

# **The “Wickedness” of Trashing the Plastics Age: Limitations of Government Policy in the Case of the Philippines**

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Working paper  
No. 231

December 2019

The SOAS Department of Economics Working Paper Series is published electronically by SOAS University of London.

ISSN 1753 – 5816

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### **Suggested citation**

Kunesch, N and Morimoto, R (2019), “The “wickedness” of trashing the plastics age: limitations of government policy in the case of the Philippines”, SOAS Department of Economics Working Paper No. 231, London: SOAS University of London.

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# The “wickedness” of trashing the plastics age: limitations of government policy in the case of the Philippines

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## Abstract

Characteristics of “wicked” problems have been applied to guide policymakers address complex, multi-faceted dimensions of social-environmental challenges, such as climate change and ecosystem management. Waste management exhibits many of these characteristics, however, literature which frames waste as a “wicked” problem is absent. Addressing this gap, this paper explores the extent to which institutional and legislative frameworks reduce waste generation, and highlights various challenges policymakers face when addressing waste management. Building a case around frameworks in the Philippines, this paper first provides a review of current waste management challenges before applying textual analysis to investigate how residual waste is addressed by existing legislation, and through ongoing legislative amendments and creation by the Philippine Congress.

This research reveals discourse exists within the narrative of waste management policy. There are those policymakers with preference for greater command and control style policy and those with greater preference for reduced policy interventions. The former supports waste mitigation through encouraging and incentivising behavioural changes, while the latter emphasises increased reliance upon market-based solutions and technological innovation to reduce waste quantities. This paper ascertains debates surrounding waste management policy, such as those ongoing within Philippine congress, demonstrate that waste management can be considered as a “wicked” problem. This paper concludes successful waste management policies should be measured by reduction in waste quantities, waste volumes and the persistence of waste toxicity, in addition to decreased detrimental impacts to human and environmental health. Parameters such as these may guide policymakers navigate the “wickedness” of waste management.

**Keywords:** wicked problems; waste management; waste pollution; plastic waste; the Philippines; government policy

**JEL classification:** Q53, Q54, Q56, Q58

**Acknowledgements:** Special thanks are due to Dr Jorge Emmanuel, Merci Ferrer and the Mother Earth Foundation’s Negros – Siquijor Chapter and War On Waste team for sharing their knowledge and continued inspiration.

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## 1. Introduction

Writing in the 1940s, Yarsley and Couzens publication “Plastics” offers indication as to how plastics have evolved into a major contemporary challenge. The authors, both industrial chemists, marvel at the high performance, versatile, and durable material characteristics of plastics and discuss plastic with romanticism in which only a historical publication without the bias of hindsight has the advantage to offer (Yarsley and Couzens, 1942). Forecasting plastics would conserve natural resources by supplementing products previously made of wood (1942, p. 152), the magnitude of the single-use plastics industry and the extent to which “end-of-life” plastic is discarded in the environment is beyond Yarsley and Couzens’ plastic prophecy.

Plastic, more specifically microplastics (particles less than 5 mm in diameter), are now ubiquitous in all environments. Distributed three-dimensionally by waterways and ocean currents (Raubenheimer and McIlgorm, 2017), plastic contamination is documented within ocean sediments and Arctic ice (Geyer et al., 2017). Atmospheric fallout of microplastics is a novel and subsequently, a neglected area of research. However, recent studies reveal microplastic contamination in snow samples (Bergmann et al., 2019), possibly originates from waste incineration (Dris et al., 2016). Owing to the global scale of mismanaged plastic and multi-sector reliance on the material, the processes by which plastics are leaked from land-based sources into undesignated environmental sinks have been overlooked by research literature. As evidenced by Marine Pollution Bulletin editorial, titled “*So when will we have enough papers on microplastics and ocean litter?*” (Borja and Elliott, 2019), a paradigmatic shift is underway for greater research to examine the complexity of the waste stream connecting sources of virgin plastic to environmental sinks. Greater research into these processes sheds light on how and where plastics are mismanaged and at what points plastic transitions from a useful material of value, to a disposable and valueless waste material.

There is substantial debate over who is to be held accountable for the creation of mismanaged plastic waste. The mainstream narrative shifts responsibility between three main actors located at different points in the waste stream: 1) the fossil fuel industry who extract hydrocarbon based plastic, 2) product manufacturers who drive plastic supply chains and approve product design, and 3) consumers whose demand, behaviours and choices dictate the rate of plastic consumption. Waste management is highlighted by the United Nations Sustainable Development Goals (SDGs) as a key element of sustainable development and accordingly, has also become a political priority for governments (Wilson, 2015).

Cities in low- and middle-income countries, particularly those located in Asia, face major solid waste management<sup>3</sup> (SWM) challenges as population and economic development is forecast to increase. As commodity consumption positively correlates to income, so too does waste production (*Green Cities*, 2012). Furthermore, the biodegradable percentage of waste decreases as the Global Waste Management Outlook report demonstrates “organic fractions [of waste]... are significantly higher in middle- and low-income countries...than in high-income countries” (Wilson, 2015, p. 57). In countries with growing populations and increased urbanisation, such as the Philippines, there is a temporal lag between consumption-led economic growth and a country’s capacity to enhance the efficiency of its waste management catering to increased consumption, and increased residual waste, therefore increase in waste quantities overall. This gap between increased waste creation and establishing effective waste management systems influences both the location and magnitude at which plastic waste end up in unintended and unmanaged sinks.

Waste management systems refers to the collection, transportation, treatment and disposal of waste. Between urban and rural regions in the Philippines, waste collection rates vary dramatically (Kaza et al., 2018), and landfill provides an end-of-pipeline treatment solution for the vast majority of solid waste. Comparatively, in Europe, at least 90% of waste is collected and Integrated Waste Management (IWM) systems are successfully utilized to reduce waste volumes (Bufoni et al., 2014). IWM is defined as “selection and application of suitable techniques, technologies, and management programs to achieve specific waste management objectives and goals” (Kreith and Tchobanoglous, 2002, p. 1.8). In countries with developed waste management systems, waste streams are redirected from landfill sinks via simultaneous applications of waste reduction, reuse, recycling (3Rs) principles and Waste to Energy (WTE) programs. Traditionally associated with incineration, WTE is broadly applied to any waste treatment process which generates energy, including processes of thermochemical, physicochemical or biochemical conversion (Malinauskaite et al., 2017).

Residual waste, by definition, cannot be reused, recycled, or composted. Therefore, WTE or waste reducing policies, as systems of IWM, or landfill, can be applied as strategies to treat residual waste. In the case of the Philippines, waste incineration is prohibited, therefore policies which incentivise waste reduction and landfill are two legal options for policymakers. Decoupling waste generation from economic growth is difficult to achieve and correspondingly, policies which incentivise waste reduction encourage reduced consumption. Economic and human development must be carefully considered when formulating regulatory policy. Single use plastic bans and levies have been introduced in the Philippines (UNEP, 2018; UNEP, 2018), however

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<sup>3</sup> Solid waste refers to waste generated from municipal, industrial, and agricultural sources but is herein used to reference municipal waste sources only.

there is limited information on the success, implementation and enforcement of such policy instruments.

Economically, landfill is the least costly waste treatment method to manage large volumes of residual waste; examples of which include plastic packaging, associated commonly with Fast Moving Consumer Goods (FMCG) and plastic bags (GAIA, 2019). Currently, approximately 3.4 billion PHP is spent on waste collection, transportation and disposal in Metro Manila alone (Arancon et al., 2013, p. 60). This is an expense which is forecast to increase five-fold by 2025, given that the country's annual waste generation is predicted to double from 14.6 million metric tonnes (MMT) per annum to 28.4 MMT (Hoornweg and Bhada-Tata, 2012), owing to continued urbanisation and economic growth.

The environmental costs of landfill are significant however, and these have not been successfully internalised yet. Areas of land of adequate size to store waste, and geology to prevent leachate are often unavailable (Soupios and Ntarlagiannis, 2017). Landfill capacities are often surpassed due to urbanisation and population growth, but also short-term urban planning forecasts and increasingly shorter product lifecycles. The Global Alliance for Incinerator Alternatives (GAIA) (2019) argues that residual waste, in the form of single-use disposable plastic, is the greatest obstacle to effective SWM in the Philippines.

