From End-of-Pipe Treatment to 3R

Sustainable Waste Management in Indonesia

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Introduction

Seeing trash is inevitable in Indonesia, when travelling around the country (Fig.1, Fig.2, Fig.3). Especially in urbanised areas, such as in Jakarta, it seems as if trash is just piled up everywhere, on the streets, in nature, and in the water. This has been my observation during my six months of study in Indonesia, where I did see plenty of waste but no sustainable waste management. I remember that all waste was being picked up by small garbage trucks or waste pickers (Fig.4 & Fig.5). I did not have the possibility to recycle my waste. There were only trash bins for separating waste on my campus area, Universitas Gadjah Mada (Fig.6), but it seems to only exist on certain areas. It does not seem to allow citizens much for separating their waste even if they wanted to.

g.1 Streets in Riau[1]

Fig.2 Riverbanks of Jakarta[2]

Fi **g.3** Ocean of Bali[3]

1 Trash on the streets of Pekanbaru, Riau, via https://upload.wikimedia.org/wikipedia/commons/1/10/Sampah_di_simpang_Jalan_Gabus_dan_Jalan_Tuanku_Tambusai_Pekanbaru_Riau.JPG, Accessed on 18 February 2016

2 Trash on the banks of a river in Jakarta, via http://energitoday.com/uploads//2015/01/sampah.jpg, Accessed on 18 February 2016

3 Trash in the ocean, near Bali, via http://images.travelerstoday.com/data/images/full/8268/trash-in-indonesia-seas-photo-by-zak-noyle.png?w=600, Accessed on 18 February 2016

Fig.4 Garbage cart[4]

Fig.5 Waste pickers[5]

Fig.6 Separation bins for trash at Campus[6]

Because of my interest in sustainable-living in my daily life, I observed that there is a large vegetarian community in Indonesia. My interest for sustainability and consumption in Indonesia grew and I wrote my Bachelors' thesis on this topic. I experienced that an important aspect is awareness of the impact of certain practices on the environment. I began doing research on the environmentalist community in Indonesia, and I wrote a paper on de-/reforestation practices in Indonesia as well. As recycling is an aspect of sustainable and environmentally-friendly consumption, I began doing research on waste management practices in Indonesia.

Indonesia is named the second biggest contributor to plastic waste in the oceans[7], the second highest emitter[8], and the third largest polluter in the world[9]. Rapid industrialisation, urbanisation, population growth[10], economic growth and a consumption boom resulted in an increase in waste. International, national, and regional attention has risen, due to disasters

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4 Waste cart, via http://assets-a2.kompasiana.com/statics/crawl/555e8aae0423bd7e688b4567.jpeg?t=o&v=760, Accessed on 14 April 2016

5 Waste Pickers Indonesia, via http://cdn.tmpo.co/data/2015/11/05/id_451483/451483_620.jpg, Accessed on 18 February 2016

6 Recycle bins on campus, via https://bioshared09.files.wordpress.com/2012/03/med_0505110337_lain-kampus-lain-pula-cara-kelola.jpg, Accessed on 18 February 2016

7 Jong, H.N., Indonesia in state of waste emergency, via The Jakarta Post (Published 9 October 2015), http://www.thejakartapost.com/news/2015/10/09/indonesia-state-waste-emergency.html, Accessed 12 February 2016

8 Dwyer, L., Indonesia's wildfires are as bad as some of the planet's worst air polluters, Takepart (published 20 October 2015), Access via; http://www.takepart.com/article/2015/10/20/indonesia-wildfires-bad-as-planets-worst-air-polluters

9 Fogarty, D., Indonesian president Jokowi's missed opportunity in Paris, Straits Times (published 1 December 2015), Access via; http://www.straitstimes.com/world/europe/president-jokowis-missed-opportunity-in-paris

caused by bad waste management, the visibility of waste, and the growing awareness of the impact of human actions on the natural environment. There is thus a high demand and need for proper waste management, and the traditional form of End-of-Pipe treatment has been replaced with a more sustainable form, namely that of 3R (reduce, reuse, recycle). Waste management in Indonesia is insufficient still, and internationally the view on it is very bad, but interesting developments, such as the recently implemented pay-for-plastic-bag policy and the Waste Bank (an individual citizen initiative), show that a serious shift is going on, making it an interesting topic to discuss.

