Health*, 147: pp. 20–29, doi: https://doi.org/10.1016/j.puhe.2017.02.002 (accessed 10 Aug. 2018).

Figure 2: The rise of NCDs
Contribution of NCDs to premature mortality, 1990 - 2016[41]



Source: Global Burden of Disease Study (2016), Disability-Adjusted Life Years and Healthy Life Expectancy 1990-2016 | GHDx, https://cht.hm/2N9jJ11 (accessed 10 Aug 2018).

* *Premature mortality measured by disability-adjusted life years (DALYs) lost per annum per 100,000 people*

2.4 Diet-related environmental outcomes: status and trends

Growing populations and a shift towards more resource-intensive diets are putting the environmental sustainability of food systems under pressure. Globally, agriculture is already putting extreme pressure on biodiversity and on nutrient (nitrogen and phosphorus) cycles, and rapidly increasing risks for land-use change, climate change and freshwater use.[42] In Indonesia, these environmental impacts of agriculture are driven both by domestic consumption of food and biofuels, and by exports of palm oil, rubber, coffee and cocoa.

Land-use change due to agricultural expansion is the main cause of biodiversity loss and climate change impacts in Indonesia. Palm production alone has accounted for half of all agricultural land expansion since 1975.[43] While palm oil is by far the most efficient vegetable oil in terms of yield per hectare, its expansion is associated with irretrievable loss of globally important biodiversity in Indonesia, classed as one of the world's top 10 'megadiverse' countries.[44] The highest rates of forest loss have been on the islands of Sumatra and Kalimantan, where agro-industrial land development has been particularly rapid.[45, 46]

[41] Global Burden of Disease Study (2016), Disability-Adjusted Life Years and Healthy Life Expectancy 1990–2016.

[42] Campbell, B. M. et al. (2017), 'Agriculture production as a major driver of the earth system exceeding planetary boundaries', *Ecology and Society*, 22(4): doi: https://doi.org/10.5751/ES-09595-220408 (accessed 10 Aug. 2018).

[43] Wicke, B. et al. (2011), 'Exploring land use changes and the role of palm oil production in Indonesia and Malaysia', *Land Use Policy*, 28(1): pp. 193–206, doi: https://doi.org/10.1016/j.landusepol.2010.06.001 (accessed 10 Aug. 2018).

[44] Mongabay Enviromental News (2016), 'The Top 10 Most Biodiverse Countries', Mongabay Environmental News, May 21, 2016, https://cht.hm/2wF53xa (accessed 10 Aug. 2018).

Land-use change, and peat and forest fires are the dominant sources of greenhouse gas emissions in Indonesia, placing the country among the world's highest emitters and accounting for 53 per cent of annual emissions, as against 33 per cent originating from the energy sector.[47] Land-use change associated with agriculture is a much larger source of greenhouse gas emissions than agriculture *per se*, accounting for about six times the emissions of agricultural practices (647 million tonnes of CO2 equivalent – mt CO2e – per annum, compared with 111 mt CO2e per annum).[48] Within the smaller portion of emissions from agriculture, which contributed 6.7 per cent of all greenhouse gases emitted by Indonesia in 2014,[49] methane from rice paddies and nitrous oxide from soil fertility management on croplands are the two dominant sources.

In terms of nutrient cycles, the average use of inorganic fertilizers in Indonesia is about 70 per cent above the world average, although it is substantially lower than in very high-use countries such as China and Malaysia.[50] Expansive farming and overuse of heavily subsidized fertilizers[51] on steeply sloping land across Indonesia leads to high rates of soil erosion and, in turn, to land degradation. Over one-quarter of Indonesia's land is considered heavily degraded, reducing the productive capacity of that land and in turn often bringing about greater agricultural expansion to meet demand. Erosion contributes to high rates of natural landslides in Indonesia: 890 landslides were recorded between 1998 and 2009, resulting in the death of some 1,280 people.[52] Increased erosion stimulated by forest loss from agricultural conversion also has spillover effects on water quality; increased run-off of both sediment and fertilizers contributes to already high rates of eutrophication and impacts negatively on water quality.[53] Climate change is likely to drive more frequent extreme weather events in Indonesia, including dry spells during critical growing periods and floods that will likely increase the frequency of landslides and exacerbate land degradation, as well as amplifying water stress in over-extracted water basins, especially in Java.

[45] Wijaya, A. et al. (2015), 'Assessment of Large Scale Land Cover Change Classifications and Drivers of Deforestation in Indonesia', *ISPRS - International Archives of the Photogrammetry, Remote Sensing and Spatial Information Sciences*: XL-7/W3: pp. 557–562, doi: 10.5194/isprsarchives-XL-7-W3-557-2015 (accessed 10 Aug. 2018).

[46] Margono, B. A. et al. (2014), 'Primary forest cover loss in Indonesia over 2000–2012', *Nature Climate Change*, 4(8): pp. 730–735, doi: 10.1038/nclimate2277 (accessed 10 Aug. 2018).

[47] Republic of Indonesia (2017), 'Indonesia Third National Communication under the United Nations Framework Convention on Climate Change', Jakarta, Indonesia, https://cht.hm/2PyitC3 (accessed 10 Aug. 2018).

[48] Republic of Indonesia (2016), 'First Nationally Determined Contribution of the Republic of Indonesia to the UNFCCC', Jakarta, Indonesia, https://cht.hm/2oLvT2l (accessed 10 Aug. 2018).

[49] World Resources Institute (2017), 'CAIT: WRI's Climate Data Explorer', https://cht.hm/2ChdcwX (accessed 30 Nov. 2017).

[50] World Bank (2018), 'Fertilizer Consumption (kilograms per hectare of arable land)', https://cht.hm/2M0hAQF (accessed 13 Dec. 2017).

[51] Warr, P. and Yusuf, A. A. (2014), 'Fertilizer subsidies and food self-sufficiency in Indonesia', *Agricultural Economics*, 45, pp. 571–588, doi: https://doi.org/10.1111/agec.12107 (accessed 10 Aug. 2018).

[52] Sitorus, S. R. P. and Pravitasari, A. E. (2017), 'Land Degradation and Landslide in Indonesia', *Sumatra Journal of Disaster, Geography and Geography Education*, 1(2): pp. 61–71, https://cht.hm/2Cpl8fo (accessed 10 Aug. 2018).

[53] Asian Development Bank (2016), *Indonesia: Country water assessment*, https://cht.hm/2oCtDKu (accessed 12 Feb. 2018).

Dietary change offers both risks and opportunities to improved nutrition and environmental governance in Indonesia.

Fish and shellfish provide the primary source of animal protein in the Indonesian diet. Species such as tuna, grouper and snapper show signs of being overfished,[54] and unsustainable exploitation threatens both mangrove and coral health.[55] Indonesia is at the heart of the Coral Triangle, which covers just 2 per cent of the global ocean but provides habitats to over three-quarters of all known coral species.[56] Capture fisheries are likely to be limited in their capacity to meet further growth in demand, with the majority already fully exploited or overexploited. Aquaculture production is expected to expand at 5.6 per cent per annum, overtaking capture fisheries as the principal source of fish by 2030.[57] The use of wild fish-based feed and prophylactic antibiotics will need to be carefully managed to avoid further pollution of riverine and coastal ecosystems.

Other important environmental impacts of agriculture in Indonesia include food and plastic waste and haze from forest fires. As with other countries in Southeast Asia, economic growth, rising urbanization and shifting consumer preferences in Indonesia have given rise to an increase in both food waste and packaging waste.[58] Estimates suggest that rates of food waste are higher per capita than in the US or China,[59] underlining that waste constitutes a significant issue in Indonesia and is a clear barrier to efforts towards food self-sufficiency.[60] Total volumes of plastic pollution in Indonesia are second only to China globally,[61] and almost 70 per cent of all plastic is generated by the food and beverage packaging sector.[62] Plastic waste is associated with myriad environmental issues, including chemical pollution and bioaccumulation in fish, both of which harm a vital food source.[63] Haze from forest fires associated with agriculture reached a peak in 2015, with detrimental (though contested) effects on human health and mortality.[64]

Early attempts to estimate the role of Indonesian diets in driving agriculture's environmental impacts have focused on climate change. Including both agricultural and associated land-use emissions, the average Indonesian diet is estimated to produce 1.6 kg CO2e per capita per day, [65] which gives a national total of 152 mt CO2e per year, or 10 per cent of Indonesia's CO2 emissions. Grains, specifically rice, contribute the bulk of these emissions. Emissions associated with domestic consumption of palm oil account for a smaller but highly significant share. Domestic use of palm oil as a cooking oil or in processed food accounts for just 15 per cent of total palm oil production.[66] With land use change from Indonesian palm oil production estimated to be responsible for 250 mt CO2e per year, domestic consumption releases 38 mt CO2e – double the emissions from the burning of fossil fuels. Indonesia already ranks alongside India as the world's largest consumer of palm oil, and domestic consumption is likely to account for a growing share of production in coming years, due to population growth and dietary change.

Although rates of meat consumption in Indonesia are low by global standards, meat production is already a significant contributor to diet-related emissions and embedded land use.[67] Poultry consumption in particular is growing rapidly in Indonesia.[68] Meeting this demand while maintaining an effective ban on poultry imports in order to promote self-sufficiency is likely to present increased demand for land and agricultural expansion, particularly for corn feed.[69] While beef consumption is low, at 2.2 kg per head per annum, and has not increased markedly in recent years, an expected doubling or tripling over the next 20 years will have environmental impacts.

[54] California Environmental Associates (2016), *Indonesia Fisheries: 2015 Review*, https://cht.hm/2NgT4PH (accessed 12 Feb. 2018).

[55] Quincieu, E. (2015), *Summary of Indonesia's agriculture, natural resources and environment sector assessment'*,Asian Development Bank, https://cht.hm/2wJOAqq (accessed 12 Feb. 2018).

[56] California Environmental Associates (2016), *Indonesia Fisheries: 2015 Review*.

[57] Phillips, M. et al. (2015), 'Exploring Indonesian aquaculture futures', Penang, Malaysia: WorldFish, Program Report, 39, https://cht.hm/2wJpxEJ (accessed 10 Aug. 2018).

[58] Manalil, N. M., Darado, M. A. and Otterdijk, R. V. (2014), *Appropriate food packing solutions for developing countries*, Rome: FAO of the United Nations.

[59] Economist Intelligence Unit (2016), 'Fixing Food: Towards a More Sustainable Food System', https://cht.hm/2MMxYtf (accessed 10 Aug. 2018).

[60] Aprilia, A. (2013), 'Food for Thought, Food to Waste', *The Jakarta Post*, November 7, 2013, https://cht.hm/2CfUzJA (accessed 10 Dec. 2017).

