Market Report Waste and Circular Economy in Indonesia

February 2019

An assignment of Rijkswaterstaat Leefomgeving
(# 4300014200)

MetaSus
EUROPEAN SUSTAINABLE SOLUTIONS

Rijkswaterstaat
Ministry of Infrastructure and the Environment

BreAd B.V.

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Cover photo: Indonesian girl on a motorcycle posing in front of a Dutch HYVA waste compactor truck at the landfill Bantar Gebang in Bekasi near Jakarta.

The Expert

This market survey was carried out by **Mr. Bert Keesman** of MetaSus. A Mechanical Engineer by origin, Mr. Keesman is an experienced consultant in the field of exports promotion in environmental technologies. Among other assignments, he has worked for the United Nations Economic and Social Commission for Asia and the Pacific (ESCAP) in Bangok, Thailand and for the UNIDO supported Technology Management Center in Costa Rica. He is involved in many export promotion projects, especially in Latin America, Africa and Asia.

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Summary

The waste situation in Indonesia is precarious. Every year the nation generates over 65 million tons of waste. Most of it ends up in landfills and waste dumps or is just discarded or burned. Recycling rates are 10% at best. The country is second only to China as a contributor of plastic waste to the world's oceans. As the world's largest island nation, waste logistics are complicated and potentially costly.

The Indonesian Government is recognizing the problem and has set ambitious goals to remediate it. By 2025, the country will have to produce 30% less waste. The remaining 70% should be treated, either through recycling, Waste-to-Energy or sustainable landfilling. A decree has been issued to ensure the feasibility of Waste-to-Energy projects through guaranteed feed-in tariffs and tipping fees in 12 target cities. In the coming 10 years, a system of Extended Producer Responsibility for packaging will be set in motion. The distribution of single use plastic bags will be drastically reduced.

Forward looking regions and municipalities such as Surabaya, Bali, Kendari and Bogor are contributing to better waste management through a general clean-up of the city, a ban on single use plastic bags or innovative programs such as plastic bottles for bus tickets. Community initiatives such as the so called "waste banks" are encouraging, and so are the recycling efforts of the approximately three million waste pickers.

It is against this backdrop that the Ministry of Environment and Forestry of Indonesia and the Ministry of Infrastructure and Water Management of the Netherlands are cooperating in the field of climate change, waste management and circular economy. Activities include pilot projects, meetings, capacity building and demonstration projects. Private companies in both Indonesia and the Netherlands can play a key role in achieving the ambitions of the bilateral cooperation and thus a more sustainable waste management and a circular economy in Indonesia. The current market study is a first step towards mobilizing the private sector.

On the basis of the findings it is recommended to set up a so called Partners for International Business or PIB program. In such program, a group of at least five Dutch companies in waste management and circular economy join forces to explore business opportunities in Indonesia, either directly or through cooperation with Indonesian counterparts. Promising fields are, among others, improved waste logistics, revitalization of landfills and waste dumps, diversion of waste from landfills, plastics recycling technology and Waste-to-Energy projects. Activities in the frame of a PIB will typically entail outbound trade missions, inbound study tours, seminars, matchmaking events and a local liaison in Indonesia who will act as the local representative for the participating companies. It was found that Denmark is currently in a similar phase in the cooperation with Indonesia. It is tentatively recommended to join forces and set up the trade promotion activities jointly.

1. Introduction

This is the report of a market study for products, services and expertise in waste management and circular economy in Indonesia (with a special focus on Java / Jakarta). The study was carried out by Mr. Bert Keesman of MetaSus in the period 24 October – 2 November 2018 as part of an assignment for Rijkswaterstaat Leefomgeving in the Netherlands. In the first week, the study coincided with the EU Circular Economy mission to Indonesia.

The goal of the study is to provide companies of the Netherlands in waste and circular economy with a basis to decide whether to become active on the Indonesian market. The report has no scientific ambitions. As a follow-up to this market survey and depending on the interest on the part of the private sector, MetaSus in cooperation with BreAd BV (Mr. Hans Breukelman) may formulate a proposal for a Partners for International Business (PIB) programme. If approved, such PIB will be executed in parallel with the ongoing cooperation program in the field of climate change, waste management and circular economy between the Ministry of Environment and Forestry of Indonesia and the Ministry of Infrastructure and Water Management of the Netherlands.

2. Indonesia

2.1 A very brief introduction

Indonesia is a country of extremes. With a population of 268 million (current UN estimate), it is the fourth most populous country in the world. The annual population growth rate is a little over 1%. The total land area of 1,811,570 Km2 (almost 43 times the Netherlands) is split up into 17,508 islands[1]. The country has 76 active volcanoes along the "Ring of Fire". As a big country situated in active seismic areas, Indonesia experiences more earthquakes than any other country. At the same time, it is a beautiful country with spectacular landscapes and a population that enjoys being friendly. As one company representative put it: "*Indonesia is actually not a country, you will find that it is a collection of communities*".

The Netherlands and Indonesia share a common history that goes way back. In the period 1603 – 1800 the Dutch East India Company (VOC) had its Asian headquarters in Batavia (now Jakarta). When the VOC was formally dissolved in 1800, the Dutch Government took over and gradually extended its influence to rule pretty much all of what is now Indonesia. In the second world war the country was occupied by Japan. On 17 August 1945 Indonesia declared independence, but it took the Dutch until 27 December 1949 to recognize this. Although the independence war involved quite some bloodshed, nowadays the Dutch are treated the same way as any other foreigner in Indonesia.

The Javanese (40.2%) and the Sundanese (15.4%) are the biggest ethnic groups in Indonesia. Close to 90% of Indonesians identify themselves as Muslim, and the influence of Islam is on the rise. The official language is bahasa Indonesia, which can be considered a Malay dialect with a host of influences from other languages, including Dutch.

Considering the size of Indonesia and the amount of islands, it is a bit of a puzzle where to put the focus of business promotion. In Table 1 a comparison is provided between the major islands.

	Population (million)	Pop density (/km2)
Java	145	1,121
Sumatra	47	90
Sulawesi	17	97
Kalimantan	15	28
Irian Jaya	4	10

TABLE 1. QUANTITATIVE COMPARISON BETWEEN THE MAJOR ISLANDS IN TERMS OF POPULATION[2]

As waste management and (to a lesser extent) circular economy generally require economy of scale, for most Dutch companies Java will be the place to start in Indonesia. This is why the focus of the market study has been on Java, and especially its capital Jakarta and surroundings.

[1] CIA World Factbook.

[2] Figures generally refer to 2015.

There are exceptions of course. If your business is to set up integrated waste management systems on small islands, then there is a whole archipelago to choose from.

2.2 Indonesia in a global perspective

The parameters below can help to put Indonesia in perspective relative to other countries.

Per capita income

The per capita GNI is the gross national income divided by the mid-year population. In 2017 Indonesia scored US$ 11,900 per capita, almost qualifying as a middle-income country (US$ 12,005). Comparable countries in this respect are Egypt (US$ 11,360) and Perú (US$ 12,890).

GDP Growth

GDP Growth in Indonesia has been very stable over the past decade. On average, GDP growth was 5.46% in the period 2008-2017, with a low of 4.63% in 2009 and a high the year after at 6.22%.

Trade freedom

In terms of Trade Freedom, the Heritage Foundation places Indonesia in the "Moderately free" category on place 69 (between Montenegro and Brunei Darussalam). Indonesia is ranked 15th among 43 countries in the Asia–Pacific region, and its overall score is above the regional and world averages.[3]

Corruption

On the 2017 corruption perceptions index of Transparency International Indonesia ranks # 96 out of 180 countries in the list. Political and administrative corruption remain but the Anti-Corruption Commission is doing good work and there have been positive reforms to the business environment.

Education

On the UNDP education index Indonesia is at place 116.

It has been argued that Indonesia should join the group of countries with newly advanced economic development called BRIC (Brazil, Russia, India and China), which would then become BRIIC (or BRIICS, including South Africa). While this discussion is a little outdated, it is still illustrative for the economic power and growth potential of Indonesia.