In this sociological research, I hope to answer the question of what the significance is of 3R for waste management in Indonesia, with a main focus on policies, developments, and citizen involvement. In the literature, focus has mostly been on the government. The debate on waste management has two sides. Some argue that inadequate financing, unqualified or lack of staff and lack of public awareness are to blame[11], others argue that the government is to blame, as the majority of the local government still apply the End-of-Pipe treatment[12], do not provide good support and blame other factors[13]. The traditional method is seen as not sufficient anymore and developments are needed[14]. There is a focus on researching sustainable developments that are suited for the Indonesian case, which are mainly composting and waste-to-energy practices[15]. Areas for improvement have been discussed. In conclusion, there should be better collaboration between the government, NGOs, the private sector, and citizens, through better education, information dissemination, better monitoring,

10 World Bank, in 2014

11 Marshall, R.E., Farahbakhsh, K., Systems approaches to integrated solid waste management in developing countries, in Waste Management 33 (2013) 988-1003, Elsevier Ltd. & Shekdar, A.V., Sustainable solid waste management: an integrated approach for Asian countries, in Waste Management 29;4 (2009) 1438-1448, Elsevier.

12 P.1, Sutomo, Community-driven waste management, how sustainable are Waste Banks in Yogyakarta?, Thesis for MSc in Urban Management and Development Erasmus University, Rotterdam (2013) IHS.

13 Permana, A.S., Towolioe, S., Aziz, N.A., et. al., Sustainable solid waste management practices and perceived cleanliness in a low income city, in Habitat International 49 (2015) 197-205, Elsevier Ltd.

14 Ibid & Aprilia, A., Tezuka, T., Spaargaren, G., Inorganic and hazardous solid waste management: current status and challenges for Indonesia, in Environmental Sciences 17 (2013) 640-647, Elsevier B.V.

15 Ibid & Ibid.

and better implementing policies[16], to which I can only agree with. The Waste Bank gets attention too, as they are being able to reduce, reuse, and recycle[17] thus working together with the concept of 3R, as well as the fact that it creates self-awareness, pro-environmental behaviour, social bonds within the community, encourages technological development, educates, and provides economic support.[18] The role and involvement of citizens is discussed in the light of this[19]. Because the pay-for-plastic-bag policy is very recent, it has not been (much) discussed yet, and especially this is a good example of better citizen involvement according to me, which I see as an important aspect of sustainable waste management.

I will begin this paper with explaining the traditional waste management and reasons to switch to 3R, after which I will discuss sustainable developments. At the end I hope will be able to show that 3R is becoming more and more significant for Indonesia, as sustainable

16 Ibid & Ibid & Ibid & Ibid & Zurbrügg, C., Gfrerer, M., Ashadi, H., et. al., Determinants of sustainability in solid waste management – The Gianyar Waste Recovery Project in Indonesia, in Waste Management 31 (2012) 2126-2133, Elsevier Ltd. & Resosudarmo, B.P., Indonesia's clean air program, in Bulletin of Indonesian Economic Studies 38;3 (2002) 343-365, Carfax Publishing Taylor & Francis Group.

17 Wijayanti, D.R., Suryani, S., Waste Bank as Community-based Environmental Governance: A Lesson Learned from Surabaya, in Social and Behavioral Sciences 184 (2015) 171-179, Elsevier Ltd. & Sutomo, Community-driven waste management, how sustainable are Waste Banks in Yogyakarta?, Thesis for MSc in Urban Management and Development Erasmus University, Rotterdam (2013) IHS. & Gregson, N., Metcalfe, A., Crewe, L., Moving things along: the conduits and practices of divestment in consumption, in Transactions of the Institute of British Geographers, Journal Compilation 32 (2007) 187-200, Royal Geographical Society.

18 Ibid & Dhokhikah, Y., Trihadiningrum Y., Sunaryo, S., Community participation in household solid waste reduction in Surabaya, Indonesia, in Resources, Conservation and Recycling 102 (2015) 153-162, Elsevier B.V.