As with other development dilemmas which require social, environmental and economic planning, waste management is a significant challenge for policymakers. These problems are clouded by conflicting values among stakeholders and decision-makers owing to the ambiguity surrounding the problem and unclear consequences of any action taken to mitigate said problem. As such, these problems have been coined as “wicked” problems. Literature describing “wicked” problems has been used to conceptualise the complexities of policy planning to address global climate change (Lehtonen et al., 2018; Levin et al., 2012), water pollution (Patterson et al., 2013), and ecosystem management (Dronova, 2019) among other socio-environmental concepts. Few studies have examined SWM as a “wicked” problem (Chan, 2016; Tong and Tao, 2016), and none provide context-specific to the Philippines.

This paper hopes to address this literature gap and demonstrate residual waste as a “wicked” problem by answering two questions. Firstly, to what extent do Philippine legislative and institutional frameworks mitigate the creation of residual waste? and secondly, how is residual waste addressed within proposed legislation filed through congress? This paper argues that waste management policy, should facilitate “taming” (mitigating) residual waste, and therefore be measured by reduction in waste quantities, waste volumes and the persistence of waste toxicity, in addition to decreased impacts to human and environmental health.

This paper is structured as follows. Firstly, the concept of “wicked” problems is explored through a literature review followed a review of the application of “wicked” problems as contextual framework to SWM. Section three explores existing waste management systems in the case of the Philippines and frames the environmental and social implications of these strategies as failing to “tame” the “wickedness” of waste management. Section four provide the methodology for this paper and section five describes efforts to mitigate residual waste volumes in existing legislation and reveals the narrative within congress bills, highlighting discourse over how residual waste should be mitigated. Section Six provides recommendations for further research and conclusions.

## 2. Literature Review

### 2.1. Complexities of wicked problem

Conceived within the context of social policy, wicked problems describe the nature of social and environmental policy challenges, examples of which are encapsulated by the SDGs (Elia and Margherita, 2018). Coining the term, Rittel and Webber explain that their adjective choice is synonymous with “tricky” or “malignity” as opposed to the moral and ethical connotations of the word “wicked” (1973, p. 160). In their paper, Rittel and Webber describe ten distinguishable properties which contribute to the “wickedness” of a problem. Apply the framework of a “wicked problem” to a broad range of disciplines such as economics, environmental science, health, and urban planning, the ten characteristics, which set “wicked” problems aside from their “tame” counterparts, have since been refined further by scholars. Duckett and colleagues (2016) propose “wicked” problems can be summarised into six characteristics, where Conklin (2005) suggests six different characteristics. In the context of marine plastics, Landon-Lane proposes “wicked” problems have seven features (2018), while Batie (2008) and Howes and Wyrwoll (2012) both refer to four qualities offered in a comparison made by Kreuter (2004).

The consensus is that “wicked” problems are indefinable both by definition and by solution. Unlike definable “tame” problems, “wicked” problems are ill-structured and are influenced by dynamic and incorrigible interconnected linkages of social, political, economic and ecological inputs and outputs. The centre of a “wicked” problem is therefore ambiguous. “Wicked” problems are also unique; the unique perception of each actor who frames the problem also influences potential solutions and actions for intervention depending on whether the views of that person are more tolerant or adverse to risk. Where “tame” problems have low uncertainty and solutions deduced and measurable by scientific enquiry, “wicked” problems do not. “Wicked” problems present high uncertainty; hence, parameters offered to solve a “wicked” problem are imprecise and may be inadequate. Furthermore “wicked” problems evolve in response to any input given to the problem and by giving input to the problem, outputs evade optimal and long-life solutions. There is no stopping rule to such problems. Policymakers are left to make decisions with only “known unknowns” (Ocampo, 2011). Consequently, solutions to “wicked” problems are subjectively good or bad. Delivering a definitive true or false resolution, which “tame” problems receive, is impossible.

Based upon this contextual framework of “wicked” problems, Grant-Smith and Osborne (2016, p. 47) argue that scenarios requiring infrastructure provision are “tame” problems. Grant-Smith and Osborne contend that these problems are definable, despite being complicated and technically demanding, and can be solved through application of systematic processes and technology. This is true, Rittel and Weber present “paved streets, roads and piped water” as examples of tame

problems within their original work (1973, p. 156). In the case of managing residual waste, provision of infrastructure such as landfill is necessary to provide adequate SWM services (Wilson, 2015). However, dimensions of financing, political fragility, population growth, insufficient technical capacity, ambiguity around responsibility and accountability, and decentralisation also contribute to SWM challenges, as discussed previously and by Kaza (2018). Whilst infrastructure is necessary, these additional dimensions of managing residual waste, in addition to environmental impact, distort any clear policy action and push waste management outside the scope of a “tame” problem into the indistinct territory of a “wicked” problem.

Viewed through the conceptual lens of Levin (2012), dimensions of residual waste surpass even the “wickedness” of most policy dilemmas, and so may be addressed as a “super wicked” problem. Collective global contributions to the problem, absence of central institutional framework, temporal pressures, and contemporary bias demonstrated through hyperbolic discounting, aggravate the complexities of “wicked” policy challenges into the realms of the “super wicked” (Levin et al., 2012). Placing residual waste within Levin’s framework; as populations and urbanisation increases, a greater number of consumers create greater quantities of nonbiodegradable waste. With no central administrative body providing a global institutional waste framework, by which intervention is possible to curb consumption and subsequent waste creation, society as a global unit therefore, omit the “wickedness” of the plastic problem. This in turn results in the waste problem perpetuating, and our consumption choices in the present push the need for response and solution to the problem into the future and onto future generations.

Authors using “super wicked” to describe policy challenges have attracted criticism, however. Criticising Lazarus’s (2009) use of Levin’s framework in the context of climate change legislation, Cole (2010) argues that the defining characteristics of “super wicked” problems apply to an array of legislative challenges not specific to environmental challenges exclusively. Moreover, Duckett (2016) incorporates aspects of Levin’s framework within his consolidation of Rittel and Weber’s ten characteristics of “wicked” problems. It appears scholars are opposed to complicating the way in which naturally complex problems are explored with labels to categorise policy challenges into more or less challenging.

“Wicked” problems are inherently interlinked by inputs into, and outputs from these policy challenges; therefore, it is also unlikely that categorisation of socio-environmental challenges could even be possible. For example, consumption creates residual waste and methods of waste management contribute to greenhouse gas (GHG) emissions, which in turn fuels global climate change. The Intergovernmental Panel on Climate Change (IPCC) estimates solid waste contributes 4% of GHG attributed largely to uncaptured methane emissions from landfill (2006, p. 3.6). How and who decides which part of this web is “tame”,

“wicked”, or “super wicked”? Awareness of these complex interconnections is vital to combating the “wickedness” of “wicked” problems (Lehtonen et al., 2018).

## 2.2. The “wicked” problem of residual plastic waste

Literature exploring waste management as a “wicked” problem is scarce in comparison to the body of literature which places mismanaged ocean plastic within this conceptual framework. For example, Landon-Lane’s (2018) “Corporate Social Responsibility (CSR) in marine plastic debris governance” paper acknowledges the obligation multinational corporations (MNC) have to diluting the “wickedness” of residual waste as major actors contributing to the design and manufacture of plastic products. The scope of Landon-Lane’s paper does not explicitly explore marine plastic debris as a land-based waste management problem. Examining consumption as a causative symptom to the “wickedness” of SWM, Chan’s (2016) paper does, however.

Exploring waste management as a “wicked” problem and doing so through an ethical lens, Chan’s approach captures and allows for elaboration upon the temporal and discounting dimensions of wicked problems described by Levin (2012) and Duckett (2016). Where Landon-Lane’s paper is specific to waste management in the context of private stakeholders, the moral obligations which Chan discusses can be applied uniformly to any actor who contributes to decision making relating to residual waste, be that product design decisions, consumer choices, or policymakers waste management strategies. Offering Singapore’s offshore Semukau landfill infrastructure project as an example, Chan (2016) stresses greater moral consideration must be given to consequences received by future generations from the actions of the present and their endeavours to “tame” the challenges of residual waste disposal. Where such feats of design and civil engineering exhibited by the Semukau landfill are currently beyond the fiscal and technical capacity of the Philippines, the moral dimensions of waste disposal that Chan discusses apply to all waste disposal strategies which require infrastructure, construction and treatment of some kind.