[3] See also https://www.heritage.org/index/country/indonesia.

3. Current ISWM situation in Indonesia

3.1 Waste production and expected growth

For the year 2017, the Ministry of Environment and Forests of Indonesia reports an annual waste output of 65.8 million tons for the whole of Indonesia[4]. With a population of 264 million at the time, this boils down to an average waste output of 0.68 kgs/pppd in 2017.

According to the ESP3 DANIDA study, DKI Jakarta's waste output in 2016 amounted to 6,989 tonnes per day, 6% of which never made it to a landfill. In June 2018, the figure was up to 7,400 tons/day. This indicates approximately a 3% growth rate in waste volume per year. If this growth continues, by 2029 DKI Jakarta will produce over 10,000 tons of waste a day.

City	Waste	Population	Waste
	tons/day	Millions	Kgs/pppd
DKI Jakarta	7400	10,5	0,70
Surabaya	2154	3,0	0,72
Bandung	2241	2,6	0,86
Medan	1765	2,3	0,78
Semarang	1226	1,7	0,73

TABLE 2. ESTIMATES OF PER CAPITA WASTE OUTPUT IN MAJOR CITIES BY MID 2018.

Table 2 shows the estimated waste output in kgs/pppd for five major cities in Indonesia by mid 2018. Waste volumes are extrapolated from Dian Adriani's 2015 figures (see "Sources") with DKI Jakarta's growth rate, and population figures are extrapolated from 2010 figures with a 1% per year growth rate. Obviously this analysis is flawed, but for the purpose of this market report the waste outputs are useful indications and it is considered safe to say that the waste generation in urban areas is around 0.75 kgs/pppd. This is consistent with the World Bank's estimate of the 2016 waste footprint in the world's cities of 0.74 kgs/pppd.

Figure 1 depicts the composition of the waste in Indonesia as measured in 2013 and presented by the Indonesian Ministry of Environment and Forests. Although this is five years ago, the impression is that the situation has not changed much. The 60% organic content stands out, and so does the 14% plastics. Unfortunately, in fertile Indonesia useful and profitable applications of processed organic waste (such as compost) are hard to find. The plastics content has made it to the forefront of Indonesian thinking about waste, thanks to the fact that the country has gained itself a silver medal in the world championships of contributers to the plastic soup in the oceans (after gold medalist China).

[4] Presentation of Mr. Novrizal Tahar, the Director of Solid Waste Management of the Ministry of Environment and Forestry on the occasion of the EU seminar on the circular economy held in Jakarta, 24-26 October 2018.

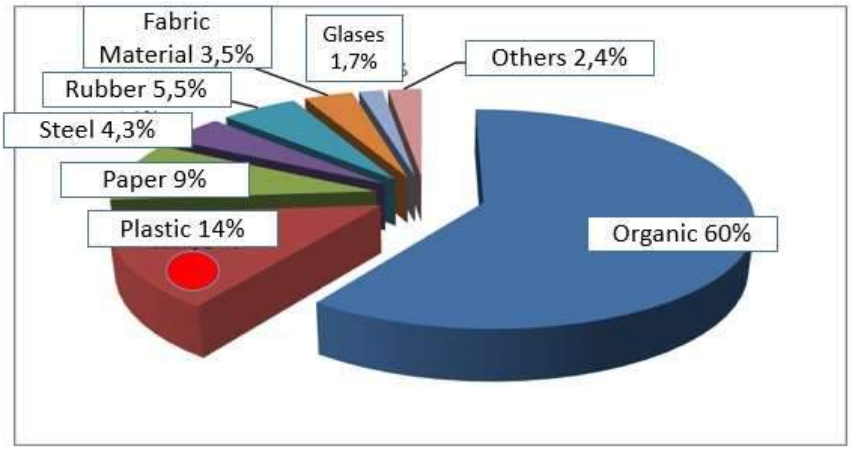

FIGURE 1. COMPOSITION OF THE WASTE IN INDONESIA5.

3.2 Waste collection, transfer, treatment and recycling

3.2.1. Waste collection

Waste collection from residences is carried out by municipalities. Appartment buildings, offices, schools and the like have to contract commercial companies to manage their waste. A recent study by the World Bank (2018) revealed big differences in the percentage of municipal waste collected between big cities and urban districts. See Figure 2.

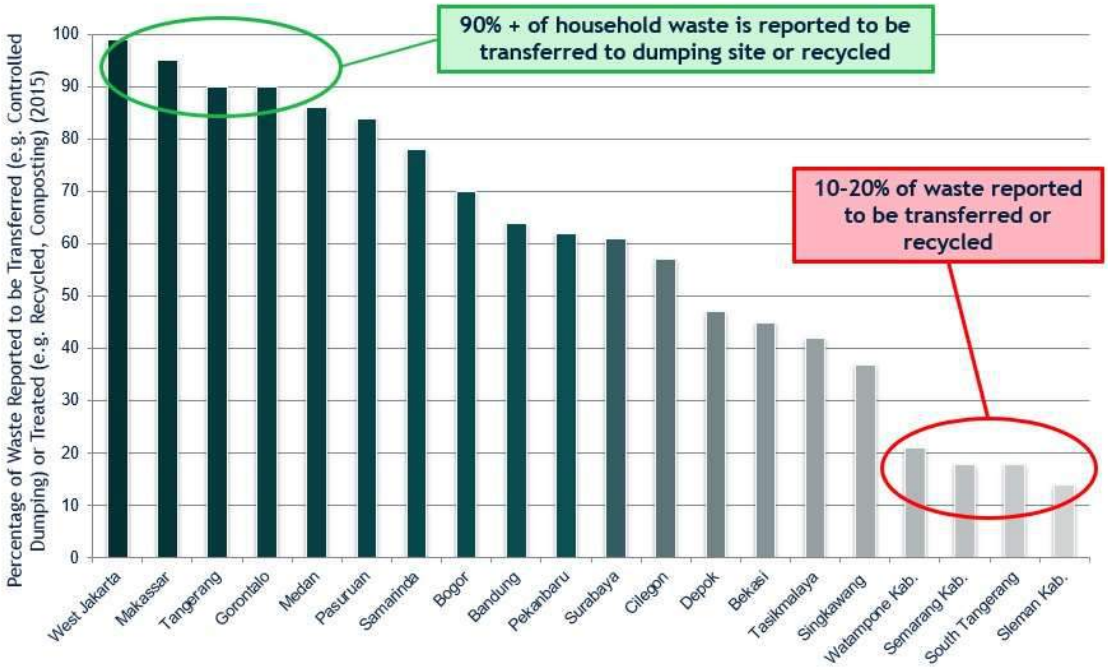

FIGURE 2. PERCENTAGE OF MUNICIPAL WASTE COLLECTED

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[5] Figures 2013. Source: Ministry of Environment and Forestry of Indonesia.

The differences in waste collection percentages between big urban centres such as West Jakarta and smaller districts are enormous. This is especially visible in the city of Tangerang in the Banten province on Java, which has a 90% household waste collection rate, whereas in South Tangerang not even 20% of the municipal waste is collected.

The Danish ESP3 DANIDA report provides an overview of the waste collection system in DKI Jakarta. Waste collection services are provided by the Province Environmental Department. See figure 3.