19 Ibid & Ibid & & Dhokhikah, Y., Trihadiningrum Y., Sunaryo, S., Community participation in household solid waste reduction in Surabaya, Indonesia, in Resources, Conservation and Recycling 102 (2015) 153-162, Elsevier B.V., Fehr, M., Managing waste through managing people, Chapter 6 in Waste Management – An Integrated Vision, (2012) InTech. & Sutomo, Community-driven waste management, how sustainable are Waste Banks in Yogyakarta?, Thesis for MSc in Urban Management and Development Erasmus University, Rotterdam (2013) IHS. & Zurbrügg, C., Gfrerer, M., Ashadi, H., et. al., Determinants of sustainability in solid waste management – The Gianyar Waste Recovery Project in Indonesia, in Waste Management 31 (2012) 2126-2133, Elsevier Ltd. & Wijayanti, D.R., Suryani, S., Waste Bank as Community-based Environmental Governance: A Lesson Learned from Surabaya, in Social and Behavioral Sciences 184 (2015) 171-179, Elsevier Ltd. & Gregson, N., Metcalfe, A., Crewe, L., Moving things along: the conduits and practices of divestment in consumption, in Transactions of the Institute of British Geographers, Journal Compilation 32 (2007) 187-200, Royal Geographical Society.

developments are made, and weak points of waste management are improving. 3R will become more significant if they continue with sustainable developments, and citizens will get a more prominent role in it. There are still aspects that require improvement, but recent developments seem to support 3R, making of it a success, and which might put an end to the growing of the waste problem in Indonesia.

Waste Management and its Problems

Since the 1980s, there has been a growing focus on sustainability. However, the main focus was being put on air pollution. Pollution began to be monitored, and only after the 1990s there was a more active focus on actually reducing air pollution, by trying to reduce pollution caused by motor vehicles.[20] Since 1998, waste management began to be seen as a polluter as well, and received greater attention[21]. Indonesia became a democratic state around this year, and full authority and responsibility of waste management was given to the municipal governments.[22]

The municipal governments are responsible for collecting and transporting the waste of their city district. It is collected by waste trucks owned by the municipal government, and transported to designed areas. Small enterprises and waste pickers play a significant role as well, as they collect waste from the streets or specific types of waste from landfills and sell it to interested companies. They are very visible, but are still not officially acknowledged, even though greater attention has been drawn to their horrible life situation. The waste is disposed on the district's landfill, which is an open dump area often just outside the city. It is said that approximately 81% of waste ends up in such an open dump landfill, 16% in a controlled landfill, and the rest on a sanitary landfill.[23] Since open dump landfills are very harmful for both the natural environment as well as for the nearby living community, controlled and sanitary landfills have been developed. According to data from 2009, 69% of the municipal solid waste (MSW) ends up on these landfills, 10% is buried, 7% is recycled, 6%

20 P.344-345, Resosudarmo, B.P., Indonesia's clean air program, in Bulletin of Indonesian Economic Studies 38;3 (2002) 343-365, Carfax Publishing Taylor & Francis Group.

21 P.198, Permana, A.S., Towolioe, S., Aziz, N.A., et. al., Sustainable solid waste management practices and perceived cleanliness in a low income city, in Habitat International 49 (2015) 197-205, Elsevier Ltd.

22 P.153, Damanhuri, E., Handoko, W., Padmi, T., Municipal solid waste management in Indonesia, in Pariatamby, A., Tanaka, M. (eds), Municipal solid waste management in Asia and the Pacific Islands; challenges and strategic solutions, (2014) Springer; Singapore.

23 Munawar, E., Fellner, J., Injury time for Indonesian landfills, via https://waste-management-world.com/a/injury-time-for-indonesian-landfills, Accessed 6 March 2016.

is scattered in parks, canals, rivers, terminal and ports, markets, and other places, and the remaining 5% is burned.[24] 65% of MSW is organic, consisting of for example food.[25] 50-to 60% of this is generated by households.[26] A sufficient amount of the remaining 50-to 40% is generated by traditional markets, mainly consisting of organic waste.

MSW increased from 0.8 kg per capita to 2.1 kg per capita over the past decade[27], with 3.76% between 2005 and 2008 only[28]. The waste in cities is said to increase with 2 to 4 percent every year[29]. There are more landfills needed to be able to store this growing amount of waste, but land is difficult to find in urbanised areas, which also causes the land to be expensive[30]. In many larger cities there are not enough trucks to collect all the trash as well. [31] This leads to many excess trash ending up in canals, nature, and on the streets[32]. The trash that is being disposed of in open dumping landfills leads to smoke, and bad smell and flies, which causes health problems and spreads diseases. The waste is very visible in the city, and often clogged up in canals and gutters, causing floods. The bad waste management caused a

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24 P.170, Ministry of Environment of Republic of Indonesia, State of Environment Report in Indonesia 2009 (2010), MoE of Republic of Indonesia; Jakarta.