Exploring the impact of rapid urbanisation on SWM in the context of Beijing, China, Tong and Tao (2016) describe the contribution the informal waste sector (IWS) make to IWM systems of recycling via labour-intensive segregation activities. Greater parallels can be drawn between Tong and Tao’s case study and the Philippines, which is increasingly becoming urbanised and where IWS play a vital role in waste recovery. Where Chan discusses environmental, social, economic, and ethical costs of residual waste on future generations, Tong and Tao focus their work on increased engagement with present actors. Highlighting that SWM policy is often blinkered by the environmental and resource dimensions of waste, the authors argue failure to integrate *all* stakeholders in SWM planning processes increases the risk of creating

knowledge gaps, which in turn perpetuates the “wickedness” of SWM further. Tong and Tao demonstrate this point in the case of Dongxiaokou, a former “waste city” on the periphery of Beijing. Here, IWS, comprised of rural migrants, autonomously developed an effective, but illegal, recycling market. Consequently, IWS were “seen as either a symptom of the [waste] problem or a tool that could be an option for solving the problem” (Tong and Tao, 2016, p. 15) but were not perceived as empowered stakeholders to contribute in the decision process over the government’s adoption of an “urban circular economic system” (ibid). The same is true for the Philippines where IWS are not included within the scope of legislative frameworks (Paul et al., 2012). Tong and Tao emphasize collaborative and inclusive strategies are necessary to manage SWM “wickedness”, and to overcome the evolving nature and “no stopping solution” characteristic of “wicked” problems.

Reviewing Tong and Tao’s article, Goldstein is in agreement “urban waste management is always a “wicked” problem” (2017, p. 177). However, by focusing on government failure to include all stakeholders and prioritising profit maximising features of urban planning over SWM, Goldstein argues Tong and Tao discuss “tame” but technically complex dimensions of SWM, rather than focusing specifically on the wicked features (Goldstein, 2017). In response to Goldstein’s comments, Tong (2017) argues the wickedness, by its very definition given by Rittel and Webber (1973), stems from a decision-makers actions guided by their individual values to try to provide a solution to waste management.

### **3. Case Study: Framing residual waste challenges in the Philippines**

As the scale of consumption, manufacturing and waste management is vast and driven by a global network of actors, each paper included within the literature review contributes understanding to the multi-faceted dimensions of waste management in the Philippines. Taking into consideration the contribution of all actors, both within the Philippines and internationally, and the moral dimensions of waste, this section now focuses upon how institutional frameworks support waste management strategies in the Philippines and how these framework engage with stakeholders to mitigate residual waste.

#### **3.1. Philippine solid waste management systems**

Chaired by the Department of Environment and Natural Resources Environmental Management Bureau (DENR-EMB), the Philippines' National Solid Waste Management Commission (NSWMC) consists of 14 members from government departments and three private sector representatives from the recycling industry and plastics industry, and the non-government organisation (NGO) sector. Providing a framework for SWM, the commission emphasises the adoption of waste avoidance practices in the form of the 3Rs and integration of IWM systems. Despite this framework, landfill remains the most common waste management strategy in the Philippines (Modak, 2017)

The NSWMC (2015) report states a total of 523 uncontrolled<sup>4</sup> landfill sites and 317 controlled sites in the Philippines, with the commission promoting transition to Sanitary landfill (SLF). SLF are modern engineered sites which isolate waste, facilitating biological and chemical decomposition of waste without leaching contamination to the environment. The National Solid Waste Management Status Report (ibid.) claims 86 SLF are in operation with an additional 51 sites under construction in 2014. More current information is not available, as the commission has failed to meet its mandate to produce biannual updates since 2015. Furthermore, it may be brought to question whether these sites are correctly maintained to prevent contamination from leachate, or if SLF is just a green label pasted onto controlled sites. In the case of Montalban SLF located in Metro Manila, Castañada (2012) reports the latter.

Developing waste composition profiles is key to improving the efficiency of waste management systems. According to Waste Assessment and Characterisation Surveys (WACS) conducted by NSWMC (2015), biodegradable, recyclable and residual waste constitute 52%, 28% and 18% the average weight of municipal waste, respectively. Waste statistics are complicated to gather. Conducting WACS with

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<sup>4</sup> Uncontrolled sites are unmanaged therefore waste received is unsegregated and unmonitored.

greater methodological rigour<sup>5</sup> in 21 locations across the country, GAIA found contradictory results. Average waste compositions consisted of 62% biodegradable, 15% recyclables, and 23% residual waste (GAIA, 2019). Building a waste profile based on weight alone is limiting. For example, the weight of residual waste will constitute a greater number of individual items but lower weight in comparison to recyclable or biodegradable waste. Addressing this, GAIA conduct Waste Assessment and Brand Audits (WABA) to disaggregate WACS data and reveal the quantity and composition of residual waste.

164 million sachets<sup>6</sup> and 48 million plastic bags are consumed in the Philippines daily (GAIA, 2019). These findings are not surprising given packaging consumes approximately one-third of all plastics produced, and plastic recovered from the environment commonly consists of food-related packaging (Heidbreder et al., 2019). Positive correlation between consumption and income reflected by greater waste consumption in urban areas has already been discussed, and Silpa (2018) demonstrates the Philippines is no exception to this trend. By 2028, the country's population is estimated to surpass 120 million (UN, 2018), with urban populations projected to exceed rural populations. Using GAIA's (2019) daily consumption of sachet and plastic bag estimates to give projections of residual waste generated annually, and give consideration to the country's increasing population; the waste management challenge the Philippines faces is drawn into focus. Trends that indicate increased urbanisation creates greater residual waste than biodegradable waste must be factored in also. These projections demonstrate greater action is necessary to address both dimensions of residual waste creation and waste management.

The Philippines boasts high recyclable waste recovery rates, owing largely to a substantial IWS who rely on collecting high-value materials as a source of income. Comparatively, less than 5% of residual materials are recovered due to low-value and undesirable collection conditions (Ocean Conservancy, 2015). While recycling residual materials is possible, it is a technically complex process (Al-Salem et al., 2009; Hopewell et al., 2009; Singh et al., 2017). Aspects of this complexity include blend of materials added to composite plastics and the wide range of chemical additives combined during plastic production to act as plasticisers, adhesives and flame retardants in addition to modulating texture, colouring, and antimicrobial properties (Thompson et al., 2009). Consequently, recycling residual waste is not a common practice and landfill is the most convenient treatment practice.

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<sup>5</sup> DENR recommend 3 days waste collection from minimum of 30 households. GAIA recommend 9 days waste collection from a minimum of 50 households.

<sup>6</sup> mono-layered or multi-layered, flexible packaging containing small quantities products, commonly associated with FMCG (Nulkar, 2016; *The New Plastics Economy*, 2017)

### 3.2. “Taming” Residual Waste With Landfill: Environmental and Social Implications

As previous sections have demonstrated “wicked” problems, by their very nature, are clouded by a tremendous deal of uncertainty. Evidence which corroborates the detrimental impact of residual waste toxicity on the environment and human health can be utilised as known parameters to guide decision-making processes. This section discusses the various pitfalls of landfill as a waste management strategy in the context of the Philippines. Abbasi and Abbasi (2012) acknowledge that pollutant control is more problematic in uncontrolled landfill sites as unsegregated waste produces pollutants in larger quantities. Major concerns are (i) gas emissions; (ii) leachate contaminating soil (iii) leachate contaminating water resources, both groundwater and surface water and (iv) disease via biological vectors or exposure to contamination.

Through natural processes of decomposition, GHG, namely methane (CH<sub>4</sub>), carbon dioxide (CO<sub>2</sub>) and nitrous oxide (N<sub>2</sub>O), are emitted from landfill. The Intergovernmental Panel on Climate Change (IPCC) estimates solid waste contributes 4% of greenhouse gases (GHG), attributed largely to uncaptured methane emissions from landfill (2006, p. 3.6). Producing a global warming effect 25 times greater than that of carbon dioxide, CH<sub>4</sub> is an extremely potent GHG. Consequently, the Philippines National Framework Strategy on Climate Change 2010-2022 (Climate Change Commission, n.d.) identifies waste as the third greatest emitter of GHGs in the Philippines, following energy and agriculture sectors. The country’s inefficient waste management, therefore, contributes to “wickedness” of global climate change, of which the Philippines features within the top ten countries most affected by climate risk (Eckstein et al., 2018).