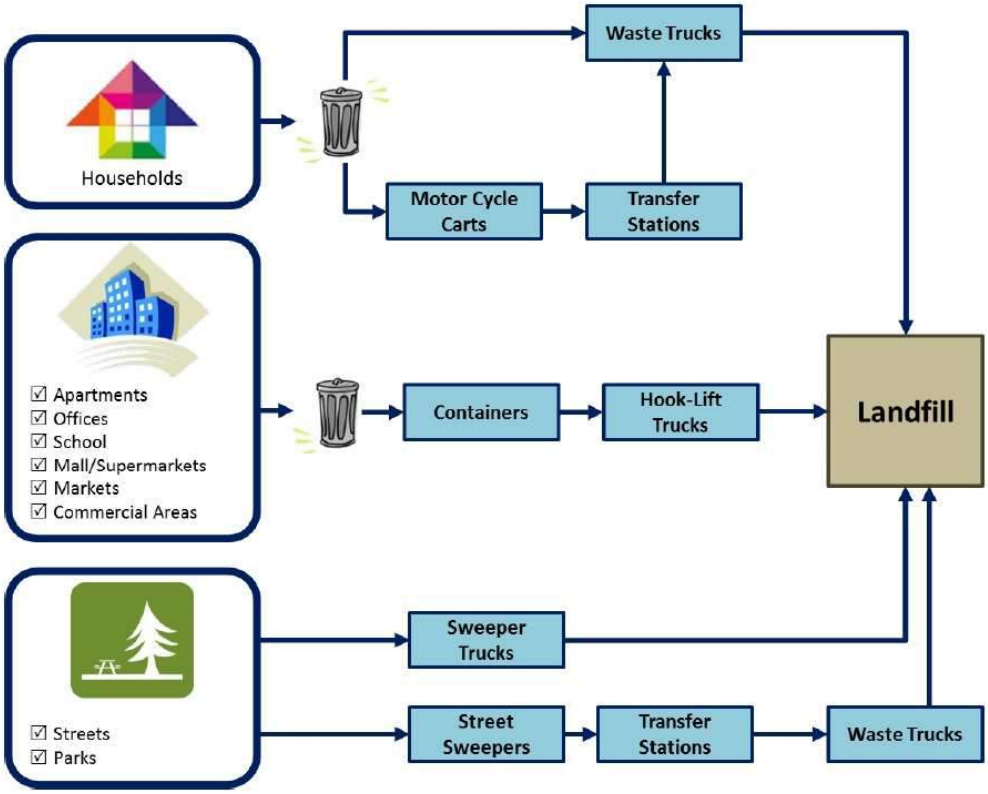


FIGURE 3. WASTE MANAGEMENT SYSTEM IN DKI JAKARTA

Type of facility	# of units[6]
Large transfer station with office ("Dipo")	40
Transfer station without office ("Transito")	31
Container 10 m3	429
Container 6 m3	332

TABLE 3. WASTE COLLECTION AND TRANSFER INFRASTRUCTURE IN JAKARTA, 2017[7]

[6] Figures for Jakarta, 2017.

[7] Source: DANIDA report.

In residential areas with narrow streets, waste is collected by manual carts (gerobak sampah) or by motorcycle carts, then delivered to collection points or transfer stations. In case of wider roads, the waste is collected by garbage trucks of the Province Environmental Department. The facilities at the waste collection and the waste transfer points can be divided into four categories as shown in Table 3.

Figure 4 shows a waste “Dipo” in North Jakarta. Actually, the size of this “large” transfer station is modest and it causes quite some nuisances for the surrounding community. The deployment of professional large scale waste transfer stations would be a tremendous step forward for Jakarta and other cities in Indonesia.

FIGURE 4. WASTE TRANSFER STATION IN NORTHERN JAKARTA

Appartment buildings, offices and similar facilities contract their waste collection services from certified and registered companies such as Waste 4 Change (http://waste4change.com/). Any business activity in Indonesia which impacts the environment requires an environmental licence in the form of an AMDAL or (in case of less environmental impact) a UKL-UPL license. Such license states that the holder is responsible for the proper management of the generated waste. A 50,000 m2 upscale apartment complex in Jakarta visited as part of the market study is paying a certified transporter EUR 435 a month for unlimited pick-up (in practice, twice a day) of 16 tons of waste. The waste collector provides a manifest from the landfill Bantar Gebang that the waste was properly received. Hazardous waste such as fluorescent light bulbs has to be handled by specialized companies.

An interesting component of the Indonesian waste collection infrastructure are the so called “bank sampah” or waste banks. This name can be interpreted quite literally. Residents take their organic and non-organic waste to the waste bank, which is managed by local volunteers. In return for the waste they receive credit on their own account from which they can withdraw. The organic waste is converted into compost at the waste bank, and the dry waste is separated into plastics, paper and bottles / metal and sold. According to the Ministry of Environment and Forestry, nowadays Indonesia has 5,244 waste banks in 34 provinces and 219 cities. The Box below shows an example of a waste bank in South Jakarta. In general, the impression is that the waste banks are a very commendable instrument to promote public involvement in municipal

waste management in Indonesia, but in terms of quantity of waste recycled and diverted from landfill they do not (yet) play a significant role.

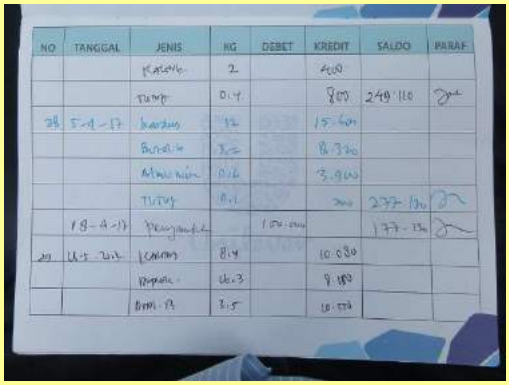
Box 1. Bank Sampah (Waste Bank) Mekar Sari in South Jakarta

Creating waste banks is an important goal of the Indonesian authorities. According to a decree of the Mayor in South Jakarta, all 65 sub-districts have to have a waste bank. As part of the market survey, a visit was paid to the Bank Sampah Mekar Sari. This community managed waste bank was created in 2014 and is now serving 240 households. Every two weeks 1.5 tons of waste is collected. Assuming a waste output of 0.75 kgs per person and an average household size of 3.9, a little over 15% of the waste output of the participating households is recycled through the waste bank.
The prices of the main recyclables at the time of the visit were as follows:

Material	RS/kg	EUR/kg
Plastic bottle	3,500	0.21
Plastic bottle caps	2,500	0.15
Plastic cups	4,000	0.24
Newspaper	1,400	0.08
Cardboard	1,100	0.07
Metal	2,500	0.15
Glass	200	0.01

Sign of the Bank Sampah Mekar Sari.
Note the Unilever involvement.

Handicrafts made out of waste on sale.
The little brown baskets go at EUR 3 each.



Waste bank account of one of the 240 participating households

Subdistrict Head Mr. Ramli welcomes visitors to the waste bank

3.2.2. Waste transport and transfer

In Indonesia, municipal waste transport between the households and the Temporary Solid Waste Collection Point (TPS) is the responsibility of the community. The transport between the TPS and the landfill is carried out by the municipality.

In a big city such as Jakarta, the waste logistics system includes regular TPSs and TPSs with on-site recycling activities (TPS 3R). According to the rules in Jakarta, there should be one TPS 3R for each sub-district and one TPS for each of the 2,700 community units. The real situation (in 2017, according to the DANIDA report) is presented in Table 4.
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	Goal	Real situation
Collection points (TPS)	2,700	761
Transfer stations (TPS 3R)	247	71

TABLE 4. WASTE COLLECTION POINTS AND TRANSFER STATIONS IN JAKARTA

At the collection points, the waste is transferred manually from pushcarts to dump trucks. A simple design to allow vertical transport from the pushcarts to the dump trucks could be successful here. Another improvement could be the development of large waste transfer stations in strategic locations in Jakarta. There have been such stations in the Sunter area (1,500 tonnes/day) and in East Jakarta (1,000 tonnes per day) but these have been discontinued.

A variety of vehicles is used to take the waste from the collection points (and, in some cases, from the households) to the garbage disposal site Bantar Gebang. Most vehicles are not specifically designed for waste transport, causing nuisances such as leachate leakages on the roads. The DANIDA report provides a list for the Jakarta Provincial Government in 2016, as shown in the Table 5.