25 P.169, Ibid.

26 P.141, Damanhuri, E., Handoko, W., Padmi, T., Municipal solid waste management in Indonesia, in Pariatamby, A., Tanaka, M. (eds), Municipal solid waste management in Asia and the Pacific Islands; challenges and strategic solutions, (2014) Springer; Singapore.

27 Sweeping Opportunities in Indonesia's Waste Management Industry, via Global Business Guide Indonesia (published 24 February 2014), http://www.gbgindonesia.com/en/main/business_updates/2014/upd_sweeping_opportunities_in_indonesia_s_waste_management_industry.php, Accessed 4 February 2016

28 P.8, Ministry of Environment of Republic of Indonesia, State of Environment Report in Indonesia 2009 (2010), MoE of Republic of Indonesia; Jakarta.

29 P.172, Wijayanti, D.R., Suryani, S., Waste Bank as Community-based Environmental Governance: A Lesson Learned from Surabaya, in Social and Behavioral Sciences 184 (2015) 171-179, Elsevier Ltd., D.R., Suryani, S., Waste Bank as Community-based Environmental Governance: A Lesson Learned from Surabaya, in Social and Behavioral Sciences 184 (2015) 171-179, Elsevier Ltd.

30 P.1189, Aye, L., Widjaya, E.R., Environmental and economic analyses of waste disposal options for traditional markets in Indonesia, in Waste Management 26 (2006) 1180 - 1191

31 Lucas, A., Jakarta's rubbish nightmare, on Inside Indonesia 80 (October – December 2004), http://www.insideindonesia.org/jakartas-rubbish-nightmare, Accessed 6 March 2016.

growth of public outcry since 1998. Local communities living next to the landfills had to deal with the consequences of the bad management, and complained about the visibility of the waste, the smell, flies, and diseases that arose in the community. It did not remain with complaints as they began protesting against the bad waste management since the early 2000s. The local people have been fencing the landfills in Bekasi, where the landfill of Jakarta is situated, and Bogor.[33]

Open dumping also leads to pollution of water, air and soil, and it releases methane and CO2[34]. The problem received international attention due to the major contribution of it to pollution and emissions. National attention especially grew when the bad waste management led to several deaths, when a landfill was overused, reaching from 60 to up to 70 meters, and due to rain caused a landslide on February 21, 2005[35]. Landslides in landfills did occur before since the 2000s, but this time 140 people were buried alive[36]. The landslide took place in the landfill of Bandung, located in Cimahi Leuwigajah. It was this event that marked the failure of the traditional waste management, and left Bandung with a serious waste problem after their landfill got out of use[37]. The city was being called the Bandung Sea of Trash, when people just left their trash everywhere in the city. Bandung declared itself to be in a state of a Waste Emergency Situation in May 2006.[38] Especially now the urgency to

32 P.150, Damanhuri, E., Handoko, W., Padmi, T., Municipal solid waste management in Indonesia, in Pariatamby, A., Tanaka, M. (eds), Municipal solid waste management in Asia and the Pacific Islands; challenges and strategic solutions, (2014) Springer; Singapore.

33 P.173-174, Ibid & Lucas, A., Jakarta's rubbish nightmare, on Inside Indonesia 80 (October – December 2004), http://www.insideindonesia.org/jakartas-rubbish-nightmare, Accessed 6 March 2016.

34 P.8, Ministry of Environment of Republic of Indonesia, State of Environment Report in Indonesia 2009 (2010), MoE of Republic of Indonesia; Jakarta.

35 P.152, Damanhuri, E., Handoko, W., Padmi, T., Municipal solid waste management in Indonesia, in Pariatamby, A., Tanaka, M. (eds), Municipal solid waste management in Asia and the Pacific Islands; challenges and strategic solutions, (2014) Springer; Singapore.

36 P.151 Ibid & Ibid & P.8, Ministry of Environment of Republic of Indonesia, State of Environment Report in Indonesia 2009 (2010), MoE of Republic of Indonesia; Jakarta., State of environment report in Indonesia 2009.

37 P.8, Ministry of Environment of Republic of Indonesia, State of Environment Report in Indonesia 2009 (2010), MoE of Republic of Indonesia; Jakarta.

38 P.178, Ibid.

find a solution for the problem grew, as it became more of a national problem and could not be further ignored.