Without appropriate infrastructure to capture these emissions, unmonitored release results in low-temperature smoulder or uncontrolled fires. This is how Smokey Mountain uncontrolled landfill in Metro Manila gained its name (Abad, 1991; Adriano et al., 2018). Furthermore, when residual waste containing chemical additives undergoes processes of incomplete combustion, synthetic chemicals such as dioxins (Polychlorinated dibenzo-p-dioxins, PCDDs), and furans (polychlorinated dibenzofurans, PCDFs) are produced. Examples of Persistent Organic Pollutants (POPs), these chemicals are of global concern owing to their longevity, high leachate potential and bioaccumulative toxicity through food chains (Raubenheimer and McIlgorm, 2017). As a signatory country of the Stockholm Convention, the Philippines is mandated to take measures to reduce the unintentional release of these chemicals, with the goal of continued minimisation and ultimate elimination. The Stockholm Convention adopts principles of precaution to address the temporal and hyperbolic discounting dimensions applicable to climate change and to waste

management. However, with relevance to the waste sector, poor waste management hinders the Philippines achieving its obligation.

Focusing on the impact of waste on a national level in the Philippines, Minh (2003) found the presence of all of the aforementioned POPs within soil samples at Payatas controlled landfill in Metro Manila. Samples from this site had the highest average concentration of dioxins and furans compared to sites examined by authors in Cambodia, India and Vietnam and 11 further countries examined by Wagrowski and Hites (2000). Similarly, Kwan (2013) found high levels of polybrominated diphenyl ethers (PBDEs), also an example of a POP, in sediment cores and water leachate sampled from both the Smokey Mountain and Payatas sites.

Many landfill sites in the Philippines are located in close proximity to waterways; Smokey Mountain is adjacent to the Manila Bay, the Payatas site is situated half a kilometre from Novaliches Reservoir the main source of drinking water in Metro Manila. In Negros the Candau-ay uncontrolled landfill in Dumaguete City, the provincial capital of Negros Oriental, literally overhangs the Banica River. Plastic leakage and direct contamination from leachate are therefore hard to control and monitor. Groundwater contamination occurring from gas emissions via hydrostatic pressure and capillary action through rock fractures is a greater challenge to monitor (Castañeda et al 2012). Examining wells utilised for drinking water around Payatas, Su (2009) found contaminants associated with landfill leachate well beyond national drinking water levels recommended by DENR-EMB and the Department of Health.

The complex relationship between the IWS and their contribution to waste management has been touched upon already in this paper. Following the collapse and subsequent fire at the Payatas site in July 2000, killing 218 IWS workers (Angara, 2010), it was then the IWS who relied on the site for their livelihood who were instrumental in the site reopening. Examining the presence of POPs in the breast milk and hair samples of waste workers at the Payatas site, Malarvannan et al. (2013) found concentrations were significantly higher than those women who reside in further proximity to the site. POPs are ubiquitous within the environment and the levels observed in this study were comparable to other Asian or European countries. Nazareno et al. (2012) found IWS residing in and around Inayawan SLF in Cebu City, perceived the sites had a negative impact on their health. Dengue fever, skin diseases, and diarrhoea cited as the most common illnesses,

This section has discussed the pitfalls of landfill in the Philippines drawing reference to three sites in Metro Manila; Payatas, Smokey Mountain and Montalban, and the Inayawan Sanitary Landfill in Cebu City. In each case, these sites are located within one of the country's three metropolitan centres and therefore only represent the scenario of landfill in an urban context. At present, no published information

describes landfill scenarios in a rural setting, which highlights an area requiring further research.

#### **4. Research Methodology**

Placing residual waste within the conceptual framework of a “wicked” problem and having discussed the empirical evidence demonstrating landfill may be a false solution to “tame” residual waste; this paper now examines the extent to which residual waste volumes are addressed within Philippine legislative policy.

In the Philippines, any proposed amendments to laws, or creation of new laws, must be filed with Congress through one of two legislative arms; the House of Representatives or the Senate. Filed and approved with one arm, the proposed bill must then be approved by the second, before signed into legislation by the President. Herein, existing legislative frameworks are examined to assess the extent to which creation and treatment of residual waste is tackled. Congress bills from July 2010 until August 2019 reflecting the 15<sup>th</sup> until 18<sup>th</sup> Congress are also examined to capture how residual waste may be tackled by future policies and therefore the narrative for SWM among Philippines policymakers.

To identify the presence of waste mitigation themes, legal documents were subject to thematic textual analysis following six phases described by Braun and Clarke (2006). As opposed to content analysis, which is used to combine qualitative and quantitative data, thematic analysis facilitates examination of language patterns in a flexible manner, irrespective of epistemology or theoretical framework (Clarke and Braun, 2013). Conducting analysis of this kind creates a risk of diluting subjective context (King, 2004). However, applied to legislative documents which are assumed to be objective, this critique does not apply.

Legislative frameworks were identified within the National Solid Waste Management Status Report 2008-2014 (DENR-EMB and NSWMC, 2015) and were obtained from the Philippine Laws and Jurisprudence Database (Arellano Law Foundation, Inc, n.d.). These documents relate directly to SWM, or provide context influencing the implementation of the Philippines Republic Act (R.A.) 9003 “Ecological Solid Waste Management Act of 2000”. Institutional frameworks, such as the National Solid Waste Management Framework (2004) and Philippine Development Plans, which support SWM legislation are also highlighted within the National Solid Waste Management Status Report 2008-2014 and are referred to throughout this paper. Of these documents, only the Philippine Development Plans were included within this analysis to ascertain how SWM is prioritised within the government’s medium-term expenditure planning. These documents were sourced from the websites of the NSWMC (DENR-EMB, n.d.) or the National Economic and Development Agency (NEDA) (Republic of the Philippines, n.d.).

A total of 10 legislative frameworks and six supporting institutional frameworks were reviewed, and are shown within Table 1 and Table 2, respectively. Documents were coded using key phrases identified within R.A. 9003. To indicate strategies to mitigate waste; “Reduce”, “Reuse”, “Recycle” also referred to within Philippine documentation as “3Rs”, were used, in addition to “segregation” and “composting” which are associated with IWM. As “Waste to Energy” is an IWM strategy this was also included as a key phase, however, incineration is prohibited by R.A. 9003 and R.A.8749 “Clean Air Act of 1999”.

Table 1. Philippine legislative frameworks relating to Solid Waste Management

Number	Legislative Frameworks	Date Approved
R.A. 6969.	Toxic Substance and Hazardous and Nuclear Waste Act of 1990	26 October 1990
R.A. 7160.	Local Government Code of 1991	10 October 1991
R.A. 8749.	Clean Air Act of 1999	23 June 1999
R.A. 9003.	Ecological Solid Waste Management Act of 2000	26 January 2001
R.A. 9275.	Philippine Clean Water Act of 2004	22 March 2004
R.A. 9512	Environmental Awareness and Education Act 2008	12 December 2008
R.A. 9513.	Renewable Energy Act of 2008	16 December 2008
R.A. 9729.	Climate Change Act of 2009	23 October 2009
P.P. 760.	Declaring Every Month of January as “Zero Waste Month”	5 May 2014

R.A. - Republic Acts; P.P. - Presidential Proclamations.

Source: Adapted from DENR-EMB and NSWMC (2015).

Table 2. Philippine Institutional Frameworks Relating to Solid Waste Management

Institutional Frameworks	Published
Implementing Rules and Regulations of R.A. 9003	DENR, 2001
National Solid Waste Management Framework	DENR-EMB and NSWMC, 2004
National Framework Strategy on Climate Change 2010-2022	CCC, n.d.
National Solid Waste Management Strategy 2012-2016	DENR-EMB and NSWMC, n.d.
Philippine Development Plan 2011-2016	NEDA, 2013
Philippine Development Plan 2017-202	NEDA, 2017

CCC - Philippine Climate Change Commission

Source: Adapted from DENR-EMB and NSWMC (2015).

Congress bills were acquired from the House of Representatives (Republic of the Philippines, n.d.) or Senate of the Philippines websites (Republic of the Philippines, n.d.) using key search terms (“waste”, “trash”, “R.A. 9003” and “R.A. 8749”).

Secondary search terms were also used to capture bills specific to forms of residual waste (“packaging”, “plastic” “plastic bag”, “single use”). House Bills (HB) and Senate Bills (SB) relating specifically to municipal waste, reduced waste volume, and landfill were included in the analysis. This research focuses on municipal waste therefore

bills relating to electronic waste and hazardous or toxic waste specifically were not included, although some overlap does occur.