Type of vehicle	Quantity	Capacity (tonnes)
Big dump trucks	557	6
Small dump trucks	518	4
Big hook-lift trucks	125	4
Small hook-lift trucks	104	3
Compactor trucks	109	5
Trailers	25	10
Street sweeper vehicles	20	n.a.
Total	1,458	

TABLE 5. VEHICLE FLEET OF DKI JAKARTA IN 2016

Hino truck

Isuzu truck

Mitsubishi truck

Most of the trucks are purchased in Asia. Japanese brands such as Hino, Isuzu and Mitsibishi are common, see the (relatively new) examples above. However, the Dutch company HYVA managed to sell 50 compactor trucks to the Province Environmental Department in Jakarta, as shown in the Box below.

Box 2. Sale of 50 HYVA compactor trucks to the Province of Jakarta

The Bergschenhoek based company HYVA has sold 50 waste compactor bodies to the Province Environmental Department of Jakarta. This is one of the results of a seven year presence in Indonesia of Mr. Egbert van Hoek, the local HYVA representative. He has teamed up with the Indonesian company PT. GARIS HARMONI, active in vehicle manufacturing and construction, ponton manufacturing, and the local distributor of Atlas Copco and Jinwoo SMC. Mr. van Hoek has some useful suggestions for doing business in Indonesia:

- Get your products listed on the e-catalogue system (https://e-katalog.lkpp.go.id/)
- Build up a good relationship with the customer before getting down to business
- Work with a good local team
- If possible: Learn to speak the language - it is relatively easy!
- Aftersales service is important (spare parts and know-how)
- If possible, set up your own office in Indonesia, apart from working through a local distributor
- Brand names are important in Indonesia. The saying goes: You can get all kinds of “teh-botol” (sweet tea in a bottle), as long as it is “Teh Botol” (the leading brand). For new products on the market this is considered an opportunity.

HYVA waste compactor body mounted on a HINO FG 235 JL truck at Bantar Gebang

3.2.3. Waste treatment including recycling

According to the Presidential Regulation # 97 of 2017, by 2025 the Indonesian Government aims for a 30% reduction of the waste output per capita and a 70% waste handling which should reduce the quantity of waste deposited in landfills. The strategy to achieve this is depicted in Figure 5 (Source: Ministry of Environment and Forestry).

FIGURE 5. STRATEGY TO ACHIEVE 70% WASTE HANDLING BY 2025

Organic waste

Organic waste is an important target of the strategy because it makes up around 60% of the waste in Indonesia. There are several initiatives to process this organic waste through composting. The German NGO Atmosfair (www.atmosfair.de) together with the German development association BORDA have a program where community-based organizations are trained to run 15 small and decentralized recycling facilities around Jakarta, Yokyakarta and Surabaja. Waste is collected from households and taken to the recycling facilities where it is separated by local employees. Recyclables such as plastics and glass are sold to help finance the operation. The organic fraction is composted with the help of bamboo aerators and sold as fertilizer. On average, this yields 800 kgs of compost a month per recycling facility (certified by the Ministry of Agriculture) and an additional income of around EUR 50. More info:

Another initiative is called Bali Compost Crafters. New Zealand born Oliver Mauger and North American Robert Withrow have set up a mechanized composting plant on the island of Bali where they produce compost, topsoil and mulch out of organic waste from agriculture and municipalities. They produce 2,000 m3 of compost annually, which equals two-thirds of the waste going into Bali's garbage dump Suwung on a daily basis. Mauger and Withrow cooperate with the sanitation department (Dinas Kebersihan dan Pertamanan or DKP) and the Udayana University, which has dubbed the production site "The Compost Laboratory". More info: Robert Withrow, +62 08 13501 68816, info@balicompostcrafters.com.

Munawar and Fellner (2015) report that in Jati Barang landfill in Semarang, the composting of the organic fraction of municipal solid waste is carried out on an industrial level. Hundreds of people were hired there to help compost the organic fraction and separate non compostable

materials. The additional revenue obtained by the waste management authority from this work reached US$ 105,000 per year.

At the Bantar Gebang landfill in Bekasi near Jakarta, a pilot composting facility was visited. 4 tons of compost a day are being produced there. The process stages include:

1. A receiving area for the organic waste from traditional markets
2. A mixer and crusher: separation of inorganic material and organic material crushed
3. Granulator: fine particles of compost processed into granules
4. Rotary dryer where the granules are being dried
5. Packing area where the granules are packed for distribution

Figure 6 shows some photos. Even at such low production figures, there is not sufficient demand for the compost that is being produced because people don't know it and they don't trust it.

FIGURE 6. PILOT COMPOSTING PLANT AT BANTAR GEBANG

All in all, in Indonesia composting has not (yet) caught on as a commercially attractive activity and does therefore not yet play a significant role in reducing waste to landfill. The figures for home composting are unknown. It could be interesting to explore the possibilities for low grade composting at landfills and use the compost as cover material for the waste.

Another way to reduce the quantity of waste to landfill is anaerobic digestion of the organic waste. DANIDA reports that the Ministry of Public Works in Indonesia has built pilot dry anaerobic digestion plants in several cities. A 50 tonnes/day plant was established in Pesanggrahan in South Jakarta. This plant has never operated due to a number of technical and operational difficulties. The Danes recommend to rehabilitate and operate this existing dry anaerobic digestor and duplicate the experience in other locations. However, it is doubtful whether this will be the optimum strategy to reduce the quantity of waste to landfill.

Recycling

Recycling activities in Indonesia are channeled through informal scavengers, the waste banks and the recycle center facilities (TPS 3R). Recycling figures are hard to find. The website "Global Recycling" reports that "according to researchers and media, the recycling rate is about 2% overall and 7.5% in urban regions". If is accurate, there is an enormous additional opportunity for recycling, including a lot of low hanging fruit.

According to the World Bank, approximately 3 million people are involved in waste recycling in Indonesia, well over 1% of the population. Most of these people belong to the informal sector. They are contracted by local neighbourhoods to collect the waste, or they sort the waste at collection points, or they search for recyclables at landfills or waste dumps. The items with a value are sold to waste traders, who sell the materials to industry. The scavengers have an important role in waste collection and recycling in Indonesia and some of them make a decent living out of this.

The waste banks are another source of recycled items. As mentioned earlier, the total number of waste banks is now over 5,000. They have been established in all 34 provinces and 219 cities in Indonesia. Authorities at all levels are keen on further expanding the network of waste banks, but in terms of volume of recycled materials they do not (yet) play a significant role.

The waste collection centres with recycling activities (TPS 3R) are another source of recyclables. The “3R” part refers to “Reduce, Reuse and Recycle”. In a TPS 3R, wet waste is composted and/or even digested and dry waste is separated into recyclables. On youtube there are quite some videos showing the set-up of TPS 3R facilities in Indonesia. A multilevel (re)design for TPS 3R Sumur Banding District, Bandung City can be found at: https://www.youtube.com/watch?v=6BwcTXvP0bY. This site has a small office and areas for waste separation, shredding, composting (incl. maturation) and a waste digestion area. The pictures below give an impression of the size and appearance of the TPS 3R facilities (these sites have not been visited as part of this market study). Some collection centers have been set up by commercial recycling companies.

All in all there are many initiatives in recycling, but most are relatively small scale. Add this to the complicated logistics of the world’s biggest island nation and the result is that the processing industry for recyclables is short of recovered materials. This is especially true for plastics (see next section).

3.2.4. The case of plastics

Especially since Indonesia was identified as the second biggest contributor to marine plastics in the world, the prevention and recycling of plastics has moved to the forefront of Indonesian thinking about waste treatment. This is an area where preventive measures are being taken both at island and municipal scale. Just recently, on December 24th 2018, the Bali Governor Mr. Wayan Koster announced a ban on single-use plastics, to be implemented within 6 months. By the end of 2018, the municipality of Bogor announced a ban on single-use plastic bags in all modern retailers. The city of Surabaya added its own twist to the issue by allowing its citizens to trade used plastic bottles for bus tickets.

In spite of these commendable initiatives, plastics will continue to play a prominent role in Indonesia in the foreseeable future, and so will plastics recycling. In her April 2018 presentation for the United Nations Center for Regional Development, the President of the Plastics Recyclers Association ADUPI (370 members) Mrs. Christine Halim explains why Indonesia is facing a number of formidable challenges in this area. The large population with low to mid buying power needs economically viable solutions, the vast land area with thousands of islands complicates the distribution and collection chain and the hot, humid and often dirty air creates a need for quality light-weight packaging with good barriers.