[61] Jambeck, J. R. et al. (2015), 'Plastic Waste Inputs from Land into the Ocean', *Science*, 347(622): pp. 764–68, doi: https://doi.org/10.1126/science.1260352 (accessed 10 Aug. 2018).

[62] British Plastics Federation (2015), *Plastics Industry in Indonesia*, https://cht.hm/2MLQ5iQ (accessed 13 Dec. 2017).

[63] Barnes, D. K. A. et al. (2009), 'Accumulation and fragmentation of plastic debris in global environments', *Philosophical Transactions of the Royal Society B*, 364(1526): pp. 1985–98, doi: https://doi.org/10.1098/rstb.2008.0205 (accessed 13 Dec. 2017).

[64] *Guardian* (2016), 'Indonesia dismisses study showing forest fire haze killed more than 100,000 people', https://cht.hm/2LVCVL1 (accessed 13 Dec. 2017).

[65] Behrens et al. (2017), 'Evaluating the Environmental Impacts of Dietary Recommendations'.

[66] Wright, T. and Rahmanulloh, A. (2017),'Indonesia Oilseeds and Products Update January 2017', USDA Foreign Agricultural Service, https://cht.hm/2LYEuYk (accessed 12 Feb. 2017).

[67] Behrens et al. (2017), 'Evaluating the Environmental Impacts of Dietary Recommendations'.

[68] Wright, T. and Darmawan, B. (2017),'Indonesia: Voluntary Poultry Report', USDA Foreign Agricultural Service, https://cht.hm/2wJ5Wnz (accessed 12 Feb. 2018).

[69] Ibid.

3. Delivering healthy diets from sustainable production: key enablers and constraints

Dietary change offers both risks and opportunities to improved nutrition and environmental governance in Indonesia. Many of the components of a successful strategy are already in place, not least a strong set of national dietary guidelines. But certain aspects of markets, public policies, governance, infrastructure and technology are yielding perverse health and environmental outcomes, while others are yet to be used to their full potential.

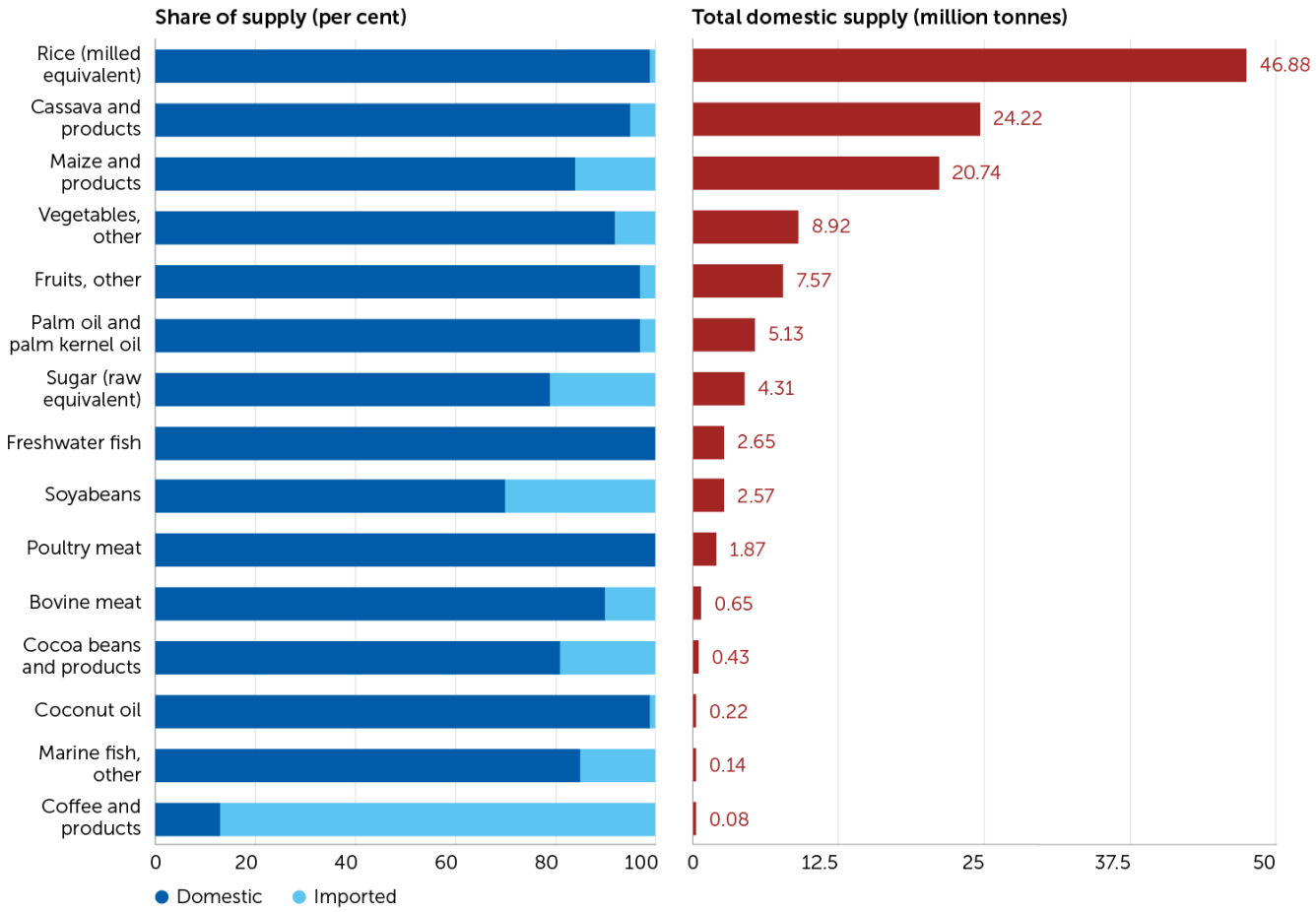
3.1 National policy priorities

3.1.1 Self-sufficiency in five strategic food commodities Central to Indonesia's food and agricultural policy is the commitment made under the 2012 Food Law (No. 18/2012) to achieve self-sufficiency in five strategic commodities: by 2017 for rice, maize and soy, and by 2019 for beef and sugar; these targets imply significantly greater change in the supply balance for soy and sugar than for rice, beef and maize (Figure 3).

This commitment informs three core tenets of central government food policies:

- **Support for producers:** Indonesia's public spending on agriculture is, at 4.6 per cent of GDP, the highest – and fastest growing – among middle-income economies and the countries of the OECD. Financial

Figure 3: Comparative share of domestic production and imports in total domestic supply of key commodities in Indonesia, 2013



Source: Food and Agriculture Organization (2013), FAOSTAT Food Balance Sheets, https://cht.hm/2LWVmyl (accessed 29 Oct. 2018).

support for domestic producers includes price floors for medium-quality rice and subsidized fertilizers.[70] Palm oil producers receive further incentives from Indonesia's biofuels mandate for a blend of 20 per cent biodiesel (from palm oil), rising to 30 per cent by 2020,[71] the highest blend rate in the world.[72]

- **Consumer price controls:** The national government regularly sets and enforces retail price ceilings for medium- and premium-quality rice[73] as well as other foods such as soy, sugar, chillies, shallots, beef and buffalo meat. The measures aim to ensure household food security and control inflation.
- **Trade restrictions:** Protectionist trade measures are in place on a range of basic foods to protect domestic producers from overseas competition: rice imports are permitted only when domestic production is insufficient to maintain mandated stock levels, and outside Indonesia's harvest season;[74] maize imports are allowed only when domestic supply is insufficient to meet domestic demand, and must be approved by the Ministry of Trade;[75] horticultural imports are only permitted at certain ports.[76] Exports are similarly restricted, both for the five self-sufficiency commodities and for fertilizers.[77]

3.1.2 Export-led agricultural growth Growth in agricultural commodity exports is a central component of agricultural policy at national and provincial levels. Agricultural commodities – particularly palm oil – are an important source of GDP, with agriculture contributing 13.5 per cent of GDP in 2015.[78] In terms of palm oil, Indonesia alone accounts for 54 per cent of global exports, worth around $17.7 billion per year.[79] Both the Indonesian state government and provincial governments such as East Kalimantan promote increases in palm oil production and export as central to economic growth strategies. National production has doubled in the last 20 years. The Indonesian palm oil growers' association, GAPKI, has now announced ambitions to raise production from 35 million tonnes in 2016 to 42 million tonnes by 2020.[80]

[70] van Tongeren, F. et al. (2014), 'Fertiliser and Biofuel Policies in the Global Agricultural Supply Chain', *OECD Food, Agriculture and Fisheries Papers*, 69: doi: https://doi.org/10.1787/5jxsr7tt3qf4-en (accessed 10 Aug. 2018).

[71] OECD (2017), 'Agricultural Policy Monitoring and Evaluation 2017: Country Snapshots', https://cht.hm/2wH61rQ (accessed 10 Aug. 2018).

[72] Wright, T. and Rahmanulloh, A. (2017),'Indonesia Oilseeds and Products Update January 2017'.

[73] For example in September 2017: https://cht.hm/2ClO3Bk (accessed 10 Aug. 2018).

[74] The Indonesia Logistics Bureau (BULOG) is the only body permitted to import medium-quality rice. Private companies are permitted to import speciality rice only, such as basmati, jasmine or low-glycaemic varieties, subject to approval by the Ministry of Trade. Wright, T. (2017), 'Indonesia: Grain and Feed Annual', *Global Agricultural Information Network*, Report No. ID1707, https://cht.hm/2MP0c6m (accessed 10 Aug. 2018).

[75] Wright, T. (2017), 'Indonesia: Grain and Feed Annual'.

[76] Patunru, A. A. and Rahardja, S. (2015), 'Trade protectionism in Indonesia: Bad times and bad policy', *Lowy Institute for International Policy*, https://cht.hm/2PZje86 (accessed 10 Aug. 2018).