A total of 142 congress bills were collected and analysed; 65% were first filed through the House of Representatives and the remainder through Senate (Appendix 1). Grouping the bills by act titles or proposed actions, revealed two distinct narratives exhibited within Table 3. On one hand, there are policymakers in favour of increased policy intervention to coerce behavioural changes that would subsequently reduce the creation of residual waste. On the other hand, there are policymakers who wish to alter existing legislative frameworks to facilitate greater technological endeavours that would mitigate residual waste quantities, such as WTE. Coalitions were identified among policymakers by examining key actors, their political affiliations and recurrent bill titles. This task was time-consuming but reasonably straight forward as exact copies of bills are often refiled by the same politician or a different politician representing the same political party or, in some cases, there is overlap between bills filed with the House of Representatives and the Senate<sup>7</sup>.


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<sup>7</sup> See Appendix 1: HB05379 (Suansing, 2015) and SBN-2349 ((Santiago, 2014) for example

Table 3 Narrative, Themes and Justification for proposed policy action relating to residual waste management

Narrative	Theme	Justification
Behavioural Change	Single-Use Plastics: ban; phase out; or regulation	<ul style="list-style-type: none"> <li>Supports R.A. 9003, and proposes additional legislative measures are put in place to reduce single-use, and encourage reusable address the problem of plastic waste</li> <li>acknowledges significant benefits plastics have brought society but argues plastics used in single-use commodities threatens: the entire ecosystem; agriculture through increased flood risk; food sources, livelihoods, human health. Also undermines disaster risk reduction efforts and exasperates economic burdens</li> <li>Acknowledges the Philippines is a marine biodiversity hotspot but a major contributor to mismanaged plastic waste</li> <li>Failure to address plastic pollution could discourage foreign investors who are increasingly examining Environment, Sustainability and Governance (ESG) criteria to assess investment risk. Relevance to the SDGs also</li> <li>Single-use plastics have been banned/regulated in some countries e.g. Rwanda, Kenya, Ireland, Austria; Some LGUs have already banned/regulated single use</li> <li>Bills propose the following products are prohibited: polystyrene, plastics straws, stirrers, balloons, cigarette butts, products containing microbeads, plastic bags, plastic bottles</li> <li>emphasizes important role of public and private participation and the responsibility of manufacturers to collect, recycle and dispose of plastics in circulation,</li> <li>Bills which propose phasing out range between six months to three years</li> <li>Proposes greater R&amp;D for single use plastic alternative and capacity building for workers employed by the plastics industry</li> </ul>
	Proposed act mandating the use of recyclable or biodegradable materials for the packaging of consumer products	<ul style="list-style-type: none"> <li>Need to limit the presence of non-biodegradable packing in the environment</li> <li>Recyclable or biodegradable materials reduced waste created, produce less pollution better fuel efficiency</li> </ul>
	Plastic Bags: ban; phase out; regulation or recycling.	<ul style="list-style-type: none"> <li>Plastics bags are prone to degrade into microplastics, are damaging to the environment, Obstructs water ways which increases risk to human life in storm events. Acknowledges climate change impact will increase such events</li> <li>Total ban would not perpetuate “throw-away mentality” but a plastic bag levy would allow transitional period.</li> </ul>
	Proposed act to ban importation of foreign solid waste	<ul style="list-style-type: none"> <li>China introduced “National Sword” policy which bans the importation of four waste categories including plastics.</li> <li>Philippines is at risk of receiving foreign waste – waste received from Japan (1999), Canada (2013-2014), South Korea (2018), Australia (2019) and Hongkong (2019).</li> <li>Protection and conservation of Philippine natural resources</li> </ul>
	Amend R.A. 7160 Section 17 of to include IWM	<ul style="list-style-type: none"> <li>Strengthen the interest of LGUs in planning and implement respective collection and disposal systems</li> </ul>
	Amend R.A. 8749 Section 20 to include “Siga” as a prohibited activity	<ul style="list-style-type: none"> <li>“Siga”, small-scale traditional open burning, threatens human right to breath clean air</li> <li>R.A. 8749 contradicts R.A. 9003 Section 48 which places an explicit ban on open burning of waste as a management technique</li> </ul>

Table 3. Narrative, Themes and Justification for proposed policy action relating to residual waste management (continued)

Narrative	Theme	Justification
<b>Behavioural Change</b> (continued)	Amend R.A. 9003 Section 4 to include representative from DepEd join the NSWMC	<ul style="list-style-type: none"> <li>Waste management is a personal responsibility which should be integrated into education</li> <li>Cleanliness starts at home</li> </ul>
	Amend R.A. 9003 Section 32 to institutionalise rewards for compliance and best practices	<ul style="list-style-type: none"> <li>Incentivises barangay solid waste management councils to support LGUs achieve their responsibilities for SWM</li> <li>Encourages operation of MRF in alignment to 3Rs</li> </ul>
	Amend R.A. 9003 Section 49 to provide stiffer fines and sanctions for non-compliance	<ul style="list-style-type: none"> <li>Deter prohibited acts mentioned in Section 48. These include littering, open burning of solid waste and manufacture of non-environmental packaging</li> <li>Encourage 3Rs, great private, and public participation</li> <li>Strengthen formal and informal education on waste</li> <li>Promote research and development for improved SWM inclusive of indigenous methods of waste disposal</li> <li>Improve SWM to mitigate GHG emissions contributing to climate change</li> </ul>
<b>Technological Innovation</b> 	Repeal R.A. 8749, Section 20 to allow incineration and promote WTE	<ul style="list-style-type: none"> <li>WTE can be used as a mode of waste disposal to reduce waste volumes and minimise impact of waste on the environment.</li> <li>Provides renewable source of electric generation, in alignment to R.A. 9513</li> <li>R.A. 8749 does not ban incineration only “processes which emit poisonous and toxic fumes”.</li> <li>R.A. 8749 and R.A. 9003 are outdated</li> <li>Variety of WTE technologies available including incineration, pyrolysis anaerobic digestion and landfill gas recovery</li> <li>Advances in emission control have lessened dioxin and furan emissions</li> <li>WTE can be fitted with equipment to monitor, record, and make publicly available emissions</li> <li>Fiscal and non-fiscal incentives can be provided to attract investment and innovation.</li> <li>Responsibilities can be relieved from LGUs to the owners and operators of WTE facilities</li> <li>European, Japanese and Chinese markets utilise WTE technologies to manage waste</li> </ul>

## 5. Finding and discussion

### 5.1 Addressing residual waste within legislative frameworks

The “Ecological Solid Waste Management Act of 2000” (R.A. 9003) (Republic of the Philippines, 2001) was brought into action as a direct repercussion to the collapse and subsequent fire at the Payatas site in July 2000, killing 218 IWS workers. The act endeavours to guide the country’s transition towards sustainable methods of waste disposal and condenses all sanitation laws prior to 2000 including “Toxic Substances and Hazardous and Nuclear Wastes Control Act of 1990” (R.A. 6969).

Despite its relevance to SWM, R.A. 6969 does not appear referenced as frequently as R.A. 9003 nor R.A. 8749 in frameworks relating to waste. This is surprising given that R.A. 6969 defines long-term environmental hazards as substances which include *“resistance to biodegradation, have potential to pollute ground and surface waters or have aesthetically objectionable properties such as offensive odours”* (Republic of the Philippines, 1990, p. 3). The nonbiodegradable characteristics of residual waste and pollution associated with storage and management of residual waste arguably fit within the scope of this definition. In alignment to the Basel Convention on the control of transboundary movements of hazardous waste and their disposal, R.A. 6969 prohibits transportation and trade of any hazardous material which present an unreasonable risk to the environment, such as waste, and calls for advancing research on toxic chemicals, including those associated with landfill such as mercury (Buagas et al., 2015) and POPs.

The “Local Government Code of 1991” (R.A. 7160), which grants greater autonomy to individual Local Government Units (LGUs) through decentralised government structure, devolves SWM responsibilities from the DENR to LGUs (Republic of the Philippines, 1991). R.A. 7160 supports LGU integration and collaboration with NGOs and Civil Society Organisations (CSOs); a strategy which has proven beneficial to alleviating complexities of wicked problems (Tong and Tao, 2016). Section 17 of R.A. 7160 delegates waste collection to *barangays* and waste disposal and environmental management systems to individual LGU’s. Greater stakeholder consultation can, therefore, aid LGUs develop waste disposal strategies tailored to the respective constraints within their jurisdiction such as land availability, finance, technical capacity and technological alignment.

Perhaps in light of the Payatas tragedy, IWS are excluded from the scope of R.A. 9003 and its implementing rules and regulations. Risk of creating conceptual gaps in the context of waste management, therefore, increases and escalates dramatically if the majority of autonomous LGUs exclude IWS. This ultimately will negative influence on residual waste disposal for the county as a whole. With investment and effort from LGUs, IWS integration is feasible (Paul et al., 2012). Knowledge the IWS possess is valuable in addressing the general public’s poor understanding of

residual, recyclable and compostable materials which remains a challenge to waste management overall.