As one of the achievements in this field, Mrs. Halim mentions that Indonesian recycling companies have been doing plastic waste management to maximize material recovery and reduce demand for new (virgin) material. Her own company Langgeng Jaya Fiberindo with plants in Jakarta and Surabaya is an example of this. This company was visited on a field trip by the Dutch delegation at the EU CE seminar 24-26 October 2018. It processes recycled plastics to produce polyester staple fiber (PSF), PET strapping band, as well as spunbond and needle punch for geotextile. The PSF production capacity is 1500 tons per month. The Jakarta plant is fully mechanized and will soon acquire new machinery for bottle-to-bottle recycling. Below are some pictures taken during the visit.

FIGURE 7. IMPRESSIONS OF THE PRODUCTION PROCESS AT LJ FIBERINDO IN JAKARTA

Although Langgeng Jaya Fiberindo is sourcing its used plastics from places as far away as Bali, Sulawesi and Kalimantan, a limiting factor for the company's growth is the insufficient supply of

recovered plastics. According to Mrs. Halim, what could help is a professionalization of the collection system for recyclables (including the informal sector), the implementation of effective plastics collection systems on the islands (e.g. through baling) plus the introduction of an Extended Producer Responsibility (EPR) system for packaging.

In the coming months, Mrs. Paola Cannucciari, Senior Programme Manager of the Bali based NGO EcoBali will carry out an assessment of the plastics waste processing sector in Eastern Java, including an inventory of the technological needs for further development of the sector. This project has been assigned by MVO Nederland (contact person Mrs. Nancy Alexaki, n.alexaki@mvonederland.nl). The results of this study are expected to be most valuable for Dutch providers of technology and services in plastics recycling.

The implementation of an EPR system for packaging could be a quantum leap forward for plastics recycling in Indonesia. According to Mr. Novrisal Tahar, the Director of Solid Waste Management of the Ministry of Environment and Forestry, such EPR system for packaging is due to be implemented in the coming 10 years, that is, before 2028.

A local organization that will most certainly play a role in this is PRAISE: the “Packaging and Recycling Association for Indonesia Sustainable Environment” (https://praiseindonesia.com/). This is an independent association fronted by six founding companies (Coca-Cola, Danone, Indofood, Nestlé, Tetra Pak, and Unilever Indonesia) which has initiated, supported, facilitated and invested in various programs and initiatives towards packaging waste management in Indonesia, especially by minimizing the impact of packaging waste. Activities include providing education to local communities, improvement of the waste collection systems and strengthening the system of TPS 3R's and the Waste Banks. PRAISE avoids the word EPR and instead has coined the term ESR: Extended Stakeholder Responsibility. Thus the responsibility for the packaging waste is spread over a wider group of stakeholders than just the producers and importers of the packaging materials. Although PRAISE undoubtedly contributes to recycling in Indonesia, the impression is that the organization was at least partially created with the aim to avoid (or postpone) the implementation of an EPR system for packaging in Indonesia with all its associated logistics and costs for PRAISE’s founders.

3.2.5. Waste to Energy

The Indonesian Government is well aware that in the coming decades the challenges posed by the growing quantities of waste cannot be met without the application of waste to energy at a large scale. In order to facilitate this, in 2018 Presidential Regulation No 35 was adopted regarding “The Acceleration of Thermal Processes for Solid Waste Treament”. 12 Cities are specifically targeted (most on Java): DKI Jakarta, Tangerang, South Tangerang, Bekasi, Bandung, Semarang, Surakarta, Surabaya, Makassar (Sulawesi), Denpasar (Bali), Palembang (Sumatra) and Manado (Sulawesi). In these cities, a feed-in tariff of US$ 13.35 cents/KWh for power plants < 20 MW is guaranteed, plus topping up of the gate fee by an amount of up to IDR 500,000 (about EUR 30) per ton waste from the state budget. According to the DANIDA report, the feed-in tariff for WtE plants with a capacity of between 20MW and 50MW is US$ 15.95 cents/KWh.

At these conditions and considering the urgent need for alternatives to landfilling in the target cities, one would expect various large scale WtE projects to be already under way. There are

additional drawbacks though: NIMBY considerations on the side of the population, the generally high moisture content of the waste requiring preparatory stages before incineration, plus the fact that in practice, it is hard to negotiate the “guaranteed” feed-in tariffs for a prolonged period of time.

The most advanced project is a 2,200 tonnes per day Mass Burn Facility in Sunter, North Jakarta. This BOT project is a joint initiative of PT Jakarta Propertindo, or Jakpro (http://www.jakarta-propertindo.com), which is responsible for the facility’s construction, along with Finnish state owned energy company Fortum (www.fortum.com). On December 20th 2018 the DKI Jakarta Governor Anies Baswedan launched the plant’s construction. The overall investment value is US$ 250 million. However, in February 2019 it was reported that the Sunter project could not be started before the tipping fee and power purchase agreement (PPA) between PT Jakarta Propertindo (Jakpro) and PT PLN had been agreed. PT Jakpro has contracted an international consultant to assess the necessary tipping fee, that will be submitted to the DKI Jakarta DPRD as the basis for the revision of Perda No. 3/2013 concerning Waste Management.

In 2017 the JFFE Engineering Corp and Clean Authority of Tokyo conducted a feasibility study into a Waste to Energy Power Plant Project for Bali. It was concluded that such WtE plant would indeed be feasible, provided that Presidential degree No.18 and Ministerial Degree 44 would indeed be applied during the BOT operational phase of 25 years.

Another WtE option is to turn municipal waste into Refuse-derived Fuel (RDF) and use it as alternative fuel in Indonesia’s cement kilns. The first integrated MSW to RDF processing facility is currently being developed in Cilacap Regency, Central Java. The capacity will be 120 tons of municipal waste per day, to be processed through a bio drying method. The local cement factory Holcim Lafarge will use the waste as a substitute for coal in cement manufacturing. The technology has been tested in a one-year trial at the Geotainer facility, located in Holcim Narogong Plant, Western Java.

This initiative is being coordinated by the Indonesian Ministry of Environment and Forestry. The Danish Government (through its ESP3 program) contributes the mechanical and electrical equipment. The Ministry of Public Works and Housing builds the main facilities. The Central Java Provincial Government finances the construction of supporting facilities and bears the operational cost for the first five years. All facilities will be built on land owned by the Regency of Cilacap, which further supports the operational cost and will provide new trucks to improve the waste transport capacity to up to 120 tons per day.

It will be most interesting to monitor the progress of both initiatives. In case they are successful, they may be replicated in other parts of Indonesia and contribute significantly to alleviating Indonesia’s waste problem. And they will generate promising business opportunities, including for Dutch supppliers of technology and services.

There are additional ways to generate energy from waste, such as biogas extraction from landfills. This is briefly covered in the next section. Anaerobic digestion of municipal and agricultural waste streams is another option. This has not been part of this market study but it may be a promising option to pursue in future studies.

3.2.6. Waste disposal

Indonesia is still heavily dependent on waste disposal in landfills ("Tempat Pembuangan Akhir" or TPA) as a final solution to get rid of its waste. The World Bank has recently conducted an analysis about MSW management in 104 Indonesian cities (100,000+ inhabitants) and found that landfill practices leave much to be desired (Figure 8).

FIGURE 8. WORLD BANK ANALYSIS OF LANDFILL PRACTICES IN 104 INDONESIAN CITIES

The analysis involved 36 million out of the annual 65.8 million tons of waste in Indonesia, or approximately 55%. The troubling fact is that waste disposal in small cities and rural areas tends to be even less sustainable.

As part of this market study a visit was paid to the Bantar Gebang landfill in Bekasi City near Jakarta. This site was set up as a private initiative in 1989 but has been taken over in 2016 by the DKI Jakarta Environmental Agency. The site is financed directly by DKI JEA, so there is no tipping fee[8]. It has a total area of 110 has with almost 82% used for waste disposal and the remainder for supporting infrastructure such as entrance, roads, leachate treatment etc. This landfill has been operating since 1989. It receives more than 1,200 waste trucks every day and 7,000 tons/day of municipal waste (most during the night).