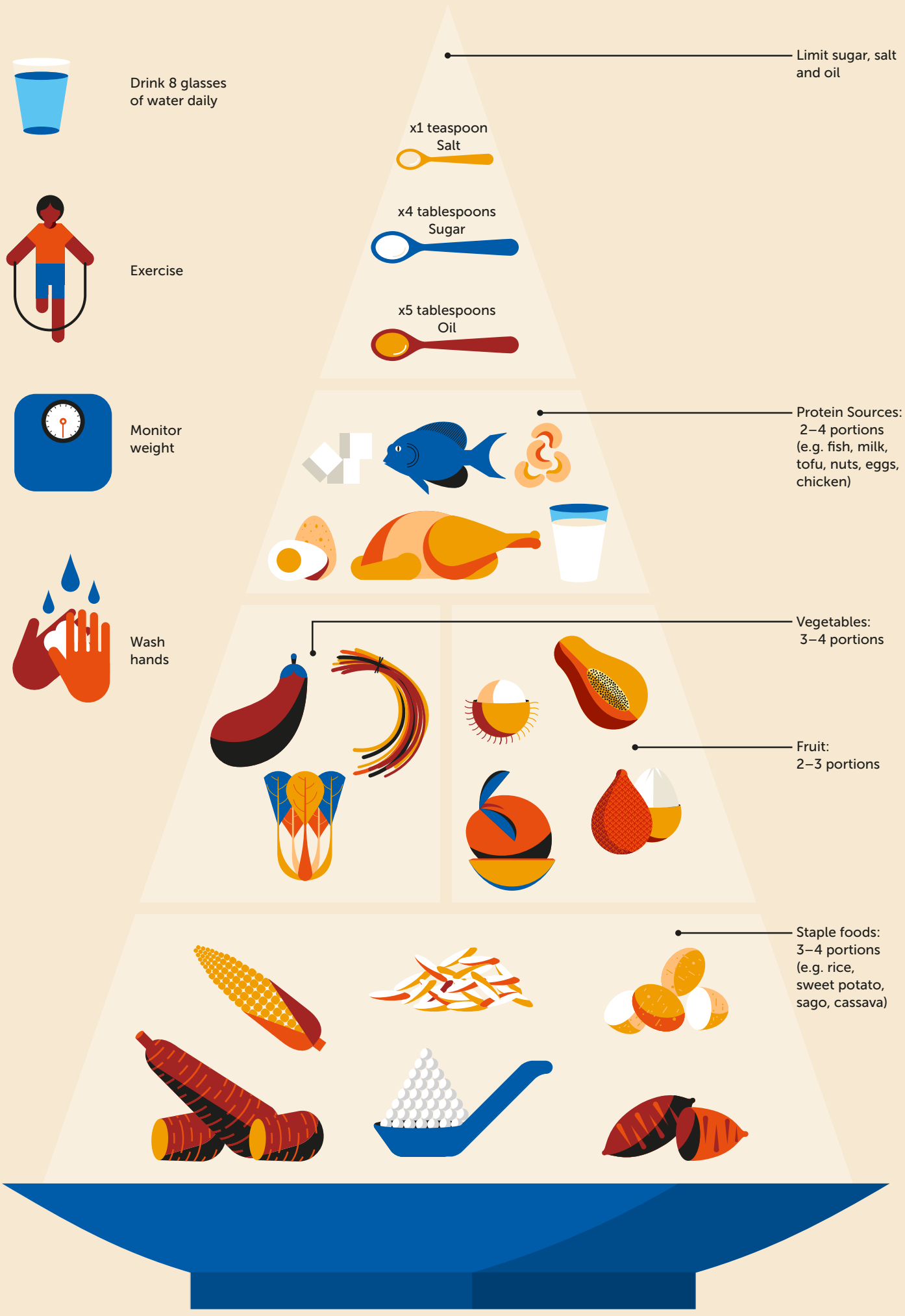
[77] Ibid.

[78] Food and Agriculture Organization of the UN (2017), 'Indonesia: Country fact sheet on food and agriculture policy trends', https://cht.hm/2NfIUii (accessed 10 Aug. 2018).

[79] Chatham House (2017), 'resourcetrade.earth', http://resourcetrade.earth; data for 2015 (accessed 10 Aug. 2018).

[80] Sturman, C. (2017), 'Indonesia's palm oil industry is set to surge', *Business Chief*, 8 Sep 2017, https://cht.hm/2MJv7Bc (accessed 10 Aug. 2018).

Figure 4: Indonesia Balanced Nutrition Guidelines – 'balanced nutrition pyramid' and 'healthy eating plate'



3.1.3 National dietary guidelines Under its National Long-Term Development Plan for 2005–25, the government is committed to the provision of nutrition of sufficient quality to all households. The emphasis on nutritional quality is supported by a set of national dietary guidelines, first introduced in 1995 and subsequently revised in 2014. The Balanced Nutrition Guidelines (*Pedoman Gizi Seimbang*) give detailed guidance for professionals, together with a set of 10 messages directed at the general public: enjoy and be grateful for a variety of foods; eat lots of vegetables and enough fruits; include a wide variety of staple foods in your diet; make a habit of eating high-protein side dishes; limit consumption of sweet, salty and fatty foods; enjoy breakfast; drink plenty of safe water; get used to reading labels on food packaging; wash hands with soap and running water; and do enough physical activity to maintain a normal weight. These are presented pictorially as both a 'balanced nutrition pyramid' and a 'healthy eating plate' (Figure 4).[81]

3.1.4 Programmes to address household food security and undernutrition Addressing undernutrition, particularly wasting and stunting among children, is the top priority for food interventions in Indonesia. *Rastra*, the national programme for rice procurement, subsidization and distribution – with an annual budget of 21 trillion rupiah (around $1.6 billion)[82] – has been in place in varying forms since the late 1990s. At present, *Rastra* accounts for more than half of total social assistance spending, with the government targeting 15.5 million low-income households as potential recipients of subsidized rice. However, inaccurate targeting and inadequate monitoring meant that closer to 33.4 million households – more than half of all households – actually received *Rastra* subsidized rice in 2016.[83] Alongside the *Rastra* programme, particular focus has been placed on addressing high levels of childhood stunting and wasting, and the Indonesian government has worked closely with the Scaling Up Nutrition (SUN) Movement and other international and national organizations to deliver nutrition programmes to children and pregnant women. The *Generasi Sehat dan Cerdas* (Healthy and Bright Generation) programme, for example, disburses grants to communities in over 5,500 villages across 11 provinces to support the provision of iron supplements and antenatal care to pregnant women, together with nourishment and immunization programmes for children. In collaboration with the UN, the government has also invested in the WASH programme – comprising interventions in areas of water, sanitation and hygiene[84] – to reduce the prevalence of food- and water-borne diseases that inhibit nutrient uptake and increase childhood morbidity and mortality. Programmes to explicitly address and improve data collection for NCDs have also emerged, such as the

[81] Food and Agriculture Organization of the UN (2014), *Food-based dietary guidelines – Indonesia*, https://cht.hm/2Cp4AEi (accessed 10 Aug. 2018).

[82] Timmer, C. P. and Sumarto, S. (2017), 'Evolution and Implementation of the Rastra Program in Indonesia', in Alderman, H. et al. (eds) (2017), *The 1.5 Billion People Question: Food, Vouchers, or Cash Transfers?*, Washington, DC: World Bank Group.

[83] Ibid.

[84] World Bank (2016), *World Bank – Indonesia Economic Quarterly: Pressures Easing*.

Adoption of a healthy and sustainable diet can deliver a sizeable portion of commitments under both Indonesia's NDC and the internationally agreed SDGs and their targets.

Indonesian Ministry of Health's *Posbindu PTM* programme, which includes monitoring and reporting on dietary risk factors.[85] Presidential decrees (such as number 83 of 2017) that address 'Food and Nutritional Strategic Policies' strengthen these efforts, but require translation at the regional and provincial level to achieve implementation.[86] In addition, an extensive network of nutrition academies provide evidence and pilot programmes to support both nutrition awareness and inform the design of future nutrition programmes.

3.1.5 Sustainable consumption and production, including waste management Indonesia has taken a leading role in the ASEAN region in promoting sustainable consumption and production practices. It has a national 10-year framework programme on sustainable consumption and production (10YFP-SCP) that guides action under the international 10YFP agreed at the UN Conference on Sustainable Development (Rio+20) summit held in Rio de Janeiro in 2012, and the Indonesian government leads the ASEAN Forum on sustainable consumption and production.[87] Indonesia's national 10YFP is led by the Ministry of Environment and Forestry and the National Development Planning Agency (BAPPENAS), and includes a commitment to pursuing 'quick wins' via eco-labelling and green public procurement, as well as via improved waste management.[88] However, implementation is not yet showing results; notably, in 2016 Indonesia was ranked second worst for volumes of food loss and waste among 16 countries studied (including the US, China and Brazil), with nearly 300 kg of food wasted per person each year.[89]

3.1.6 International commitments and regulations Indonesia is involved in new international partnerships under the UN Sustainable Development Goals (SDGs) and the Paris Agreement on climate change. Indonesia has established ambitious emissions reduction targets under its 2010 National Action Plan for Greenhouse Gas Emissions Reduction (RAN-GRK), which were communicated in 2015 to the UNFCCC in the nation's Nationally Determined Contribution (NDC) to the Paris Agreement. Its unconditional commitment is to a 29 per cent reduction by 2030 in overall greenhouse gas emissions – compared with 'business-as-usual' projections – from five priority

[85] Direktorat Jenderal Pengendalian Penyakit dan Penyehatan Lingkungan (2012), 'Petunjuk Teknis Pos Pembinaan Terpadu Penyakit Tidak Menular', https://cht.hm/2CjKJGK (accessed 4 May 2018).

[86] Presidential Decree (2017), 'Peraturan Presiden Nomor 83 Tahun 2017', https://cht.hm/2LR5B7P (accessed 10 Aug. 2018).

[87] United Nations Environment Programme (undated), '10YFP: Case study – The SCP update in Indonesia', https://cht.hm/2wFzYcI (accessed 13 Feb. 2018).

[88] Ibid.

[89] Economist Intelligence Unit (2016), 'Fixing Food: Towards a More Sustainable Food System'.

[90] Republic of Indonesia (2016), 'First Nationally Determined Contribution of the Republic of Indonesia to the UNFCCC'.

[91] Brack, D., Glover, A. and Wellesley, L. (2016), *Agricultural Commodity Supply Chains: Trade, Consumption and Deforestation*, Research Paper, London: Royal Institute of International Affairs, https://cht.hm/2NMcUiS (accessed 10 Aug. 2018).

[92] Reuters (2017), 'Indonesia president approves two-year extension of forest moratorium', 24 May 2017, https://cht.hm/2Q4ZXC9 (accessed 10 Aug. 2018).

sectors (forestry and peatlands; agriculture; energy and transportation; industry; and waste), with the bulk of the reduction (a combined 60 per cent) to come from the forestry and peatlands sector.[90] A moratorium was introduced in 2011 on new licences for land clearance or agricultural production on primary forests and peatlands.[91] It has since been renewed three times, most recently in May 2017 to cover an additional two years,[92] although analyses of forest cover and land use change suggest its effectiveness in preventing further clearance of forests and peatland has been limited.[93] In 2010 a letter of intent was signed between Norway and Indonesia to provide up to $1 billion in performance-based payments for reduced emissions from deforestation and forest degradation (termed a REDD+ agreement). While there are a number of demonstration projects in place,[94] Indonesia's progress on REDD+ has been slow, with relatively poor performance on deforestation to date; furthermore, the establishment of a funding mechanism and of agreed safeguards is required before performance-based payments can be made.[95] Adoption of a healthy and sustainable diet can deliver a sizeable portion of commitments under both Indonesia's NDC and the internationally agreed SDGs and their targets.[96] At a regional level, the ASEAN Secretariat has recently renewed its focus on NCD coordination efforts, including through the 'Healthy Lifestyle' cluster programme, which provides a platform for regional solutions to be scaled and adapted.