International concepts to combat the waste problem were adopted, as it was clear that the traditional form of waste management, collecting and transporting it out of sight to a landfill, was not sufficient anymore.

The waste management changed slowly, as well as the view on dirt, from that of seeing it mostly as removing a dirt from sight and collecting it out of sight, to seeing it as reducing, reusing, and recycling a source.[39] Waste is more and more being seen as a benefit and the recycling industry started to develop.[40]

Sustainable Waste Management

It was clear that traditional methods of waste management were not sufficient anymore, and it needed to change. The Ministry of Environment began initiating developments, creating national plans for waste management. On May 8, 2008, the Solid Waste Management Act was implemented, which was the first national regulation on waste management. Since then, the international concept of 3R (Reduce, Reuse, Recycle) became important and was implemented throughout the whole of Indonesia, which was supposed to be a sustainable method to combat the problems[41], replacing the traditional End-of-Pipe treatment (Fig.6). Waste now underwent several stages so to reduce the final waste disposal.

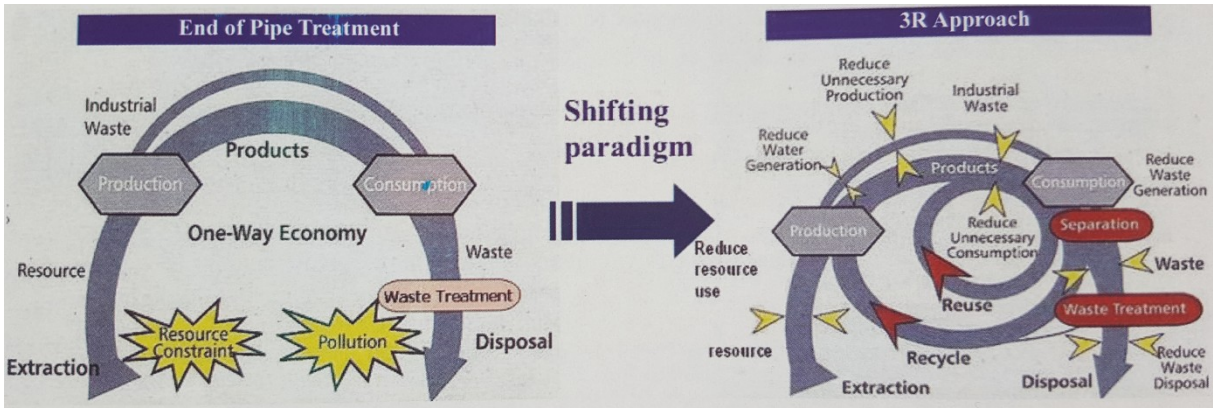

Fig.6 End-of-Pipe Treatment to 3R Method[42]

39 P.8, Ibid.

40 P.174, Ibid.

41 P.198, Permana, A.S., Towolioe, S., Aziz, N.A., et. al., Sustainable solid waste management practices and perceived cleanliness in a low income city, in Habitat International 49 (2015) 197-205, Elsevier Ltd.

42 P.176, Ministry of Environment of Republic of Indonesia, State of Environment Report in Indonesia 2009 (2010), MoE of Republic of Indonesia; Jakarta.

The highest preference of sustainable waste management is preventing waste, after which follows reducing waste, reusing waste, recycling it, transforming it into energy, and only as final option, disposing it (Fig.7).

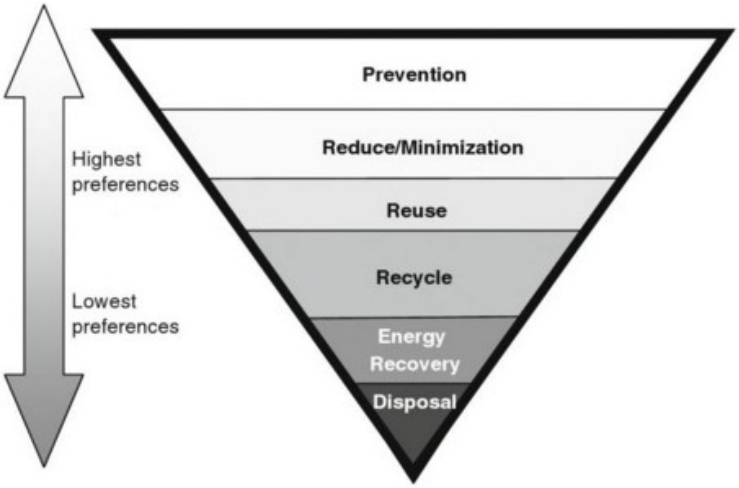

Fig.7 Sustainable waste management[43]

Indonesia seems to take this path the other way around, by focussing first on improving disposal, second developments have been made to transform waste into energy, after which reducing, reusing and recycling waste became more prominent. Only recently, preventing waste becomes a focus.