The map on the right shows the layout of Bantar Gebang. In 2008 the maximum height of the waste volume was 15 mts. At present it is 30 mts and in the future the mountain is expected to grow to a maximum height of 60 mts by combining cells. There are no roads on the landfill towards a tipping zone on top. Instead, there is a row of excavators in line from the bottom of the garbage pile towards the top that jointly move the new garbage up the mountain. At the bottom of the pile, where the garbage trucks dump their load, there is a group of scavengers sifting through the rubble in search of recyclables.

[8] In 2016, before the Province of Jakarta took over Bantar Gebang, Jakarta paid IR 134,000/ton to the private operator (approximately EUR 9.15 by the exchange rate of July 1st, 2016). This is roughly consistent with what is currently being paid in Surabaya (IR 130,000/ton or EUR 8.05).

Weighing bridge at Bantar Gebang

Excavator lift

Scavengers at the landfill

Scavenging at the tipping zone

Scavenger settlement next to the landfill

Waste truck traffic jam and landfill lining

Leachate aeration pond

Taking samples of the leachate

Part of the landfill is covered with an impermeable seal. In 2011, a landfill gas utilization system was installed in zones 1 and 2 and started to produce 16 MW of electricity. The installation is out of order because the generator is broken and there is leakage from the pipes. The electricity is supposedly sold to the state owned electricity company PLN.

The leachate treatment plant applies two methods of operation. Most of the leachate is treated through a conventional aeration and coagulation process. The remainder goes through an advanced oxidation process combined with ozone, UV and hydrogen peroxide. The capacity of the leachate treatment plant is 500 m3/day. However, in the rainy season approximately double this amount comes out of the waste heap. The remainder flows into the Ciasem and the Ciketing rivers without treatment. The solution the Government is currently studying is to clean up the rivers, but this appears to be an undesirable and probably inadequate end-of-pipe approach. Another problem that has arisen is that the groundwater for the communities surrounding Bantar Gebang is now polluted.

The composting area has been described in section 3.2.3.

There is a 50 tons/day pilot waste to energy plant on the premises which is scheduled to start operations in June 2019. This is an initiative of the Ministry of Research and Development, together with the Bandung Institute of Technology.

In the future, Bantar Gebang wants to establish an integrated Solid Waste Study Centre at Bantar Gebang. For the Netherlands, under the right circumstances this could be an interesting project to get involved in. There are ample opportunities for improvement, such as the establishment of a proper sorting area to remove the recyclables and offer a decent workplace to the scavengers. This is in line with Act 18 of 2008, which states that new landfills must be equipped with integrated processing facilities, where sorting, recycling and final waste processing take place.

In a way the landfill can be considered a study centre already, considering the different pilot plants already present. One of the driving forces for this is that in a few years, the landfill will be used to full capacity and a new location will have to be identified. In order to postpone this, currently a group of students is investigating the feasibility of mining part of the existing landfill, turning it into RDF and having it incinerated in a cement kiln. Although this does not seem to be a winning idea, it does show the openness of the operators of the site to new approaches to waste treatment.

Contact person at Bantar Gebang is Mr. Roy Sihombing, tel. +62 813-2852-7470, rms_233@yahoo.com.

So how about landfills elsewhere in Indonesia? According to Munawar and Fellner, in 2015 the situation was already precarious. They investigated landfills in the metropolitan cities of Jakarta, Surabaya, Medan, Bandung, Semarang and Surabaya, as well as in the big cities Banda Aceh, Yogyakarta, Malang and Denpasar. The service area of the observed landfills represented almost 20% of the total population in Indonesia.

Almost all landfills were originally designed as controlled landfills, some of them even as sanitary landfills. However, the operation & maintenance (O&M) that was encountered was neither controlled landfill nor sanitary landfill. There was no treatment carried out on incoming waste, irregular soil cover applications, a lot of on-site waste pickers and in some cases cattle,

inadequate leachate treatment and landfill gas was released to the atmosphere without any treatment. Furthermore, some landfills were located in coastal areas where they posed a threat to water quality.

When Law 18/2008 entered into force, the Ministry of Public Works (MoPW) made a country-wide assessment of the situation at landfills around Indonesia. It was found back then that 81% of landfills operated as open dump sites, 16% as controlled landfills, and the remainder were operated as sanitary landfills. One of the underlying problems is that the central government only covers capital investment, while all running costs are covered by local government.

3.2.7. Financial aspects

The Indonesian company Waste4Change has carried out research into the financing of the waste management system. In general, it turns out that the sector is underfinanced. Each city has its own way to pay for the operational costs of the waste management services. Jakarta citizens for instance do not pay a waste fee. All services, including waste disposal at Bantar Gebang (estimated cost EUR 8/ton), are paid from the regular city budget. Other cities do charge waste fees, but these are too low. The impression of Waste4Change is that the fee level is only 25%-40% of what is needed. And only 30% of the fees are paid. In some cases the waste fees are invisibly included in the water bill. In other cities communities of some 100 households pay the leader of the community (RT Rukun Tatangga). Sometimes the community leader pockets (part of) the waste fees so financing of the overall waste system becomes even harder.

Waste4Change has made an estimation of the costs of a responsible waste management system in Indonesia. The outcome was IDR 80,000 (a little less than EUR 5) per household per month would be sufficient. Subsequently Waste4Change has asked 1,000 randomly selected households in and around Jakarta whether they would be willing to pay this amount for a good waste management service. More than half the respondents answered that indeed they would be willing to pay.

4. Legal framework and authorities

In the context of this market study, the legal framework and institutional setting will be briefly touched and commented upon. For a complete overview the reader is referred to other sources such as the DANIDA ESP3 report.

In 2008 Indonesia adopted Law No. 18 on Waste Management. This law covers all issues related to waste management, including the rights and obligations related to municipal waste management. The law also divides the responsibility between central and local authorities, both in terms of policy and strategy, as well as the financial aspects.

The central government is responsible for formulating waste policies and strategies at the national level. The responsible entities are the Ministry of Public Works and the Ministry of Environment and Forestry. The local government determines the waste policies at the local level within the framework of the national policies. The local authorities also have the responsibility to carry out waste management (from collection to final disposal) and to control and evaluate it.

Table 6 shows the regulatory approach in ISWM at the federal level followed in the past years.

Regulation	Year	Subject
Govt. Regulation 81	2012	Household (like) waste management
Ministerial Decree 13	2012	3R and Waste Banks
Ministerial Decree 53	2016	ADIPURA Sustainable Cities program
Ministerial Decree 59	2016	Leachate standards
Ministerial Decree70	2016	Emission Standards Waste incineration
Presidential Decree 35	2018	Acceleration Waste to Energy

TABLE 6. REGULATORY MEASURES IN WASTE MANAGEMENT IN THE PAST YEARS

As per Presidential Regulation 97/2017, the goal of the Indonesian Government is to achieve a 30% waste reduction and a 70% waste handling by 2025. It is assumed that the baseline for this goal is Indonesia's waste output of 2017. Waste reduction is to be achieved through a decrease of waste generation per capita and at the source, resulting in a decrease of waste to landfill and to the environment. It will be hard to reach these goals with a growing population and an increasing affluence resulting in more waste per capita. For the 70% waste handling, on top of the earlier measures the amount of waste to recycling and recovery should increase. The Government is betting heavily on the Waste Banks system to make this happen but as we have seen earlier, this system generates only modest quantities of recyclables. For industries, there is the goal to implement an EPR system for products and packaging in the next 10 years, plus a phase out of plastic bags.