3.2 Food environments

3.2.1 Food retail The rate of transition to modern retail has been relatively slow in Indonesia. The food retail environment remains dominated by small-scale vendors: small, independently owned convenience stores (*warung*), street carts (*kaki limas*), and traditional wet markets (*pasars*) owned by municipal authorities. These vendors continue to provide more than two-thirds of fresh fish and meat sold in the country, and over half of fresh vegetables.[97] Urbanization has brought the development of a parallel food environment, composed of hypermarkets, supermarkets and, most importantly, mini-markets, though their share of total sales remains significantly lower, at 17 per cent, than in other ASEAN countries (Figure 1d).[98] Modern grocery

[93] Wijaya, A. et al. (2017), '6 Years After Moratorium, Satellite Data Shows Indonesia's Tropical Forests Remain Threatened', World Resources Institute blog, 24 May 2017, https://cht.hm/2NQycvX (accessed 12 Feb. 2018).

[94] The REDD Desk (2018), 'REDD in Indonesia', https://cht.hm/2wIwnKH (accessed 12 Feb. 2018).

[95] Clark, P. (2018), 'The great land rush. Indonesia: Saving the earth', Financial Times, 1 Mar. 2016, https://cht.hm/2Q5dr0J (accessed 12 Feb. 2018).

[96] Notable examples include SDG2 on hunger, SDG3 on health (including SDG3.4 on non-communicable diseases), SDG9 on infrastructure, SDG10 on inequality, SDG12 on sustainable consumption and production (including SDG12.3 on food waste and SDG12.7 on public procurement), SDG13 on climate and SDG14 on oceans.

[97] According to a 2010 trends survey undertaken by Nielsen Shopper. Rangkuti, F. Y. and Wright, T. (2016), 'Indonesia: Retail Foods Update', GAIN Report No. ID1638, https://cht.hm/2Niz13i (accessed 12 Feb. 2018).

[98] Ibid.

outlets are regulated to protect small-scale vendors in the face of growing competition. The Ministry of Trade regulates the number of modern outlets allowed within a certain area, their permitted distance from traditional markets, and their size and stock (modern outlets must stock a minimum of 80 per cent domestic products, for example).[99] Modern, standardized supply chains nevertheless limit the variety of foods sold, while poor transport and storage infrastructure encourages the stocking of long-life packaged and processed foods over fresh produce.[100]

3.2.2 Food service sector A significant share of food consumed in Indonesia is prepared and eaten outside the home: the country has the largest food service sector in the ASEAN region, worth an estimated $36.8 billion in 2014.[101] In Jakarta, for example, about 30 per cent of calories come from foods prepared outside the home.[102] The results of an online survey in 2015 showed that 11 per cent of respondents eat away from home at least once a day, and 44 per cent of these buy food from street vendors.[103] Low-income consumers in Bandung, West Java, purchase food two or three times a day from these providers, showing very high dependency.[104] The informal nature of much of Indonesia's traditional food service sector makes it difficult to assess accurately which foods are bought and sold. However, anecdotal evidence suggests that *kaki limas* street vendors provide an increasing amount of both hot food – popular in urban centres outside of workplaces – and locally produced and packaged snacks. Small-scale vendors are, for the most part, informal and minimally regulated. A lack of resources and knowledge about food hygiene among street vendors can lead to the spread of food-borne illnesses.[105] Notably, too, in the absence of modern food preparation and storage facilities, deep-frying of fresh produce is common.[106]

[99] Ibid.

[100] Hammond, S. T. et al. (2015), 'Food Spoilage, Storage, and Transport: Implications for a Sustainable Future', BioScience, 65(8): pp. 758–68, doi: https://doi.org/10.1093/biosci/biv081 (accessed 12 Feb. 2018).

[101] Agriculture and Agri-Food Canada (2016), *Foodservice Profile: Indonesia*, Global Analysis Report, Market Access Secretariat, https://cht.hm/2oHRmsO (accessed 10 Aug. 2018).

[102] BPS Statistics Indonesia (2016), *Consumption of calorie and protein of Indonesia population and province*.

[103] This survey, undertaken by Nielsen, captures only respondents from the 31 per cent of the population with internet access. Nielsen (2016), *What's In Our Food and On Our Mind: Ingredients and dining-out trends around the world*, https://cht.hm/2oHSnkC (accessed 17 Dec. 2017).

[104] Center of Sustainable Food (2015), Unpublished study, University of Padjajaran. Personal communication from Silvana Paath, January 2018.

[105] Vollaard, A. M. et al. (2004), 'Risk factors for transmission of foodborne illness in restaurants and street vendors in Jakarta, Indonesia', *Epidemiological Infection*, 132: pp. 863–872, doi: https://doi.org/10.1017/S0950268804002742 (accessed 10 Aug. 2018); Khairuzzaman, M. et al. (2014), 'Food Safety Challenges towards Safe, Healthy, and Nutritious Street Foods in Bangladesh', *International Journal of Food Science*, 483519, doi: http://dx.doi.org/10.1155/2014/483519 (accessed 10 Aug. 2018).

[106] Malasan, P. L. (2017),'Feeding a Crowd: Hybridity and the Social Infrastructure behind Street Food Creation in Bandung, Indonesia', *Southeast Asian Studies*, 6(3): pp. 505–29, doi: https://doi.org/10.20495/seas.6.3_505. (accessed 10 Aug. 2018).

3.2.3 Role of internet and advertising Greater online connectivity and social media penetration are reshaping the food environment, particularly in urban centres. Food delivery services were already worth some $641 million in 2017, and are projected to grow by 24 per cent a year to 2022, mainly using online platforms.[107] Major retailers such as Carrefour and Alfamart [108] have launched e-commerce platforms, and traditional food vendors are also entering the online and mobile delivery space. Launched in 2010, Go-Food, a division of the app-based motorbike-ride-hailing company Go-Jek, is already one of the world's biggest food delivery platforms, offering remote access to over 85,000 food outlets, including street vendors.[109] While Indonesia does have a regulation enforcing the labelling of nutritional content of foods,[110] the implementation of food advertising regulations remains weak, and there is extensive promotion of processed foods on television, radio and the internet, as well as in print media and on billboards. A study comparing television advertising across four Asian countries found Indonesia to have the greatest volume of food advertising aimed at children, with 15 promotions per hour during children's TV segments, mainly for sugar-sweetened beverages. At the same time, middle- and higher-income urban residents are increasingly interested in accessing food products that are marketed as healthy. Demand is growing – slowly, and from a low base – for organic-labelled food, for lower-GI rice varieties,[111] for fortified or supplemented versions of noodles and dairy products,[112] and for sweetened beverages marketed as 'healthy', such as sports drinks and green teas.[113] Alongside nutritional and health messaging, existing awareness of the negative environmental implications of foodstuffs such as palm oil is low.[114]

[107] Statista (2017), 'Online Food Delivery – Indonesia', The Statistics Portal, https://cht.hm/2PEDiMi (accessed 10 Aug. 2018).

[108] DBS Treasures (2017), 'Asean Grocery Retail: Will online grocery retail take off in ASEAN?', https://cht.hm/2LQQiMp (accessed 10 Aug. 2018).

[109] Timmerman, A. (2017), 'Go-Jek's food delivery beats all Indian food startups combined: Piotr Jakubowski', *Deal Street Asia*, 10 April 2017, https://cht.hm/2Q2uZL7 (accessed 4 Jan. 2018); Adiguna, J. (2016), 'City pushes street vendors to go online', *The Jakarta Post*, 12 March 2016, https://cht.hm/2Nn4SjH (accessed 5 Jan. 2018).

[110] Ministry of Health (2013), 'Inclusion of information on the content of sugar, salt and fat and health messages for processed food and ready-to-eat food'. Nomor 30, https://cht.hm/2Q3xUmP (accessed 5 Jan. 2018).

[111] Mintel Press Team (2017),'Indonesia's Rice Intake Slows', Mintel.com, https://cht.hm/2NKhm1n (accessed 13 Dec. 2017).

[112] Euromonitor International (2016), 'Health and Wellness in Indonesia', https://cht.hm/2LULMwd (accessed 10 Aug. 2018).

[113] Rangkuti, F. Y. (2017), *Indonesia Food Processing Ingredients Update*, USDA Foreign Agricultural Service, https://cht.hm/2oDNWqO (accessed 13 Dec. 2017).

[114] Daemeter (2015), 'Seeing Palm Oil Through Indonesian Consumers' Eyes: The Good and the Bad', https://cht.hm/2CjxJRr (accessed 10 Aug. 2018).

3.3 Decentralized governance

Since the late 1990s, a process of decentralization in Indonesia has devolved powers from central government to the country's 34 provincial, 413 district and 98 municipal governments.[115] While decentralization has allowed for the development and implementation of locally appropriate policies, weak coordination between levels of governance and financial and human resource constraints among subnational authorities, together with pervasive corruption among government officials, has limited the ability of local governments to tackle structural challenges of poverty, food insecurity, and unsustainable consumption and land use.[116,117] A high degree of incoherence and ambiguity between regulatory frameworks [118] creates contradictions across government agencies, for example in the context of designated and permitted land uses.[119] The quality and coverage of social service provision vary greatly both between and within provinces.[120] Municipal and district-level health systems are being strengthened as part of the shift towards universal health coverage (UHC), and community health workers in these settings can be agents for promoting healthy and sustainable diets. Early evidence shows that a focus on building healthcare capacity at district level has contributed to closing the healthcare coverage gap, particularly for the poorest quartiles.[121] While there is great potential to develop and share best practice from local-level initiatives, and while local governments are often the best-positioned protagonists within the country's food system to elevate or scale up successful initiatives, food is almost always absent from regional planning.[122]

[115] Nasution, A. (2016), *Government Decentralization Program in Indonesia*, Asian Development Bank Institute Working Paper Series, https://cht.hm/2wGmtZb (accessed 10 Aug. 2018).

[116] Fossati, D. (2016), 'Beyond "Good Governance": The Multi-level Politics of Health Insurance for the Poor in Indonesia', *World Development*, 87: pp. 291–306, doi: https://doi.org/10.1016/j.worlddev.2016.06.020 (accessed 13 Dec. 2017).; UNICEF Indonesia (2012), 'Making Decentralization Work for Children in Indonesia', Issue Briefs, October 2012, https://cht.hm/2Q3UQ5i (accessed 10 Aug. 2018).

[117] Bae, J. S. et al. (2014), 'Promises and Perils of Decentralized Forest Governance: The Case of Indonesia's Forest Management Units in Reducing Emission [sic] from Deforestation and Forest Degradation (REDD+)', *Society & Natural Resources*, 27(12): pp. 1346–1354, doi: https://doi.org/10.1080/08941920.2014.945061 (accessed 10 Aug. 2018).