The Ministry of Environment and the government of Indonesia have been active in several ways to improve the waste management. One example of this is the goal of the Ministry to replace all open dumping landfills with sanitary-and controlled landfills within five years.[44]

The Ministry has also been encouraging and supporting governments to make their cities green and clean[45], by providing subsidies for example, and developments have been initiated and implement. The governor of Jakarta, known as Ahok, created the Infrastructure and

43 P.18, Pariatamby, A., Fauziah, S.H., Sustainable 3R practice in Asia and Pacific Regions: the challenges and issues, in Pariatamby, A., Tanaka, M. (eds), Municipal solid waste management in Asia and the Pacific Islands; challenges and strategic solutions, (2014) Springer; Singapore.

44 P.154, Damanhuri, E., Handoko, W., Padmi, T., Municipal solid waste management in Indonesia, in Pariatamby, A., Tanaka, M. (eds), Municipal solid waste management in Asia and the Pacific Islands; challenges and strategic solutions, (2014) Springer; Singapore. & Munawar, E., Fellner, J., Injury time for Indonesian landfills, via https://waste-management-world.com/a/injury-time-for-indonesian-landfills, Accessed 6 March 2016.

45 P.154, Ibid.

Public Facility Integrated Service (PPSU) on May 2015[46], that is cleaning out canals, drainage system and gutters of rubbish that have not been cleaned for the past 25 years.[47] It turned out to be successful, when areas of Jakarta that usually flood during heavy rainfalls did not do so[48]. The president of Indonesia, Joko Widodo, has also been talking about the importance of cleaning and focusses on developments. However, the idea of cleanliness of the visible environment is not new and already believed in by the elite of Indonesia long before. Cleaning the streets is performed as the streets are 'a show window of the city' [49] and thus might not lead that much to an actual shift to sustainable waste management.

As there is a high and growing demand for energy in Indonesia with the growth of population and urbanisation, energy recovery from waste becomes a preferred option. The government set up a plan to move away from fossil fuel and start using renewable energy instead. Waste fuelled power plants, and plans for developing them, have started to emerge. The first waste-to-energy power plant by using methane gas from landfills was established in Bali in December 2008. Since then there are several in other cities, such as Jakarta.[50] Plastics are being turned into diesel, and non-plastic garbage is turned into methane gas or organic fertilizer. The methane gas is being used as fuel by, for example, the local communities for cooking.[51] Foreign investors are also being attracted to enter the waste-and recycling-sector in Indonesia.

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46 Huda, L., Ahok budgets Rp1 tn to clean Jakarta water canals, on TEMPO.CO (Published 4 March 2016), http://en.tempo.co/read/news/2016/03/04/057750774/Ahok-budgets-rp1-tn-to-clean-Jakarta-water-canals, Accessed 6 March 2016.

47 Lestari, S., Jakarta ready to face rainy season, Ahok says, on The Jakarta Post (8 October 2015), http://www.thejakartapost.com/news/2015/10/08/jakarta-ready-to-face-rainy-season-ahok-says.html#sthash.ZOroZShc.dpuf, Accessed 6 March 2016.

48 Rayda, N., Jakartans report minor floods, praise Governor Ahok, on The Jakarta Globe (28 February 2016), http://jakartaglobe.beritasatu.com/news/jakartans-report-minor-floods-praise-governor-ahok/, Accessed 6 March 2016.

49 P.199, Permana, A.S., Towolioe, S., Aziz, N.A., et. al., Sustainable solid waste management practices and perceived cleanliness in a low income city, in Habitat International 49 (2015) 197-205, Elsevier Ltd.

50 P.182, Ministry of Environment of Republic of Indonesia, State of Environment Report in Indonesia 2009 (2010), Ministry of Environment of Republic of Indonesia; Jakarta.

The government has also been focussing on turning waste into compost, by stimulating composters in the way of providing subsidies[52]. A sufficient amount of waste is organic, and thus this is a good solution. Community composting is happening as well, where the compost is managed and used by the local community.