Working with the Indonesian Government can be time consuming and cumbersome. A better bet may be to focus on the forward looking municipalities. Surabaya for instance, the capital of the East Java province, has invested heavily in participatory waste management and as a result was able to reduce the volume of its waste output by 10%. Another success story is the city of Kendari in south-east Sulawesi (population of half a million). A decade ago this city was among the filthiest in Indonesia. Nowadays waste trucks clear the streets twice a day, and residents have made sorting and recycling their household waste a habit. An eye catching move was to set up Kampung Mandiri Energi, or "Independent Energy Village", in Puuwatu district, which

produces methane gas from organic waste in the city's biggest landfill. This gas is filtered and provided free of charge to 150 poor families in the area.

As part of the preparations for a major project in Indonesia's waste sector, the World Bank has carried out a most useful assessment of pro-active (Tier 1) cities in waste management where the impact of support activities is expected to be greatest. Factors that have been taken into account include the size of the city, population density, whether or not land is available for a final disposal site, the % of waste handled, the Adipura (sustainable city) score, the spending per tonne of waste and, interestingly, the Government Commitment score[9]. This information is very useful for Dutch suppliers of technology and services in waste management in the process of determining their focus for doing business. Table 7 shows the results.

City/district	GCS
Magelang	91
Balikpapan	85
Bukittinggi	81
Tangerang	78
Kendari	76
Bitung	75

City/district	GCS
Pematangsiantar	74
Karimun District	74
Banjarbaru	73
Pare-Pare	73
Probolinggo	72
Sukabumi	71

City/district	GCS
Salatiga	71
Surabaya	67
Makassar	67
Malang	67
Jakarta	60
Palembang	50

TABLE 7. "TIER 1" CITIES ACCORDING TO THE WORLD BANK[10]

Five cities (underlined in Table 7) also appear on the target list of 12 candidate cities for Waste to Energy under 2018 Presidential Regulation No 35.

[9] Subject to changes, depending on election results etc.

[10] GCS = Government Commitment Score.

5. The private sector in waste and CE

5.1. Private sector

In order to successfully conduct business in/with Indonesia, it is important to find a good local partner company. When searching for such partner, one soon realizes that the Indonesian waste sector is still in its infancy. Every year a trade fair is being organized: “Indo Waste”, which is organized in parallel with “IndojWater” and “IndoRenergy”. The most recent edition was held in Surabaya 28-30 June 2018, the next one will be in Jakarta 17-19 July 2019. While there is a sizable group of water related companies presenting themselves at IndoWater, the waste related companies can be counted on one hand.

Company	Line of business	Contact
ACE Energy	Clean energy, especially Gas & Biogas Engines	Mr. Robin Hendera Tel. +62 21 46837291 robin.hendera@acleanenergy.com
Bali Compost Crafters	Production of compost, topsoil and mulch in Bali	Mr. Oliver Mauger Tel. +62 8 22474 14045 info@balicompostcrafters.com
ecoBali Recycling	Waste collection and recycling services for households and commercial clients on Bali. Has its own MRF. Also consulting.	Mr. Ketut Mertaadi Tel. +62 82237799819 info@eco-bali.com
Greeneration Foundation	NGO, working on sustainable consumption and production. Offices Bandung / Jakarta. 2005 initiative by Sano, Waste4Change	Mrs. Vanessa Letizia Tel. +62 878-8111-1674 ines@greeneration.org
k.l.i.n.	Bali-based company active in incineration of hospital waste using plastic residues and packaging as alternative fuel	Mr. Tristan de Gouvion Saint Cyr tristan@klin-indonesia.com
PT Gikoko Kogyo Indonesia	Engineering and manufacturing company, a.o. waste reduction equipment through non ferrous and precious metal recovery	Mr. Burin Ko Tel. +62 21 460 1970 gikoko@gikoko.co.id
PT. Pengelola Limbah Kutai Kartanegara	Collection, transportation, storage, utilization and treatment of Hazardous waste. Based in Balikpapan, East Kalimantan	Mr. Bran Tel +62 811 592 900 marketing@plkk.co.id
PT Prasadha Pamunah Limbah Industri (PPLI)	Collection, recycling, treatment and disposal services for hazardous and non-hazardous waste. 95% owned by DOWA Japan	Mr. Nobuhiro Yasui Tel. +62 21 575 0854-5 info@ppli.co.id
PT Sumber Organik	Waste to energy company: Methane extraction from landfills and using waste as fuel for thermal processes (Surabaya))	Mr. Tjatur Prasetyo Tel. +62 31 3100 6841 public.relation@sumberorganik.com
PT Xaviera Global Synergy	Compost and biogas production from organic waste, plus recycling of inorganics such as plastics and polystyrene foam	Mrs. Wilda Yanti Tel. + 62 813142 46402 wilda_79@yahoo.com
Temesi Recycling	Composting company doing 50 tons per day on Bali	Mr. I Wayan Cakra Tel. +62 85 100 438 083 temesi.compost@gmail.com
Waste4Change	Circular economy company in Bekasi active in consulting and waste management services for companies, schools etc	Mr. M. B. (“Sano”) Junerosano Tel. +62 812-2466-9021 hanifah.nurawaliah@waste4change.com
XS Project	Social and environmental company focused on transforming consumer and corporate waste into products with innovative design	Mrs. Retno Hapsari Tel. +62 812 1053 614 retno.hapsari@xsproject-id.org

TABLE 8. EXAMPLES OF COMPANIES IN WASTE AND CIRCULAR ECONOMY IN INDONESIA

Table 8 shows some examples of waste related companies that were encountered during the market study. They are presented in alphabetical order. The list is by no means complete and inclusion in the list does not reflect an endorsement on the part of the author.

The list of companies in Table 8 is a good start. The upcoming assessment of the plastics sector in Eastern Java by ecoBali will yield more companies, but additional research is needed into companies offering waste services in the country, including in hazardous waste, electronic waste and other recyclables. The goal will be to scout potential partners and clients for Dutch providers of technology and services, which can participate in matchmaking events to be organized in the future.

5.2. Sector organizations

Sector organizations, NOG's etc are a good inroad into the waste management sector. In Table 9 some relevant organizations are listed.

Organization	Main activity	Contact
ADUPI	Indonesian Association of Plastic Recyclers. Established in 2015, it now has 370 members	Mrs. Christine Halim Tel. +62 21 590 8750 christine.halim@hotmail.com
APDUPI	Indonesian Association of Small Scale Plastic Recyclers	Mr. Saut Marpaung Tel. +62 813 324 10536 sautmkt@gmail.com
Indonesia Solid Waste Association	Indonesian chapter of the International Solid Waste Association (ISWA)	Mrs. Sri Bebassari Tel. +62 21 422 1833
Indonesia Waste Platform	On-line platform fostering collaboration, capacity building and doing innovative projects (http://www.indonesianwaste.org)	Mrs. Nina van Toulon (Dutch) Tel. +62 813 5344 6507 nina@indonesianwaste.org

TABLE 9. SOME SECTOR AND SUPPORT ORGANIZATIONS IN THE WASTE SECTOR

5.3. Trade event

Every year a trade fair "IndoWaste" is organized, in parallel with the "IndoWater" event. Indowater attracts quite a number of companies but IndoWaste is still in its infancy. The next event will be held in Jakarta 17-19 July. For more info see https://www.indowaste.com/.

6. Dutch support and bi/multilateral programs

6.1. Dutch support

The Royal Dutch Embassy supports Dutch businesses with an interest in doing business in Indonesia. Below the trade support staff in Jakarta and Surabaya is presented.