In the case of urban governance and SWM in China, Tong and Tao's (2016) research demonstrates policies that focus on the resource dimension of waste limit the definition of the waste problem, and thus perturbate the complexity and "wickedness" of waste challenges further. However the Philippines legislative frameworks do exactly this, emphasising waste as a resource which should be conserved. Accordingly, R.A. 9003 sets LGUs the target of 25% waste reduction rates through implementation of circular 3R principles, encompassing waste segregation and composting. Correspondingly, Section 32 of RA 9003 directs material recovery facilities (MRF) are to be established within each *barangay* (village) to the emphasise of the act on segregation at source becoming a household responsibility. MRF provide waste sorting and segregated waste storage so that later materials can be easily sold by the barangay and transported elsewhere. In many cases, LGU's lack of capacity to maintain segregation through collection, transportation and disposal, offering households little incentive to segregate at home. Moreover, there is cultural acceptance that unsegregated resources are often recovered later along the waste stream by IWS who are instrumental in resource recovery. "Environmental Awareness and Education Act of 2008" (R.A. 5212) explicitly includes waste minimalization, segregation, recycling and composting within the scope of environmental education in hope to address knowledge barriers.

Adoption of 3Rs into policy and education intends to reduce volumes of waste directed to landfill. Where the principles of 3Rs are impactful on recyclable and biodegradable wastes, they have limited impact on residual waste. Focusing on FMCG to demonstrate this point, companies producing goods in composite, single-serve packaging do so to reduce production costs. Companies can correspondingly lower product price, facilitating the capacity for bottom of the pyramid (BOP) consumers to consume products they could not afford otherwise. This business strategy is justified as a dimension of CSR, by offering those without disposable income the opportunity to integrate into global markets and creates a start-up opportunity for micro-businesses (Prahalad, 2004).

For MNC's, this is a profit maximising exercise, however. Profits are gained not through large profit margins but via the sheer volume of products sold. Based upon the World Bank's global poverty line and 2015 population data, 7.8% of Philippine population constitute as BOP, earning less than \$1.90 USD per day (Asian Development Bank and ERCD, 2019). Comparatively, the Philippines defines its national poverty line as 344.59 PHP per day for a family of five (Philippine Statistics Authority, 2019). This equates to 21.6% of the population below the national poverty line and demonstrates there is a tremendous market of BOP consumers in the

Philippines. Promoting BOP capacity to consume as a strategy to achieve sustainable development, Prahalad (2004) demonstrates “large MNCs, such as Unilever and Procter & Gamble (P&G), are major participants in [the BOP] market”. Following Nestle, Unilever and P&G featured as companies producing the most number of branded residual waste items identified in the household WABAs conducted by GAIA (GAIA, 2019). Unpublished data gathered from household waste audits conducted in Dumaguete, Negros Oriental, by Mother Earth Foundation’s (MEF) Negros Siquijor Chapter, an NGO, reveals equivalent results.

R.A. 9003 also outlines requirements for updating SWM facilities into IWS to improve residual waste management. Assuming the act would be effectively implemented, biodegradables and recyclable materials would be recovered from the waste stream prior to landfill. R.A. 9003 mandates the closure of all uncontrolled landfill, rehabilitation of controlled sites and sets criteria for siting, establishing and operating SLF. According to the DENR-EMB and NSWMC (2015, p. 26), 86 SLF were in operation with an additional 51 sites to be constructed by 2015, however confirmation of these estimates is absent (Castañeda et al., 2012). Aligned to The Clean Air Act of 1999 (R.A. 8749), Section 48 of R.A.9003 explicitly prohibits incineration as a waste management technique based on the grounds “the burning of municipal, biomedical and hazardous waste... emits poisonous and toxic fumes” (Republic of the Philippines, 1999), and such action would be detrimental to the country and a violation of the constitution. Furthermore, R.A. 9003 stipulates that adequate leachate and gas controls are provided to minimise impacts from landfill. LGUs lack technical and fiscal capacity to accomplish such goals unfortunately.

Within the scope of Integrated Waste Management (IWM) strategies, R.A. 8749 and R.A. 9003, are commonly referenced together as providing the provisions of what is permissible as a WTE; incineration is not. However, to reduce the Philippines reliance on fossil fuels, exposure to fluctuating fuel prices and harmful emissions associated with fossil fuels, Renewable Energy Act of 2008 (R.A. 9513) (Republic of the Philippines, 2008) refers to WTE. Climate Change Act of 2008 (R.A. 9729) (Republic of the Philippines, 2009) seeks to mainstream mitigation and adaption strategies into all government policies stipulating more be done to stabilise GHG emissions, including those from landfill. National Framework Strategy on Climate Change 2010-2022 (Climate Change Commission, n.d.) promotes best practices for waste management and enhanced implementation of R.A. 9003, in addition to setting targets of doubling renewable energy capacity in the next 20 years.

The Climate Change Act of 2008, R.A. 9729, is the first act which adopts the precautionary principle to guide decision-making in climate risk management. According to Kreuter (2004, p. 450), the precautionary principle “*serves as a wicked problem-solving “device” in that it calls for all stakeholders to seek solutions that*

*protect population health against a backdrop of scientific uncertainty*". This principle encourages policymakers to practice risk-adversity over risk-tolerance when dealing with environmental challenges. International legislation relating to waste pollution takes this approach, the Stockholm Convention on the Elimination of POPs for example, but is yet to be brought to bear on waste management technologies, particularly WTE.

Following successful lobbying by NGOs including MEF and GAIA, Presidential Proclamation 760, s.2014. declares every January as "Zero Waste Month". In doing so the behavioural changes necessary to reducing residual waste are institutionalised. As a philosophy, zero waste specifies conservation of all resources, giving greater accountability to all stakeholders in processes of "production, consumption, reuse, and recovery of products, packaging, and materials" and addresses the moral dimensions of waste raised by Chan (2016),

Spanning across the 15<sup>th</sup> until 17<sup>th</sup> congress, the Philippine Development Plan (PDP) of 2011-2016, also heavily prioritises strengthening SWM for conservation, protection and rehabilitation of the environment and natural resources. This plan intersects much of the content of the Philippines ecological legislative framework. It calls for collaboration across governments and local stakeholders to ensure that waste management technology is aligned to the needs and requirement of the community. It supports the clean water act by emphasising reduced waste pollution from land-based sources and promoting technologies which would reduce GHG emissions aligned with R.A. 8749. Most encouragingly, waste diversion targets set at 25% within R.A. 9003 are increased to 50%, in addition to a further 30% overall waste reduction to be achieved by the end of the plan's scope. It also reiterates the mandate of R.A. 9003 which call upon NSWMC to publish a list of non-environmentally friendly packaging, promote cleaner production and extend producer responsibility as part of corporate social responsibility. This is theoretically a positive shift in the direction of reducing residual waste problems.

In comparison to the PDP of 2011-2016, SWM is almost entirely absent from the PDP 2017-2022. SWM is introduced only within the context of developing infrastructure as a strategy supporting the country's foundations for sustainable development. The Plan highlights the need for investment in technology to improve SWM, greater assistance offered to LGU to meet requirements of R.A. 9003 and greater public awareness". While reference is given to R.A. 9003, of which the 3Rs are promoted, there is no further reference to reducing waste volumes or targets set to guide government action. This may indicate ambitious attempts to mitigate waste stalled with the transition into the 2017 PDP, however, infrastructure is necessary and progress so long as waste quantities, waste volumes and the persistence of waste toxicity are simultaneously reduced.

## 5.2 Future strategies to “tame” residual waste, as told by Congress

The previous section has discussed the extent to which legislative frameworks address residual waste quantities, waste volumes and the persistence of waste toxicity. This section explores congress bills that demonstrate proposed action to further extenuate policy strengths and mitigate policy weaknesses. As residual waste is a “wicked” problem however, there is no clear consensus over which actions are best suited to reduce waste creation. This section explores two narratives found within bills filled from the 15<sup>th</sup> - 18<sup>th</sup> congress and discusses the way in which bills associated with these narratives are framed. While the ambition of both positions is to “*protect and advance the right of the people to a balanced and healthful ecology*” (Section 16 of “The Constitution of the Republic of the Philippines,” 1987) by reducing the creation of waste and to mitigate the unknown impact plastics have on the environment and human health, their methods of achieving this goal is very different. Summaries of these positions are provided in Table 3..