[118] Hoare, A. and Wellesley, L. (2014), *Illegal Logging and Related Trade: The Response in Indonesia*, Research Paper, London: Royal Institute of International Affairs, https://cht.hm/2Chy9ro (accessed 10 Aug. 2018).

[119] Shahab, N. (2016), 'Indonesia: One Map Policy', Open Government Partnership, https://cht.hm/2wK00dI (accessed 13 Dec. 2017).

[120] Nasution, A. (2016), *Government Decentralization Program in Indonesia*, Asian Development Bank Institute Working Paper Series, No. 601, https://cht.hm/2wGmtZb (accessed 13 Dec. 2017).

[121] Kruse, I., Pradhan, M. and Sparrow, R. (2012),'Marginal benefit incidence of public health spending: Evidence from Indonesian sub-national data', *Journal of Health Economics*, 31(1): pp. 147–57, doi: https://doi.org/10.1016/j.jhealeco.2011.09.003 (accessed 13 Dec. 2017).

[122] Silvana Paath, personal communication, January 2018.

Poor infrastructure and low access to agricultural technologies severely restrict Indonesia's ability to increase agricultural productivity and reduce the environmental impacts of agriculture.

3.4 Infrastructure and technology deficits

Chronic underinvestment in infrastructure in Indonesia is estimated to have cost at least 1 percentage point of GDP growth annually in 2000–2014,[123] with consequences that include regular electricity load-shedding, access to piped water for only 20 per cent of households, and high logistics costs equivalent to some 24 per cent of GDP owing to poor-quality roads, seaports, airports and railways.[124] Weak transport, storage and refrigeration infrastructure exerts upward pressure on food prices, contributes to high rates of food loss and waste, constrains market connectivity within and between districts, and impedes the safe and hygienic distribution of fresh produce.

Poor infrastructure and low access to agricultural technologies severely restrict Indonesia's ability to increase agricultural productivity and reduce the environmental impacts of agriculture. Bringing simple technologies to scale could have profound effects if coupled with strong environmental governance, particularly in palm oil, rice and aquaculture. One recent analysis suggests that, among the small-scale farmers that produce 40 per cent of Indonesia's palm oil, yield increases of 65 per cent are possible through improved planting stock and higher pruning and weeding rates, with the potential to raise national production by 26 per cent.[125] This would exceed Indonesia's 2020 production ambition for palm oil, while saving 1.75 million hectares of expansion.

With regard to rice, close management of the water level in paddy ('alternate wetting and drying') is known to reduce methane emissions substantially,[126] offering a low-cost solution to the largest source of greenhouse gas emissions in Indonesian agriculture. But a lack of financial and human capacity among district-level water management bodies and extension services constrains investment in irrigation infrastructure and farmers' adoption of new technologies. Similar problems prevail in fisheries and agriculture – sectors that remain dominated by small-scale operators using rudimentary equipment. Indonesia's productivity in aquaculture is currently low by global standards: average production of fish and shellfish in 2010 was 1 tonne per fish farmer, as against 7 tonnes per farmer in China, 35 tonnes in Chile and 187 tonnes in Norway.[127] Realizing aquaculture's potential to meet Indonesia's vast future protein needs will depend on improving access to basic technologies such as water pumps.[128]

[123] *The Economist* (2016) 'Jokowi's Moment. Special Report: Indonesia', 27 February 2016, https://cht.hm/2wKcPpw (accessed 13 Dec. 2017), citing World Bank estimates'.

[124] Tabor, S. R. (2015), *Constraints to Indonesia's Economic Growth*. Asian Development Bank Papers on Indonesia, https://cht.hm/2LWNWf3 (accessed 13 Dec. 2017).

[125] Soliman, T. et al. (2016), 'Closing oil palm yield gaps among Indonesian smallholders through industry schemes, pruning, weeding and improved seeds'. *Royal Society Open Science*, 3(8), 160292, doi: http://doi.org/10.1098/rsos.160292 (accessed 13 Dec. 2017).

[126] Lampayan, R. M. et al. (2015), 'Adoption and economics of alternate wetting and drying water management for irrigated lowland rice'. *Field Crops Research*, 170: pp. 95–108, doi: https://doi.org/10.1016/j.fcr.2014.10.013 (accessed 13 Dec. 2017).

[127] Food and Agriculture Organization of the UN (2012), *The State of World Fisheries and Aquaculture*, https://cht.hm/2Q2T8ky (accessed 10 Aug. 2018).

[128] Yi, D., Reardon, T. and Stringer, R. (2016), 'Shrimp aquaculture technology change in Indonesia: Are small farmers included?', *Aquaculture*, 493, pp. 436–445, doi: http://dx.doi.org/10.1016/j.aquaculture.2016.11.003 (accessed 10 Aug. 2018).

4. Pathways towards healthy diets from sustainable production

Indonesia – in common with most countries across the world – has hitherto failed to address the food system in a holistic manner, tackling health, environment and food security as distinct rather than interrelated issues. A course correction towards healthy diets based on sustainable production will require seeking joined-up solutions across the whole food supply chain. The principles of this system-based approach include a strong focus on the food environment and choices available to children and adults in their daily lives; foresight and forward planning in preparation for known emergent risks to food security, health and the environment; and food security strategies that aim to optimize the population's nutritional status rather than maximizing the national breadbasket.

In this context, there are promising opportunities for national, provincial, district and municipal governments to promote a shift to healthy and sustainable diets in Indonesia in three key areas: embedding the principles of a healthy diet, as laid out in the national dietary guidelines, into the range of food policies from agriculture through to trade, procurement and health; aligning economic and food security policies with strategies for health and environment; and partnering with food providers and local pioneers to foster a healthier, more sustainable and more equitable food environment. Table 2 illustrates some of the ways in which interlinked public policy options across these three areas can work together to steer Indonesian diets and food systems away from their currently unhealthy and unsustainable pathways.

Table 2: Public policy options to steer current trajectories in Indonesian diets towards a healthier and more environmentally sustainable pathway

Current distinctive features	10-year outlook under current policy framework	Public policy options for healthy diets from sustainable production
of Indonesian diets:		
A healthy diet is unaffordable to a third of the population; half of households receive public food aid.	Rising inequality will reduce access to nutritious diets, while costs of food voucher schemes will rise.	Increase nutritional content of food voucher schemes, aligning with existing subsidy programmes such as Indonesia Smart Card (*Kartu Indonesia Pintar*), within a wider package of local service delivery and social protection to reduce inequality.
Dietary diversity is markedly low, with rice accounting for up to two-thirds of calories consumed.	Focus on cheap food will reinforce dominance of noodles and other processed cereal products in diets.	Provide incentives for food diversity throughout the supply chain from farm to consumer. Support market access for smallholders to increase households' ability to buy diverse foods.
Meat consumption is very low in comparison with other countries of similar GDP per capita; widely eaten protein sources include fish and soy products.	Shift towards meat-based diets will accelerate, led by poultry ahead of beef or dairy.	Position sustainable aquaculture and plant foods (including local tofu/tempeh) as main supplies of future protein demand, building technological efficiency, climate resilience and food safety.
Average fruit and vegetable consumption is less than half the nationally recommended level, and intake of wholegrains, seeds and nuts is similarly low.	Falling public investment in horticulture, coupled with a lack of incentives to the agriculture and food sectors, will drive a falling share of diverse plant foods in diets.	Expand cold chain. Replace crop-specific subsidy schemes that favour rice, maize and sugar with crop-neutral support that allows producers to respond to market demand. Promote nutrition education and awareness of benefits of fruit and vegetables.

Table 2 *continued*

Current distinctive features	10-year outlook under current policy framework	Public policy options for healthy diets from sustainable production
of Indonesian diets:		
There is huge variation among diets across the archipelago.	Diets will converge towards reduced regional and daily variety.	Protect and celebrate local food cultures (e.g. with protected designation of origin – PDO – legislation).
of the Indonesian food environment:		
The transition towards modern food retail methods is slow compared with other Asian countries; much food shopping still takes place in traditional wet markets.	Food supply chains will become shorter and more homogeneous, with modern retail formats further reducing availability and consumption of fresh foods.	Engage early with businesses and local authorities to maintain availability of healthy foods, ahead of regulatory approaches in future years.
Eating foods prepared outside the home is common, especially in urban areas, providing 30 per cent of daily calories in Jakarta; street vendors have a key role in the food service industry.	Foods prepared outside the home will account for a growing share of Indonesian diets, providing a strong opportunity to shape dietary patterns through food environments.	Use the national dietary guidelines widely to create healthy food choices in public procurement (e.g. in schools and hospitals) and to set incentives for the food service sector.
Availability and advertising of less healthy processed foods, particularly sugar-sweetened beverages, is high.	Unhealthy processed foods will dominate food offerings and diets in both urban and rural areas.	Limit or ban the promotion and advertising of unhealthy foods to children. Include healthy eating more strongly in public health programmes and school curricula.
of forward links from diets to health:		
Obesity is higher among wealthy than poor people.	Obesity will 'flip' to being a problem of the poor, placing greater pressure on public heath expenditure.	Tackle obesity through primary healthcare, and reshape obesogenic food environments, for example through food vendor licences, retail zoning and incentives from universal health insurance.
Almost a third of children are chronically undernourished; many more suffer micronutrient deficiencies.	Rising inequality will entrench undernutrition among low-income households, with long-term economy-wide costs.	Ramp up investments in programmes such as the Scaling Up Nutrition (SUN) Movement, coupled with poverty reduction programmes.
Agriculture and fisheries drive resource degradation, despite environmental laws, policies and international commitments.	Indonesia is in danger of failing to meet its obligations on climate change, due to agriculture driving high rates of land-use change and associated land-based greenhouse gas emissions.	Take a system-wide approach to pressure on land that addresses demand-side drivers in tandem with agriculture technologies and land/marine governance.
Indonesian diets are less important than agricultural export commodities as drivers of environmental change.	With the nutrition transition, domestic consumption of palm oil and animal products will become an increasingly important driver of environmental change.	Include actions on food waste and overconsumption as central components of national strategies on environment and food security. Review biofuels mandate as an additional driver of land-use trade-off.

4.1 Align high-level policies and strategies in support of a healthy and sustainable food future

The overarching challenge for Indonesia is to design a coherent set of strategies for agricultural and food systems that balance outcomes for public health and the environment against existing goals of export growth and self-sufficiency. A strategy to put Indonesians on the pathway to healthy diets from sustainable production would identify the desired diet for Indonesians and follow through to identify mechanisms and incentives throughout the food supply system to deliver this diet.

Any strategy to put Indonesians on the pathway to healthy diets from sustainable production is pitted against prevailing trends towards an expansion of plantation agriculture and the four 'self-sufficiency' crops.