It becomes more serious now that the government realised that an important aspect of their goal involves the local community, as they are generating waste, and they thus have begun focussing on informing citizens. The 3R program was said to only have led to a decrease of waste of 7% in 2009, which the Ministry of Environment claimed to be due to a lack of public participation.[53] 'Socialization activities' were meant to increase participation and understanding among citizens. The Solid Waste Care Day, one such activity, first took place on February 21, 2009, and carried the name 'plastic bag free day'. It was a collaboration between the Ministry of Environment, NGOs and mass media.[54] The Solid Waste Care Day, now known as the National Waste Awareness Day, carries a deeper meaning, as it is meant to remember the disaster(s) caused by the landslide(s) in landfills. It is one way to make citizens more aware of waste, as education is seen as an important aspect of the success of the management.[55]

Other examples that more directly target citizens is the arrival of separate bins for organic and inorganic waste since 2009[56], although citizens often do not understand recycling and the importance of it, and if they do, they do not seem to know where to bring their goods to.[57] A new policy that was implemented on the 21st of February 2016, which is National Waste Awareness Day, forces costumers to pay 200 rupiahs[58] for plastic bags in several cities.

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51 Azhari, M.A., Oil rich Bojonegoro turns garbage into alternative energy, fertilizer, on The Jakarta Globe (2 March 2016), http://jakartaglobe.beritasatu.com/news/oil-rich-bojonegoro-turns-garbage-alternative-energy-fertilizer/, Accessed 6 March 2016.

52 P.178, Ministry of Environment of Republic of Indonesia, State of Environment Report in Indonesia 2009 (2010), MoE of Republic of Indonesia; Jakarta.

53 P.178, Ibid.

54 P.177, Ibid.

55 P.1181, Aye, L., Widjaya, E.R., Environmental and economic analyses of waste disposal options for traditional markets in Indonesia, in Waste Management 26 (2006) 1180 - 1191

56 P.175, Ministry of Environment of Republic of Indonesia, State of Environment Report in Indonesia 2009 (2010), MoE of Republic of Indonesia; Jakarta.

The policy is aimed to prevent or at least reduce consumption of plastic bags[59]. It acts as a test run and after proved to be successful will be implemented throughout the whole of Indonesia. Several cities part of the test run have already increased the price to 5.000 rupiah. Costumers have reacted positively on the policy, as it is also a solution for their otherwise non-usable small money. The policy is advertised via posters that show that plastic bags are bad for the environment, and costumers seem to understand the importance of it.

Local citizens became more involved in the management of their own waste, in the form of for example the waste bank. The first *Bank Sampah*[60] was established in 2008, near Bantul, Yogyakarta, when Bambang Suwerda, a lecturer on public health, saw all the piled-up waste in his village that caused diseases such as dengue. He started to build a 'community consciousness', by educating villagers of garbage disposal and how to recycle by using different trash bins. The villagers would now recycle their goods and bring it to the bank. There is a division of plastic, paper, and cans and bottles. Once there, an employee will weigh the trash and write down the amount and value of it in one's personal credit book. With the credit they can buy goods from the store. Some of the garbage is turned into other goods such as bags and shoes by village women or students, and some of the garbage is sold in bulk to interested waste companies, who for example turn it into renewable energy. The model of the *Bank Sampah* spread through media and by word, and since 2012, the Ministry of Environment began spreading the model of the waste bank as well. Bambang Suwerda was invited by the Ministry to speak about his creation to several provincial heads.[61] Now there are approximately 471 banks throughout Indonesia. One such bank even manages a

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57 Satriastanti, F.E., Indonesia Lagging Behind World in Recycling Trash, via Jakarta Globe (Published 22 June 2011), http://jakartaglobe.beritasatu.com/archive/indonesia-lagging-behind-world-in-recycling-trash/, Accessed 4 February 2016

58 Fajarta, C.R., Retailers to Charge Rp 200 for Plastic Bags to Support Govt Green Initiative, via Jakarta Globe (Published 15 February 2016), http://jakartaglobe.beritasatu.com/business/retailers-charge-rp-200-plastic-bags-support-govt-green-initiative/, Accessed 18 February 2016

59 Jakarta and 8 other Indonesian cities ready to start making consumers pay for plastic bags on Feb 21, on Coconuts Jakarta (Published 9 February 2016), http://jakarta.coconuts.co/2016/02/09/jakarta-and-8-other-indonesian-cities-ready-start-making-consumers-pay-plastic-bags-feb, Accessed 10 February 2016. & Jakarta introduces Rp 200 per plastic bag policy, gov't looking to increase rate to Rp 5,000, on Coconuts Jakarta (22 February 2016), http://jakarta.coconuts.co/2016/02/22/jakarta-introduces-rp-200-plastic-bag-policy-govt-looking-increase-rate-rp-5000, Accessed 6 March 2016.