### 5.3. Behavioural change narrative

Themes which fall into this narrative take a command and control policy position. Policy propositions include bans or regulation of specific items. Action of this kind directly prevents perpetuating “throw-away” behaviours by removing the option for consumers to consume such items. Action of this sort have been proposed against polystyrene (for example HB03725 proposed by Tambunting, 2019), plastics straws (for example HB03536 proposed by Castelo, 2019), products containing microbeads (for example HB08120 proposed by Batocabe et al., 2018), and plastic bottles (for example HB09178 proposed by Ang, 2019). Plastics bags have been targeted by 64 bills filled across the last ten years, however without successful implementation of a plastic bag act. Product-specific bans have been introduced elsewhere (UNEP, 2018; UNEP, 2018). This, to some extent, highlights a dimension to the “wickedness” of the problem; despite items being known to contribute to residual waste and detrimental to human and environmental health, without a globally administrative authority, bans cannot be implemented globally due to Westphalia sovereignty.

Furthermore, in some senses, these bills indicate evidence of the pollution haven hypothesis. Where lax environmental regulations exist complemented by weak governance and good market access; pollution and polluting activities aggregate. Microbeads, for example, have been phased out of products in Europe over the last decade with a total ban coming into play in the UK in 2018 and Europe following suit. Recent bills proposing bans on foreign waste import suggest the Philippines is increasingly at risk of falling victim to the global waste trade. These bills highlight undeclared waste imports the country has received since the Chinese National Sword Policy also banning waste import in 2018. Empirical validity of pollution

havens is a heavily debated (Levinson and Taylor, 2008), and requires further investigation.

Introduction of product-specific bans in the Philippines has potential to bolster implementation of R.A. 9003 by mitigating SWM pressures on LGUs and hinder “wicked” dimensions of waste by immediately addressing the temporal and discounting risk. However, poor implementation of the existing legislative framework threatens the effectivity of any new command and control policies. To tackle poor implementation of R.A. 9003 some of the bills filed through congress propose stricter fines and sanctions to disincentive prohibited behaviour. These bills go as far as increasing existing penalties ten-fold. Whether or not the prosecuted could pay these fines is a different story.

Bills have also been proposed providing rewards, both fiscal and non-fiscal, to incentivise best practices, particularly those carried out at a barangay level of governance. In terms of waste management processes, barangays provide a bridge between household segregation and LGU led waste management and R.A. 9003 mandates barangays to provide MRF. Unfortunately, barangays require funding to complete their obligations to R.A. 9003, as would any fiscal reward system or capacity to subsidise other revenue sources for a non-fiscal rewards system. LGUs may have insufficient capacity to provide such incentives. Poor implementation of R.A. 9003 and other legislative frameworks is largely down to decentralised government and LGUs working in silos with weak financial and technical capability.

While this narrative is more inclined towards risk adversity, in the sense of preserving environmental and human health, implementing such command and control policies exhibit tolerance to economic risk. Banning or regulating such items may prove damaging to the country’s economy as consumption is correlated to economic growth, an indicator of development. Other dimensions of the economy which could suffer from command and control style policies including labour markets, and the large micro-business sector whose clientele are largely BOP consumers. To address this, bills propose capacity building programs for those effected within the plastics industry which would facilitate shift from plastics manufacturing to production of alternative materials. Should the Philippines be the first to introduce such bold command and control policies there is, of course, inherent risk. Doing so could send market signals which disincentivises trade losing market access to countries with more lenient environmental policies. There is, however, opportunity to be found within the advantages of the first mover should the Philippines fully transition towards recyclable and biodegradable packaging for consumer goods as 12 of the bills filed over in the decade suggest<sup>8</sup>. The potential for this to be a positive outcome in terms

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<sup>8</sup> These bills align with PDP 2011-2016 which calls for greater “extend producer responsibility”.

of economic development is reinforced by environmental considerations increasingly integrated to guide investment decisions, such as the Environmental, Social and Governance (ESG) indices.

#### 5.4. Technological Innovation narrative

Bills which fall into the narrative emphasises increased reliance upon market-based solutions and technological innovation to reduce waste. The sole theme of this narrative is WTE. From 2010-2019, 15 bills have called for amendment or total repeal of section 20 of R.A. 8749 which would permit incineration and allow for WTE to be utilized as a management strategy for waste. While almost 90% of the bills analysed in this paper fall into the “behavioural change” narrative what is worth highlighting is that WTE bills have been approved by the House of Representatives and passed to the Senate for second reading. This may be influenced by the position of congressional leadership held by those filling these bills (Appendix 2). Of the other themes discussed in this paper, bills proposing plastic bag regulation have also received second reading.

Bills within this narrative argue during the last vicennium WTE technology has improved to the extent emissions are lower and toxic bi-products produced through WTE processes are reduced. Support for these bills is also driven by opportunities to exploit greater sources of renewable energy as mandated within the Renewable Energy Act of 2008 (R.A. 9513). There is great debate over whether WTE can be considered renewable if its feedstock is single-use plastic materials as demand for such materials will surely drive consumption. Furthermore, high solar radiance in the Philippines and volcanic geology, the country offers itself more to solar and geothermal which are considered “green energy sources” than WTE.

Another interesting point to highlight is the lack of scientific understanding included within the explanatory notices of these proposed bills. HB02286, for example makes bold statements and *“refute that incineration of waste is harmful to the environment...there is not scientific fact that [incineration] emits over 200 toxic or potentially toxic substances...it is also not correct to say that incinerators have high operating costs and pose environmental threats”* (Marquez, 2016, p. 3). There is a considerable body of scientific and peer-reviewed evidence which suggests quite the contrary (Abbasi, 2018). Recent studies revealing microplastic contamination in snow samples (Bergmann et al., 2019), possibly originate from waste treated by incineration (Dris et al., 2016) Although the crassness of this language was removed when this bill transferred to congress (Marquez et al., 2018), denial of empirical and scientific evidence threatens to complicate the “wickedness” of “wicked” problems further. At present, we trust science operates within the realm of universal laws and

undeniable facts supported by research rigour. If the boundary is blurred between facts and the opinions of those in power, then there is a danger that known parameters which solve even the “tamest” of problems will also collapse. To solve wicked problems science must stay objective and not politicised.

Even science has its limitations, however. A few congress bills, for example, proposes the use of only oxo-degradable plastic bags, justifying this proposed act as oxo-degradable bags break down quickly and would reduce volumes of waste (Malapitan, 2011). Less than a decade later and the science which developed this material now proves oxo-degradable bags contribute significantly to the microplastics problem and are prone to accumulate POPs. This highlights the challenges of policymaking when the basis of the decision is made on limited known parameters.

Examining these bills it is clear there are patterns of political coalitions among actions are their associated parties. Representatives of four parties support repeal of Section 20 allowing waste incineration, with one party doing so repeatedly since 2010. Interestingly, a member of this party during the 17<sup>th</sup> congress also filed a bill calling for Recyclable or Biodegradable Packaging of Consumer Goods. This example demonstrates there are no clear boundaries delineating the two narratives. While filling a bill reducing the production of residual waste is counterproductive to a bill which proposes such waste is used as the feedstock for WTE, this examples also demonstrates ambiguity for which policy narrative or solution is most suited to the Philippine scenario of waste management. Policymakers may wish to reduce the residual waste problem with urgency and by whatever means possible.

Mapping political alliances could potentially forecast which narrative future waste policy will align with. However, in the Philippines, this task is not straightforward. In 2019, representatives of 181 political parties filled for congressional positions during the National and Local Elections (Tomacruz, 2018), and this quantity of political positions makes political alliances complex to map.

As Yarsley and Couzens demonstrated in their 1940's publication “Plastics” (1942), in addition to other technological innovations since, technological revolutions bring about consequences in the present that have incomprehensible influence on the future long, well beyond the scope of a few generations. Plastic is reported to remain in the environment for greater than a thousand years. How can present policymakers possibly comprehend the undefinable impact of their decisions?

## 6. Conclusion

This paper has endeavoured to fill a literature gap demonstrating waste management, specifically treatment of residual waste, as a “wicked” problem, and therefore a legislative challenge for policymakers in the case of the Philippines. While Rittel and Webber (1973) has outlined 10 characteristics to “wicked” problems, this paper has stressed upon the indefinable nature of residual waste as a result of its non-biodegradable nature, numerous actors who contribute to the problem and stakeholders within the waste treatment process. This paper emphasises stakeholder inclusion, particularly Informal Waste Sector, is key to mitigating waste. Furthermore, action to reduce temporal and discounting dimensions of waste through strategies such as the precautionary principle, are important to “taming” residual waste. Managing plastics require long-term perspectives with moral considerations.