4.1.1 Balancing competing policy priorities There have been several recent indications of willingness on the part of the national government to choose this route. BAPPENAS has already adopted FAO's guidelines for nutrition-sensitive agriculture,[129] while the Ministry of Agriculture has announced its intention to help reduce dependency on rice as Indonesia's staple source of carbohydrate, including through measures to promote the cultivation of tubers such as sweet potato and cassava.[130]

Any strategy to put Indonesians on the pathway to healthy diets from sustainable production is pitted against prevailing trends towards an expansion of plantation agriculture and the four 'self-sufficiency' crops: soy, rice, maize and sugar. These trends are underpinned by public policy imperatives of economic development and food self-sufficiency, supported by strong lobby groups and business interests in large-scale agriculture. Further political support comes from the downstream large-scale food processing and retail businesses that profit from the increasing dominance in diets of processed foods manufactured from the 'self-sufficiency' crops.

Making the case at national level will necessitate demonstrating that the agriculture that provides more diverse diets not only does not further exacerbate environmental degradation, but also delivers on jobs and GDP. Better inter-ministerial and interdepartmental coordination is clearly important to resolving directly contradictory policy positions. But this is more than a technical challenge to be solved by inter-ministerial meetings and new institutional structures. Research shows that domestic companies and the public may see international initiatives such as REDD+ and the Paris Agreement as foreign interference in Indonesian jobs and growth.[131] Therefore, building wide support across agri-food businesses, health practitioners and the public for measures aimed at promoting both environmental sustainability and health will be a critical but long-term process for the champions of healthy and sustainable diets within the Indonesian government.

[129] Food and Agriculture Organization of the UN (2015), *Designing nutrition-sensitive agriculture investments: checklist and guidance for programme formulation*, https://cht.hm/2PA4fQY (accessed 13 Feb. 2018).

[130] *The Jakarta Post* (2017), 'Government to reduce people's dependency on rice', 25 October 2017, https://cht.hm/2PB7Az8 (accessed 13 Feb. 2018).

[131] Anderson, Z. R. et al. (2016), 'Green growth rhetoric versus reality: Insights from Indonesia'. *Global Environmental Change*, 38: pp. 30–40, doi: https://doi.org/10.1016/j.gloenvcha.2016.02.008 (accessed 10 Aug. 2018).

[132] Pingali, P. (2015), 'Agricultural policy and nutrition outcomes – getting beyond the preoccupation with staple grains'. *Food Security*, 7(3): pp. 583–91, doi: https://doi.org/10.1007/s12571-015-0461-x (accessed 10 Aug. 2018).

4.1.2 Revisiting self-sufficiency targets The first area to tackle is Indonesia's commitment to achieve self-sufficiency in rice, maize, soy, sugar and beef. Attaining self-sufficiency relies on a delicate balance of import restrictions, producer support mechanisms and consumer price controls. Any adjustments to these policies require careful consideration, given the complexity of outcomes for winners and losers among consumers and the food industry. But, as it prepares for the final five-year stage of its 20-year National Long-Term Development Plan, the government should consider whether it would be better to withdraw producer support mechanisms for the 'big five' self-sufficiency products. Both sugar and beef are associated directly with negative outcomes for public health and the environment, while rice and (to a lesser extent) maize are valuable staple foods that are overconsumed at the expense of dietary quality and diversity. Sugar in particular requires urgent attention, and could work as a first entry point for food system change in Indonesia.

Taking a systems approach to food security would open up new solutions for health and the environment. Indonesia is fighting an uphill battle to meet food self-sufficiency goals through import restrictions and producer subsidies. The government should consider meeting sugar and beef self-sufficiency through achieving reductions in consumption, in line with the national dietary guidelines, rather than through growth in domestic production to meet the trend towards diets rich in sugar and red meat. Simultaneously, current producer subsidies could be repurposed to other crops, or – drawing on experience in India – switched to 'crop-neutral' support[132] that allows farmers simply to respond to changing markets, as consumers' incomes and awareness of health and environmental impacts increase. There have also been suggestions that spending previously allocated to consumer price subsidies, which were largely removed in early 2015, could be repurposed to cover public healthcare.[133] Actions on food waste and overconsumption can likewise be central components of a food security strategy that embraces health and the environment. Additionally, many commentators have advocated regionally open markets across ASEAN as a better strategy for food security than protectionist self-sufficiency measures.[134, 135]

[133] See for example, Yates, R. (2014), 'Recycling Fuel Subsidies as Health Subsidies', *Bulletin of the World Health Organization*, 92(8): pp. 547–547A, doi: https://doi.org/10.2471/BLT.14.143495 (accessed 10 Aug. 2018).

[134] Clarete, R. L., Adriano, L. and Esteban, A. (2013), 'Rice Trade and Price Volatility: Implications on ASEAN and Global Food Security'. Asian Development Bank Economics Working Paper Series, No. 368, https://cht.hm/2PFgig7 (accessed 10 Aug. 2018).

[135] Ewing-Chow, M. (ed). (2016), *International Trade and Food Security: Exploring Collective Food Security in Asia*, Cheltenham, UK: Edward Elgar Publishing.

4.1.3 Boosting agricultural productivity A second area of policy that should be reconsidered is Indonesia's bold commitment to the contribution of agriculture to economic growth. If the government's ambitious environmental commitments on climate and on deforestation are to be honoured, this growth must come from improvements in productivity rather than land expansion. The requisite policy instrument to curb agricultural expansion is in place – a moratorium first introduced in 2011 – and this must be upheld and widely enforced, supported by tools like the government's 'One Map' initiative.[136] But to provide export growth, farm livelihoods and food availability, the government could couple restrictions on agricultural land use expansion with measures to promote environment-friendly productivity increases.

The technology gap on farms is a vast but tractable challenge. Adoption on a wide scale of simple technologies – such as improvements in palm oil planting stock – is a priority. There is also tremendous scope for Indonesian farmers to take up emerging technologies that are already proven in smallholder contexts, such as precision fertilizer management applications that greatly increase nutrient use efficiency, saving farmers' costs while reducing pollution and emissions. The scaling up of these kinds of technical innovations, which bring economic returns to farmers alongside environmental outcomes, should be achievable through a combination of extension services, start-up finance, and market incentives – all highly compatible with measures to promote on-farm diversification, which has itself been long advocated by commentators as an important strategy to improve farmers' livelihoods.[137] Helping farmers to build their own competencies and knowledge systems, for example via Farmer Field Schools, which have a rich and successful history in Indonesia,[138] is as important as sharing appropriate technologies. Supportive finance could draw on international funds that couple protection of natural landscapes with support for sustainable intensification – such as Rabobank and the UN Environment Programme's new $1 billion Kickstart Food fund, which will target Indonesia and Brazil[139] and which could operate through existing community-based mechanisms such as the Village Funds programme.

The Ministry of Environment and Forestry, in collaboration with the Ministry of Agriculture, should also consider introducing a requirement for set-aside land for food production in 'outgrower' schemes (e.g. 'plasma' plantations for smallholders), and providing legal protection for community forests. Diversifying land use in this way could promote healthier and more sustainable diets among those working in agriculture, in line with evidence that mixed or swidden farming is associated

[136] Wellenstein, A. (2017), 'One Map: accelerating unified land administration in Indonesia', The World Bank blog, 1 Sept. 2017, https://cht.hm/2ClmSqc (accessed 13 Feb. 2018).

[137] World Bank (2003), *Priority issues for Indonesian agriculture*, https://cht.hm/2M33aze (accessed 13 Feb. 2018).

[138] See for example: https://field-indonesia.or.id/en/history/.

[139] Rabobank (2017), 'Rabobank and UN Environment kick-start $1 billion program to catalyze sustainable food production', 16 Oct. 2017, https://cht.hm/2MPvKcw (accessed 10 Aug. 2018).

[140] Ickowitz, A. et al. (2016), 'Forests, Trees, and Micronutrient-Rich Food Consumption in Indonesia', *PloS One*, 11(5): doi: https://doi.org/10.1371/journal.pone.0154139 (accessed 10 Aug. 2018).

with more diverse local diets compared with monocrop plantations,[140] as well as positive outcomes for biodiversity and carbon storage.

4.1.4 Scaling up sustainable supply of vegetables, fats and proteins

Special attention will need to be paid to Indonesia's expanding need for vegetables, fats and proteins to fill the current nutrition gap (see Table 1) for a growing population. For vegetables, interventions to improve the cold chain, raising access and food safety, and reducing waste, will be needed to complement support to small-scale producers. Palm oil is likely to provide the bulk of future demand for fat in the Indonesian diet, pushing the environmental burden from exports to domestic consumption and amplifying the need for measures that reduce land expansion and increase productivity, as described above.

Regarding protein, it would make sense for Indonesia to position sustainable aquaculture and plant foods (soy and others) as the main suppliers of future demand, with poultry and egg production based on sustainable feed sources constituting a secondary option, while avoiding the environmental and health risks associated with red meat. Again, there is a large technology gap to be filled in the aquaculture sector in order to bring production efficiency in line with the global industry. Additional needs across all crops and aquaculture are measures to deal with growing climate risks, both specific (for example the relocation of production or processing facilities away from areas of high flood risk) and generic (for example, improving weather and climate information services for farmers and their major buyers).

4.2 Mainstream the principles of a healthy and sustainable diet

Indonesia's national dietary guidelines hold much untapped potential to inform public policy in support of healthier eating. Globally, dietary guidelines are a key foundation of public food policy, providing a consensus on what constitutes a good diet that is legitimized by both scientific evidence and public consultation.[141] But, to have a real impact on diets, dietary guidelines need to be reflected throughout government policies.[142,143]

In their current form, Indonesia's national dietary guidelines provide a robust basis for supporting and scaling up action on dietary change, but are understood and used principally as an advocacy tool. There is considerable scope to reimagine the guidelines as a set of principles to inform the full range of public policy on food, waste, agriculture, environment and health, not least through the design of Indonesia's social safety nets. Two key principles within Indonesia's dietary guidelines that address both health and environmental challenges are to diversify diets, and to moderate consumption of food in general – and of sweet and fatty foods in particular.

[141] Fischer, C. G. and Garnett, T. (2016), 'Plates, pyramids, planet. Developments in national healthy and sustainable dietary guidelines: a state of play assessment', FAO and the University of Oxford, https://cht.hm/2Nafan9 (accessed 10 Aug. 2018).

[142] Ibid.

[143] Bailey, R. and Harper, D. R. (2015), *Reviewing Interventions for Healthy and Sustainable Diets*, Research Paper, London: Royal Institute of International Affairs; Fischer and Garnett (2016), 'Plates, pyramids, planet. Developments in national healthy and sustainable dietary guidelines: a state of play assessment'.