60 Pp.64-65, Nilan, P., Wibawanto, G.R., "Becoming" an environmentalist in Indonesia, in Geoforum 62 (2015) 61-69, Elsevier Ltd.

kindergarten, where parents from poorer neighbourhoods can bring their children to, in return of their recycled goods. In this way, the community receives additional income and goods and a clean environment. They can actively participate in managing their own environment, and it helps in creating awareness regarding waste.

Conclusion

Due to urbanisation, industrialisation, population growth and a consumption boom, it is said that (MS-) waste increased with 162,5% in the last decade. In 2009, 81% of this waste was disposed of in open dumping landfills, which are often badly managed. Only 7% of it was recycled. Open dumping landfills is causing several both health and natural environment-related problems, and caused many deaths in 2005, marking the failure of traditional waste management.

It was clear that the traditional waste management method was not successful anymore, and it received greater attention from the Ministry of Environment. Waste management was now for the first time acknowledged as a major national problem, and it received international attention as well. The government began implementing national plans, and more sustainable methods of waste management began to emerge since the beginning of the 2000s. However, we see that public outcry already existed, and it seems that there was a sense of ignorance for the problem coming from the government.

On May 8, 2008, the Solid Waste Management Act was implemented, and the international concept of 3R began to be used, thus replacing the End-of-Pipe treatment. It was the first national regulation on waste management. Since then, sustainable waste management practices became more seriously practiced, and sustainable developments began to emerge more rapidly, of which I have just discussed several examples.

The focus still seemed to be on improving disposal practices, as the Ministry focusses on improving disposal areas and infrastructure, but waste is more and more being seen as a source, and the focus is changing from being on proper disposal of a waste, to reducing, reusing, and recycling of a resource. Practices such as turning organic waste into compost and transforming waste to fuel have emerged, and these methods seem to be perfectly suitable for the Indonesian case. Better waste separation and encouraging waste reduction received more attention recently, and it seems that by greater support, and by focussing more on the role and involvement of citizens, the final stage of sustainable waste management has been reached, namely preventing waste.

In combatting the waste problem, the focus more and more is being put on fostering understanding of the problem among citizens and changing their consumption, with the use of media, with the goal of reducing waste. It seems that the involvement and collaboration

61 P.29-30, Sutomo, Community-driven waste management, how sustainable are Waste Banks in Yogyakarta?, Thesis for MSc in Urban Management and Development Erasmus University, Rotterdam (2013) IHS.

with citizens led, and will lead, to successes. One example of such a success is the *Bank Sampah*, that allows citizens to actively participate in the 3R method.

Recent developments seem to show that the focus of the government is not simply blaming citizens (anymore), but actively coming up with plans to improve the situation. Citizens as well seem to get more involved by initiating plans. The focus lies on coming up with sustainable solutions. However, it should be kept in mind that there are differences per area for how far this is true. It seems that there is better collaboration, by being more transparent about waste management and spreading information. This could thus make of 3R a success. Awareness and participation in reducing, reusing, recycling and preventing waste is growing and will continue to do so if developments continue in this pace. More innovative sustainable developments will probably arrive soon. 3R is already more significant for Indonesia than it was a few years ago just after implementation of the concept. The newly implemented pay-for-plastic-bag policy seems to become a success, and more national plans should be created, and already existing ones should be further implemented.

Access to and availability of sustainable options still needs improvement, and it seems that mainly the direct and visible environment receives greatest attention. However, this still leads to a step in the right direction.

As soon as sustainable waste management methods become more visible in Indonesia, in for example the way of separation trash bins everywhere, it will show how much of a success 3R has become to be. As the pay-for-plastic-bag policy was not much later implemented in Indonesia as it was in for example the Netherlands, I predict that Indonesia might even come up with innovative ideas in the area of sustainable waste management somewhere in the following years. It would be very interesting to walk around in an Indonesia, wherein one would not see the trash that has almost become to be standard for certain areas, and knowing that it is now used for other, sustainable, purposes.

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