Mr. Carel de Groot
First Secretary / Water Expert (Jakarta)
Tel. +62 811 886 027
Email: carel-de.groot@minbuza.nl

Mr. Charly Raya Leoloko
Senior Economic Policy Advisor Trade & Investment (Surabaya)
Tel. +62 811-3831-193
Email: charly.raya@minbuza.nl

One of the services the Embassy can deliver is provide guidance as to the Dutch support programs applicable in Indonesia. In order to provide a head start in this area, RVO maintains the following page:

https://www.rvo.nl/onderwerpen/internationaal-ondernemen/landenoverzicht/indonesie

6.2. Bilateral and multilateral programs

The following programs are the most relevant in view of the Dutch initiative:

Denmark - Denmark has supported the development of a waste management master plan for DKI Jakarta and is currently supporting other Indonesian cities to do the same. Denmark and Indonesia have an ongoing EUR 1.3 million cooperation in circular economy and sustainable resource management. The focus areas are: 1/ Replication of best Indonesian practices in circular economy and SWM; 2/ Separation, handling and treatment of organic waste from households and markets; and 3/ Improvement of the knowledge base in national waste management. Denmark is planning to involve the private sector in much the same way as the Netherlands. Lining up the two initiatives could be beneficial to all stakeholders.
More info: https://www.facebook.com/DenmarkInIndonesia/videos/waste-management-strategic-sector-cooperation/2217616755140125/

World Bank - A $100 million loan is supporting a $1 billion national program to reform waste management practices for around 70 participating (so called “Tier 1” and “Tier 2”) cities, impacting around 50 million people. The loan will support the strengthening of local policies and institutions, closure and rehabilitation of old and informal dumpsites, and installation of sustainable disposal sites including modern sanitary landfills with landfill gas collection mechanisms.
More info: http://projects.worldbank.org/P157245?lang=en

7. SWOT, conclusions, recommendations

7.1. SWOT analysis

In table 10 an overview is provided of the current strengths, weaknesses, opportunities and threats related to doing business in waste and circular economy in Indonesia.

Strengths	Weaknesses
• Indonesia is the fourth most populated country in the world (265 million) • The need is obvious: the waste problem is urgent • The federal Government has set ambitious goals • Forward looking local governments are taking action • The local population is becoming more aware and taking initiatives • Around 3 million waste pickers are already active in recycling	• As an island nation, Indonesia has complicated waste logistics • Federal Govt doesn't follow up on goals • Big projects attract corruption • Most initiatives in waste sector are small scale • No market (yet) for organic waste products such as compost • Waste sector is under-financed (little or no fees) • Land is scarce plus NIMBY • Focus on end-of-pipe, little prevention • No strong private sector in waste management • (Almost) No trade fairs etc
Opportunities	**Threats**
• MoU Netherlands - Indonesia on waste / CE (pilots) • Investments sparked by the World Bank (about US$ 1 billion) • Waste sector is virgin, NL can gain prime position • Participation in Solid Waste Study Centre in Bantar Gebang landfill • Waste to Energy: conditions favorable in 12 cities • Strong awareness on the plastics problem and the need to act • In 10 yrs the Indonesian Govt wants an EPR system in packaging • Development of a sustainable waste / CE model for small islands • The Dutch are looked upon favourably by Indonesians • Join forces with the Danish in exports promotion	• Competition, especiallly from countries in Asia (e.g. Japan, China) • Other (e.g. Scandinavian) countries invest more in cooperation and exports promotion • A paternalistic attitude can backfire (especially the Dutch)

TABLE 10. SWOT ANALYSIS WASTE AND CIRCULAR ECONOMY BUSINESS IN INDONESIA

7.2. Conclusions

- Considering the strengths, weaknesses, opportunities and threats listed above, it is considered that the waste and circular economy sector in Indonesia offers promising business opportunities for Dutch private sector companies. To date, these opportunities have not yet been sufficiently explored.
- Specific business opportunities that were identified include the following (in random order):
  1. The need for improved waste logistics. The case of the sale of 50 HYVA waste compactor trucks to the Province of Jakarta shows that the Indonesian authorities can be convinced of the benefits of dedicated higher end waste transport equipment. There is also a need for large scale transfer stations at strategic locations in big cities.
  2. The revitalization of waste dumps into controlled landfills and the development of new sustainable landfills is urgent. It is a key element of the planned project by the World Bank, especially in the 18 so called "Tier 1 cities".
  3. The diversion of waste from landfills. Among many other strategies, this can be achieved by the development of proper (and roofed) waste sorting facilities at landfills, with the added bonus of providing an alternative job opportunity for waste pickers who are currently working on the landfill itself.
  4. Another strategy to divert waste from landfills is to prevent organic waste from entering it. Any technology and/or strategy which can achieve this at a large scale and in a financially feasible way will be a business opportunity in Indonesia.
  5. The strong interest in the recycling of plastics generates a need for plastics recycling technology to add more value to the recuperated plastic. An example is the planned bottle-to-bottle PET recycling plant of the company Langgeng Jaya Fiberindo. However, an even bigger challenge is the need for more recuperated plastic as an input for recycling. Any initiative which can increase the amount of recovered plastic in Indonesia will constitute a promising business opportunity.
  6. Technologies or approaches which can remove / clean up plastic rubble from beaches, rivers etcetera is sure to draw a lot of interest from Indonesian authorities.
  7. Support in the development of Waste to Energy projects. In case Presidential Regulation No 35 is implemented as planned, feed-in tariffs and tipping fees probably allow for a positive business case for mass burn WtE facilities in (some of) the twelve target cities. Another option is the production of RDF as alternative fuel for cement kilns. The first RDF initiative is currently being developed at Cilacap Regency and the authorities as well as the cement kilns appear to be ready for more.
- In view of the recent policy initiatives of the Indonesian authorities, the ongoing Indonesian-Dutch cooperation in the field of climate change, waste management and circular economy, plus other initiatives such as the upcoming World Bank project, now is a good moment to step in for Dutch companies.
- On the Dutch side, there is a sizable group of companies which has shown interest in exploring business in Indonesia[11].

[11] For the moment, the group of candidate PIB participants includes Afvalzorg, AWECT, Bollegraaf, Geesinknorba, HYVA, Inashco, Leapfrog, Orgaworld, Sweepsmart, The Waste Transformers and VDL Translift.

7.3. Recommendations

- To develop a two to three year Partners for International Business (PIB) program on waste and circular economy in Indonesia. A PIB program appears to be a very suitable tool to promote Dutch business involvement in the Indonesian waste and circular economy sector. It has become very clear that a successful business development strategy requires a longer time involvement on the Indonesian market. A local liaison will be essential for the success of the Dutch companies.
- To design this PIB program in close coordination with the ongoing Indonesian-Dutch cooperation in the field of climate change, waste management and CE. This can go two ways. It may be that certain Dutch companies are especially invited to participate in the PIB considering the focus of the public cooperation project. On the other hand, pilot activities in the frame of the public cooperation project may be developed in areas that the PIB companies are working in.
- In terms of geographical focus, to concentrate on densely populated and relatively affluent Java. Within Java, the focus can be on metropolitan and big cities that were selected as “Tier 1’ cities by the World Bank. Depending on the interest of the participating companies and specific opportunities which arise in the course of the PIB, events can be organized elsewhere in Indonesia.
- Based on earlier PIB projects, it is recommended to invite all known Dutch suppliers in waste management and circular economy without restrictions as to their activities, size etc.
- Financing of investments and (especially) operations in the waste/CE sector in Indonesia are critical issues in order for improvements to materialize and be sustainable in the future. It is recommended to pay particular attention to this issue in both the PIB and public cooperation project, e.g. through a dedicated study into optimum financing strategies. The role of large corporations and/or influential families should be touched upon in such study.
- Denmark is carrying out a similar program of public cooperation and (in the coming years) business development in the waste / CE sector. The Danish Embassy is tentatively interested in combining forces in a joint program of exports promotion. In spite of the possible difficulties that may be encountered, it is highly recommended to cooperate with the Danes in the overall effort. This way, a more complete set of products and services in waste / CE can be presented and as a side effect, Dutch and Danish company representatives get to know each other. In the future, this may mean that combined Dutch/Danish groups of companies will go on a business mission to Indonesia, and delegations from Indonesia will travel to Denmark and the Netherlands.
- As a first joint activity, it is recommended to organize a Seminar on Circular Economy in Jakarta around (but not during) the summer holidays, together with Waste4Change (separate from the fair IndoWater/IndoWaste)
- In order to identify relevant Indonesian participants for the Seminar on Circular Economy, it is recommended to contract a group of students of IBR Groningen with the specific task to scout 25 participants for the seminar.[12]

[12] This has worked out very well on an earlier occasion in Colombia.

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