4.2.1 Reforming *Rastra* in line with national dietary guidelines A first priority should be the reform of *Rastra*, Indonesia's flagship programme of rice procurement and distribution. Under revised provisions being rolled out by the Ministry of Health and BAPPENAS, a voucher-based system will replace the direct provision of subsidized rice; currently, it is planned that households will receive a monthly voucher with a value of 110,000 rupiah for the purchase of rice and eggs.[144] The reform, aimed at tackling the inefficiencies and misallocation that have previously marred *Rastra*,[145] also presents the opportunity for a more ambitious overhaul of Indonesia's most costly social safety net in order to embed the principles of a healthy diet as laid out in the national dietary guidelines. The inclusion of eggs in the voucher system is a positive step, given the scale of iron and zinc deficiency and the low consumption of protein in poorer households. However, a more diverse basket of high-quality and nutritious foods that includes root vegetables, leafy green vegetables, soy-based foods and fish could go a long way in improving economic access among lower-income households to the diverse and nutritious diet as envisaged in the national dietary guidelines (while also supporting the goals of *Gemarikan*, the government's programme to encourage greater fish and shellfish consumption). Aligning this revised voucher scheme with an existing subsidy programme such as the Indonesia Smart Card (*Kartu Indonesia Pintar*) can simplify this support, and therefore increase its uptake.

4.2.2 Mainstreaming national dietary guidelines into wider social service provision While Indonesia's dietary guidelines do not yet address environmental sustainability, the national green public procurement policy offers a promising opportunity to draw on the successes in supporting the legal sourcing of timber and timber products and apply these lessons to food. Introducing criteria based on national dietary guidelines into public procurement policies can generate demand for sustainable production,[146] and can also deliver positive dietary outcomes in schools, hospitals, day-care centres, government canteens, barracks and prisons.[147] For example, school meal programmes represent an important means through which to improve the eating habits of children, both directly, by providing healthy, nutritious food to children in school, and also indirectly, by setting lifelong norms around healthy patterns of eating. One small-scale school-feeding programme launched in March 2017 took a holistic approach that aimed to link procurement from local suppliers with basic education for both pupils and parents, and could serve as a model for wider government-led programmes.[148] Similarly important

[144] World Food Programme (2017), *The Cost of the Diet Study in Indonesia*.

[145] Timmer and Sumarto (2017), 'Evolution and Implementation of the Rastra Program in Indonesia'.

[146] United Nations Environment Programme (2017), *Global Review of Sustainable Public Procurement*, https://cht.hm/2wImPzB (accessed 13 Feb. 2018).

[147] Niebylski, M. L. et al. (2014), 'Healthy Food Procurement Policies and their Impact'. *International Journal of Environmental Research and Public Health*, 11(3), pp. 2608–27, doi: https://dx.doi.org/10.3390/ijerph110302608 (accessed 10 Aug. 2018).

to school feeding strategies would be the implementation of the recommendations of the WHO Commission on Ending Childhood Obesity,[149] which align closely with Indonesia's dietary guidelines.

A number of other programmes offer similar opportunities for mainstreaming the dietary guidelines within social service provision. As part of its partnership with the SUN Movement, the Indonesian government has already increased budget allocations to nutrition-sensitive health interventions – including from 800 billion rupiah in 2015 to 1 trillion rupiah in 2016 – in the Ministry of Health.[150] However, programmes on childhood nutrition and poverty reduction, such as the *Generasi Sehat dan Cerdas* programme focused on nutritional supplements and maternal healthcare, could be further enhanced by low-cost food-based interventions in line with the national dietary guidelines. For example, a public education component could promote consumption of a diverse diet, rich in affordable plant foods as well as rice, among low-income households. Establishing greater public health expertise at subnational and district levels to help coordinate nutrition education and intervention programmes can further ensure that action is stimulated at a local level. While poverty reduction will remain the key strategy to address childhood wasting and stunting, key informants to the research underlying this paper have repeatedly highlighted public education on diets as central to tackling malnutrition.

4.3 Partner with food providers and local pioneers

The food environment provided by food outlets and media deserves greater attention from government: a long-term transition to healthy diets from sustainable production is likely to require a mix of hard and soft policy approaches that encourage partnerships with a range of non-governmental food system actors.

4.3.1 Supporting local-level leadership Given Indonesia's strong local food cultures, a promising initial step for government may be in backing locally led agendas towards food systems that support healthy diets from sustainable production. This would involve working through devolved policies and programmes to engage with industry leaders and social movements, support local innovation, provide mechanisms to share lessons and replicate successes, and improve the enabling environment for corporate stewardship. Celebration and protection of local food cultures, for example through protected designation of origin (PDO) status, could be positive. In the longer term, various forms of regulation are likely to be useful, such as food vendor licensing and

[148] Together, WFP and Cargill were engaged in a one-year project to provide food packages to 800 school students in pilot regions of Banten, East Java and Nusa Tenggara Timur. Cargill (2017), 'Cargill launches school meal program in support of the National Nutrition Programme for School Children (PROGAS)', https://cht.hm/2Clwv8c (accessed 13 Feb. 2018).

[149] WHO Commission on Ending Childhood Obesity (2016), *Report of the Commission on Ending Childhood Obesity*, https://cht.hm/2wJoILp (accessed 13 Feb. 2018).

[150] Scaling Up Nutrition (SUN) Movement (2016), *SUN Movement Indonesia Joint Assessment*, https://cht.hm/2ChKXOL (accessed 13 Feb. 2018).

Existing small-scale initiatives to shift public attitudes and behaviours around food waste offer fertile ground for government support and collaboration.

retail zoning policies that reflect public strategies to promote better diets. However, as the formulation of the 2013 Ministry of Health regulation on food labelling showed,[151] regulatory directives can be slow to reach agreement and implementation, and thus voluntary initiatives can provide a head start. Successful implementation of a plastic bags levy, although attempts in 2016 and earlier in 2018 have stalled, could be a positive step towards tackling the colossal rates of plastic pollution from the food industry, and could emulate successes seen elsewhere if priced appropriately.[152]

Existing small-scale initiatives to shift public attitudes and behaviours around food waste offer fertile ground for government support and collaboration. A number of localized food system initiatives have emerged that focus on waste, and to some extent on overconsumption. The 'Clean & Green' campaign in Depok, West Java, supports the segregation and recycling of household waste in over 100,000 households,[153] while the city of Kendari, in southeast Sulawesi, has established biodigesters to harness methane gas and generate electricity from the city's largest municipal landfill site.[154] Championing the work of progressive leaders such as Mohammad Idris, the current mayor of Depok, can help foster and encourage local-level leadership.

Social media brings further opportunities for government partnership: Indonesia has one of the fastest growing social media penetrations globally, with over 100 million active users,[155] and there already exist platforms, such as the popular 'Snapfood' campaign,[156] aimed at improving consumer awareness and using social media to discourage overconsumption and food waste. Non-governmental organizations (NGOs) are also tapping into this area; for instance, the World Wildlife Fund (WWF) 'Beli yang Baik' (Buy what's good) campaign puts the spotlight on the importance of environmentally responsible consumption while creating an online community through online petitions and social media content.[157] For these efforts in increased awareness to translate into impact, it will be critical that viable sustainable and healthy food options are available to consumers.

[151] Ministry of Health (2013), 'Inclusion of information on the content of sugar, salt and fat and health messages for processed food and ready-to-eat food'.

[152] Chilkoti, A. (2016), 'Indonesia Bag Levy Aims to Cut Pollution', *Financial Times*, 21 Feb. 2016, https://cht.hm/2NekoOB (accessed 10 Aug. 2018).

[153] Miquelis, P. and Subranamaniam, A. (2017), 'Depok: The Front Line in Indonesia's Fight against Waste', *The Jakarta Post*, 21 August 2017, https://cht.hm/2oFvCh1 (accessed 12 Dec. 2017).

[154] Arshad, A. (2017), 'When Waste Isn't Wasted: How a Small Indonesian City Turned Garbage into Electricity', *The Straits Times*, October 24, 2017, https://cht.hm/2NhEuYc (accessed 12 Dec. 2017).

[155] We Are Social Singapore (2017), 'Digital in 2017: Southeast Asia', https://cht.hm/2wKhx6G (accessed 12 Dec. 2017).

[156] IAAS Indonesia (2016), 'One Year Snapfood Campaign – Encourage Society to Make Zero Food Waste',16 Oct. 2016, https://cht.hm/2NNxZcP (accessed 11 Dec. 2017).

[157] See: http://www.beliyangbaik.org/.

4.3.2 Partnering with industry Small and medium-sized enterprises (SMEs), large domestic companies and foreign multinationals will need different approaches to partnership from government. SMEs dominate both processing and retail in Indonesia's food and beverage sector, and need particular support if they are to remain competitive while complying with government regulations. A strong starting point is the current economic stimulus package, launched in April 2016 by President Joko Widodo, which aims to empower SMEs by simplifying a number of procedures such as licensing and capital requirements. Multinational companies are the front runners in healthier food initiatives in Indonesia, but greater efforts could be made to stimulate leadership from the large domestic companies.

Experience in Europe and the US has shown that voluntary actions by the industry – supported by governments – to reformulate food items can provide a positive start, reducing added fats, salt and sugar in processed foods.[158] The Indonesian government could engage with food processors to improve the nutritional content of processed products,[159] while always reinforcing the message that highly processed foods should form only a small part of a healthy diet. Similarly effective could be voluntary commitments on advertising restrictions. Companies in Australia, for instance, have voluntarily halted food advertising to children, as well as reducing the visibility of unhealthy snacks in retail and food service sectors, following dialogue with government.[160] Gender mainstreaming in food policies and practices is also key, taking food from being only women's responsibility to one shared by all family members through messaging and public initiatives from both government and the private sector.[161] Promoting more positive framings, such as eco-labelling products with positive environmental credentials, could also increase consumer awareness; however, risks potentially arising from message confusion and overwhelming the consumer should be heeded.[162]

Collaborative approaches with informal food vendors also hold promise. Street vendors and independently owned convenience stores provide livelihoods for food-insecure families and offer diverse foods to local tastes, serving low-income customers in particular.[163]

[158] Moss, M. (2013), *Salt, Sugar, Fat: How the Food Giants Hooked Us*. New York: Penguin Random House.

[159] Ibid.

[160] See for example the 'Quick Service Restaurant Initiative for Responsible Advertising and Marketing to Children': https://www.afgc.org.au/our-expertise/health-nutrition-and-scientific-affairs/advertising-to-children/.

[161] Silvana Paath, personal communication, January 2018. See also Food and Agriculture Organization of the UN (2015), *Designing nutrition-sensitive agriculture investments: checklist and guidance for programme formulation*.

[162] OECD (2016), *Environmental Labelling and Information Schemes: Policy Perspectives*, https://cht.hm/2wLO6kq (accessed 10 Aug. 2018).

[163] Alimi, B. A. (2016), 'Risk factors in street food practices in developing countries: A review', *Food Science and Human Wellness*, 5(3), pp. 141–8, doi: https://doi.org/10.1016/j.fshw.2016.05.001 (accessed 10 Aug. 2018).

Government programmes to work with food vendors to improve food safety and hygiene standards in the first instance, and to promote the sourcing and offering of healthier and more sustainable foods in the second, could help to protect diverse food cultures while improving outcomes for public health and the environment. Interesting initiatives on which to build include #KAKI5JKT, whereby vendors who achieve safety certification are authorized to have their food delivered through online ordering (using platforms such as Go-Food), enlarging their markets while also improving food standards.[164] Health and environmental standards could be built into these types of market access incentives, underpinned by government support to help meet the required standards and maintain competitiveness. Attention should also be given to the supply-chain links used by wholesale large retailers to supply street vendors and minimarts. Programmes such as JAVARA highlight the potential for linking indigenous community production with urban markets to both support regional economies and improve biodiverse food offerings.[165] Influencing the supply of products – through reformulation for example – will have knock-on effects for the nutritional standard of food at the informal and street level.

4.3.3 Investing in infrastructure Further 'win-wins' are possible through public infrastructure investments that support healthier, more diverse food environments among private retailers, both formal and informal. BAPPENAS could pursue mechanisms to improve transport, storage and cold chain infrastructure to boost the availability of fresh produce to low-income households, particularly in rural areas where access to modern retail outlets is limited. This could involve, for example, soft credit or subsidies for refrigeration in traditional wet markets, local processing facilities and homes. Linking infrastructure investments to wider supply chain development, including the development of market demand, would be an advantage: one initiative on which to build is 'Food Smart Cities', under which an NGO in Solo is working with farmers to develop supply chains for healthier food while supporting consumer awareness programmes, urban farming, and food procurement in hotels, restaurants and schools.[166] To succeed, any new offering must provide dishes that appeal to the new wave of Indonesian food connoisseurship that cuts across all income groups – the basis for the 'New Generation of Indonesian Cooking' initiative promoted by Hivos and GAIN (the Global Alliance for Improved Nutrition).[167]

[164] CoconutsJakarta (2016), 'Government Safety Certifies 400 Street Food Vendors to Take Online Delivery Orders', Coconuts blog, March 11, 2016, https://cht.hm/2wK5Go2 (accessed 12 Dec. 2017).

[165] See: https://www.javara.co.id/about-us/.

[166] See: https://www.rikolto.org/en/project/fsc.

[167] Hivos people unlimited (2017), 'Tasty and Hip: A New Generation of Indonesian Cooking', 20 Apr. 2017, https://cht.hm/2M05MxE (accessed 13 Feb. 2018).

5. A possible entry point: sugar

Sugar – an issue to rally around quickly to make immediate progress, with a longer-term wider agenda in mind.

The agenda for food systems mapped out here is ambitious – and daunting as regards likely early success at a time when conversations about the relationships between food security, health, agriculture and the environment are only just beginning. One tactic might be to start by selecting a smaller part of the food system where the political barriers may be more surmountable and near-term progress more realistic and achievable. This could then serve as an entry point for larger conversations that tackle the food system more fully. For example, thoughtful campaigners working on food waste hope that the relatively safe near-term agenda of reducing inefficiencies and losses – in ways that benefit both retailers and consumers – can be an entry point to more challenging efforts in future, to ensure that avoided waste drives avoided agricultural production and avoided land clearance.

One possible such entry point in Indonesia is sugar – an issue to rally around quickly to make immediate progress, with a longer-term wider agenda in mind. Daily per capita sugar consumption is in the region of 50 g per day (12.5 teaspoons), around double the recommended WHO maximum of 25 g (6 teaspoons) and more than Indonesia's dietary guideline of a maximum of 40 g daily.[168] About half of the consumption comes via the processed foods and drinks industry, in processed foods and sugar-sweetened beverages, while the other half is added to food in households, institutional canteens, *kaki limas*, takeaway outlets and restaurants.

Why sugar? First, it is increasingly accepted that sugar does not play a useful role in the healthy human diet, even in the case of dietary interventions for food-insecure and undernourished children and adults. Second, the current political economy suggests the time is right. Sugar is promoted in Indonesia not for export earnings but to meet self-sufficiency goals in a scenario of rapidly growing domestic demand. Increasingly extreme state-led efforts to stimulate the sugar industry, including stimulus packages and full exemption from the 2011 moratorium on deforestation, are failing, with 10 proposed new mills and 500,000 hectares of plantations not entering into production for multiple reasons. The 2019 deadline for reaching self-sufficiency will not be met, and Indonesia has now edged out both the US and China to become the world's largest importer of sugar by volume.

Could this be a chance for the government to promote self-sufficiency through reduced demand rather than increased supply? Indonesian market research certainly suggests that demand for sugary foods such as sweetened drinks is highly elastic; consumers will switch readily in response to increases in cost. Similarly, the small-scale farmers that supply the bulk of sugar cane to the mills are not under threat of lost livelihoods – indeed, many have been switching to rice and maize, for which margins are higher and floor prices more stable. As for the sugar industry, fewer than 20 companies manage Indonesian sugar supply, several of which are state-owned enterprises, and they are largely based in Java, so they are relatively easy to convene – including via their industry associations, the Indonesian Sugar Association (AGI) and the Indonesian Sugar Professional Association

[168] Atmarita, A. et al. (2018), 'Consumption and sources of added sugar in Indonesia: a review', *Asia Pacific Journal of Clinical Nutrition*, 27(1), pp. 47–64, doi: 10.6133/apjcn.042017.07.

(IKAGI). There is, too, a precedent in that Indonesia has been discussing a sugar tax at least since 2015, and in earlier years imposed a luxury goods tax on the sugar-sweetened beverage industry.

What could be done? What would immediate actions entail? The first step would be for champions, for example in the Ministries of Health and of Agriculture, as well as BAPPENAS, or beyond the public sector, to convene a dialogue, initially with allies and then widening the conversation. The aim would be to agree and implement actions across all three spheres outlined in this report. In terms of ***aligning high-level policies and strategies in support of a sustainable food future***, primary goals would be to eliminate subsidies and stimulus packages to the domestic sugar industry, and to bring sugar plantations back under the forest moratorium. To ***mainstream the principles of a healthy and sustainable diet***, the central goals might be to bring sugar in government-supplied meals (e.g. in hospitals and school feeding programmes) under the Indonesian recommended maximum of 40 g per day, to limit availability of high-sugar foods in outlets in schools and other government buildings, and to ban or limit the advertising of high-sugar foods to children. Finally, to ***partner with food providers and local pioneers***, immediate priorities would be to work with industry on the reformulation of high-sugar products, and to involve city governments and civil society organizations in outreach, including social media, to increase public awareness of and support for the wider initiative.

What can be learnt from other countries? No country to date has taken food-system-wide action on sugar, addressing production and consumption simultaneously – so Indonesia would be a global leader in a system-wide approach. Several countries, however, have moved beyond voluntary approaches with industry to imposing taxes on high-sugar foods: examples include Mexico, the Philippines, Thailand, the UK, France and local (e.g. city-level) governments in the US, with Brazil and Canada not far behind. Reviews by national governments and external agencies (such as WHO) have found these taxes to be successful in terms of reducing a population's purchase of sugary foods and drinks, and in the reformulation of products by the relevant industry, though impacts on public health are not yet detectable. An overall lesson is that any product tax is not a standalone solution to poor nutrition, nor to shortfalls in public health budgets. One key lesson is that Hungary attributes its own success to combining public health messaging with its 'junk food' tax, introduced in 2011; the tax itself works as a public education tool as much as an economic disincentive.[169]

What resistance could be anticipated and dealt with? Notably, Argentina dropped a proposed sugar tax due to fears that a $1 billion investment from Coca-Cola would be forfeited. In Indonesia the subsidiary Coca-Cola Amatil Indonesia, which has 10,000 employees, allocated an investment package of $500 million for the 2015–19 period. However, much of this money was allocated for new production lines, and the company already sees considerable opportunity to shift into alternative products including lower-sugar (e.g. teas and health drinks) and non-sugar (e.g. bottled water) beverages. The main argument used by industry in other countries against

[169] Wright, A., Smith, K. E. and Hellowell, M. (2017), Policy lessons from health taxes: a systematic review of empirical studies, *BMC Public Health*, 17(583), doi: https://doi.org/10.1186/s12889-017-4497-z (accessed 10. Aug 2018).

a sugar tax has been the threat to jobs. Such arguments are not strong in Indonesia. While around 60,000 people are employed in the mills, refineries and large estates, due to stagnation the outlook for growth in job numbers is weak. Smallholders are not threatened. As for the processed food and drinks industries, since across the region sugar taxes are already either in place (in Thailand and the Philippines) or under consideration (in Brunei, Malaysia, Singapore and Vietnam), there is little risk that current processors based in Indonesia will relocate if Indonesia takes action to reduce the rate of growth of sugar-dependent industries. It is pertinent to note that Thailand has not seen its consumer sugar tax as any threat to its large sugar cane-growing sector, due to sustained high growth in demand in its primary export destination: Indonesia.

6. Conclusion: building momentum for change

The moment is ripe for a bold new vision for a sustainable food system, both national and global, that supports healthy diets for all.

Government decision-makers and implementing agencies across national, provincial, district and municipal levels in Indonesia will need to take a leading role in steering both diets and food production towards healthier and more sustainable options. They will also need to work through partnerships if healthy, sustainable diets are to become the norm. An urbanizing population, a modernizing food environment and growing social media penetration offer new opportunities for industry collaborations, and new platforms through which the value of healthy food can be channelled. Local pioneers – most importantly food vendors, SMEs and local activists – have a major role to play in inspiring action and linking across interest groups that seldom interact; proactive engagement of these pioneers by the government will be crucial.

Between now and 2020, when the final five-year tranche of Indonesia's National Long-Term Development Plan will begin, there is an important window of opportunity to take decisive action that will influence the future trajectory of the population's health and that of its environment, as well as to contribute substantively to the global fight against climate change and unsustainable development. Furthermore, 2019 will be a critical election year, with both presidential and legislative elections due in April. The outcome of the former will bring either a second term or an exit from office for President Widodo, who has been a committed advocate for the country's small-scale farmers and for the implementation of Indonesia's first UHC programme. Signals from Indonesian media and civil society organizations indicate that poverty reduction and social equity – including affordability of good food and good health – will stand alongside corruption and religious identity as flagship issues for voters in the upcoming elections.

The moment is thus ripe for a bold new vision for a sustainable food system, both national and global, that supports healthy diets for all. Should it choose to take action now, Indonesia could lay the foundations for a more resilient and equitable development pathway that prioritizes improved public health while at the same time safeguarding some of the world's most important ecosystems for future generations.

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