Addressing the following questions “to what extent do Philippine legislative and institutional frameworks mitigate the creation of residual waste?” and “how is residual waste addressed within proposed legislation filed through congress?”, this paper shows that while policymakers can impose longer-term horizons through legislation, residual waste is weakly mitigated by legislative and institutional frameworks in the Philippines as waste generation is deeply connected to consumption and economic drivers.

Moreover, mitigating residual waste is heavily influenced by a stakeholder’s perceptions which impact where the problem’s origin is identified and therefore where solutions to the problem are best applied. In the case of the Philippines, this paper demonstrates this point through identification and exploration of the discourse between two waste management narratives among policy makers. Greater command and control style policies encourage behavioural change and strengthen environmental policies. However, such policy interventions disrupt the market and may result in stunted economic growth which is used as a measure of development.

On the other hand, reduced policy intervention offers opportunity for market-based solution and greater technological innovation to reduce the impact of waste treatment on the environment and human health. While infrastructure and technology are required to mitigate residual waste, this paper offers caution against adoption of Waste to Energy. Such exploits may be “landfill solutions” packaged as revolutionary technology in an attempt to “tame” the “wicked” problem of residual waste.

While parameters for “wicked” problems may be imprecise and inadequate this paper stresses policy success should be measured by reduction in waste quantities, waste volumes and the persistence of waste toxicity, in addition to decreased impacts to human and environmental health. These factors align to the Philippines constitution and development plans, in addition to international development plans, such as the UN’s SDGs. Reflecting upon Yarsley and Couzens idealistic vision of plastic which opened this paper, will those in the future, who will continue to manage the waste disposed of in the present, look back upon the decisions of policymakers within this period with rueful humour?

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## Appendices

### Appendix 1. Senate Bills and House Bills Included within Analysis

Bill Theme	Congress	No.	Filed By	Party	Date Filed	Status
<b>Ban on Importation of Foreign Solid Waste</b>	18th	SBN-408	Imee R. Marcos	KBL	11/7/19	Pending on Primary Committee on Environment and Natural Resources; Secondary Committee on Finance - 5/8/19
	18th	SBN-263	Francis "Kiko" N. Pangilinan	LP	8/7/19	Pending on Primary Committee on Environment and Natural Resources; Secondary Committee on: Trade, Commerce and Entrepreneurship; Finance - 30/7/19
	18th	SBN-98	Aquilino "Koko" Pimentel III	PDP-Laban	1/7/19	Pending on Primary Committee on Environment and Natural Resources; Secondary Committee on Trade, Commerce and Entrepreneurship - 23/7/19
	18th	SBN-18	Franklin M. Drilon	LP	1/7/19	Pending on Primary Committee on Environment and Natural Resources; Secondary Committee on Trade, Commerce and Entrepreneurship - 23/7/19
	17th	SBN-2144	Aquilino "Koko" Pimentel III	PDP-Laban	14/1/19	Pending on Primary Committee on Environment and Natural Resources; Secondary Committee on: Trade, Commerce and Entrepreneurship; Finance - 16/1/19
<b>Plastic Bags - Ban</b>	18th	HB03537	Precious Hipolito Castelo	HNP	6/8/19	Pending with Committee on Ecology - 13/8/19
	17th	HB03801	Winston "Winnie" Castelo	LP	27/9/16	Substituted by
	16th	SBN-2337	Miriam Defensor Sanitago	PRP	4/8/14	Primary Committee on Trade, Commerce and Entrepreneurship; Secondary Committee on: Environment and Natural Resources; Ways and Means; Finance - 6/8/14
	16th	HB02202	Winston "Winnie" Castelo	LP	1/8/13	Pending with Committee on Ecology - 8/7/13
	15th	SBN-3233	Miriam Defensor Sanitago	PRP	17/7/12	Pending on Primary Committee on Trade and Commerce; Secondary Committee on: Environment and Natural Resources; Ways and Means; Finance - 24/7/12
	15th	SBN-3001	Miriam Defensor Sanitago	PRP	20/10/11	Primary Committee on Trade and Commerce; Secondary Committee on: Environment and Natural Resources; Ways and Means - 9/5/11
	15th	HB04922	Winston "Winnie" Castelo	LP	13/7/11	Pending with Committee on Ecology - 27/7/11

	15th	SBN-2759	Loren B. Legarda	NCP	29/3/11	Primary Committee on Trade and Commerce; Secondary Committee on Environment and Natural Resources - 9/5/11
	15th	HB03939	Carmelo F. Lazatin	Lakas–CMD	1/11/10	Substituted by HB04840
	15th	HB02109	Rufus B. Rodriguez	CDP	3/8/10	Substituted by HB04840
	15th	SBN-1103	Manny Villar	NP	12/7/10	Pending on Primary Committee on Trade and Commerce; Secondary Committee on Environment and Natural Resources - 6/9/10
	15th	HB00783	Aurelio 'Dong' Jr. D. Gonzales	Lakas–CMD	5/7/10	Substituted by HB04840
<b>Plastic Bags - Recycling Schemes</b>	18th	HB03723	Joy Myra S. Tambunting	PDP-Laban	14/8/19	Pending with Committee on Ecology - 14/8/19
	17th	HB04181	Gus S. Tambunting	UNA	20/10/16	Substituted by
	17th	HB01966	Estrellita B. Suansing Horacio Jr. P. Suansing	PDP-Laban PDP-Laban	26/7/16	Substituted by
	16th	HB05379	Estrellita B. Suansing	PDP-Laban	29/1/15	Pending with Committee on Ecology - 4/2/15
	16th	SBN-2349	Miriam Defensor Sanitago	PRP	11/8/14	Primary Committee on Environment and Natural Resources; Secondary Committee on: Trade, Commerce and Entrepreneurship; Finance - 13/8/14
	16th	HB04762	Gus S. Tambunting	UNA	28/7/14	Pending with Committee on Ecology - 5/8/14
	16th	SBN-348	Loren B. Legarda	NCP	3/7/13	Primary Committee on Environment and Natural Resources; Secondary Committee on Trade, Commerce and Entrepreneurship - 31/7/13
	15th	HB04055	Oscar G. Malapitan	UNA	26/1/11	Substituted by HB04840
	15th	SBN-1931	Miriam Defensor Sanitago	PRP	13/9/10	Pending on Primary Committee on Environment and Natural Resources; Secondary Committee on: Trade and Commerce; Finance - 13/9/10
	15th	SBN-1368	Loren B. Legarda	NCP	13/7/10	Primary Committee on Environment and Natural Resources; Secondary Committee on Trade and Commerce - 31/8/10
	15th	HB00496	Juan Edgardo M. "Sonny" Angara	LDP	1/7/10	Substituted by HB04840
	15th	HB00501	Juan Edgardo M. "Sonny" Angara	LDP	1/7/10	Substituted by HB04840

<b>Plastic Bags – Regulation</b>	17th	HB02655	Luis Jr. N. Campos i	UNA	8/816	Substituted by
	18th	HB00178	Horacio Jr. P. Suansing; Estrellita B. Suansing	PDP-Laban PDP-Laban	1/7//19	Pending with Committee on Ways and Means - 27/7/19
	18th	HB02811	Rufus B. Rodriguez	CDP	25/7/19	Pending with Committee on Ecology - 31/7/19
	18th	HB01754	Luis Raymund "Lray" Jr F. Villafuerte	NP	9/7/19	Pending with Committee on Ecology - 24/7/19
	18th	SBN-114	Maria Lourdes Nancy S. Binay	UNA	1/7/19	Primary Committee on Environment and Natural Resources; Secondary Committee on: Trade, Commerce and Entrepreneurship; Ways and Means; Finance - 24/7/19
	17th	HB08558	John Marvin "Yul Servo" C. Nieto		14/11/18	Pending with Committee on Ways and Means - 20/11/18
	17th	HB08523	Horacio Jr. P. Suansing	PDP-Laban	18/10/18	Pending with Committee on Ways and Means - 12/11/18
	17th	SBN-1948	Loren B. Legarda	NCP	23/8/18	Primary Committee on Environment and Natural Resources; Secondary Committee on: Trade, Commerce and Entrepreneurship; Ways and Means; Finance - 28/8/18
	17th	SBN-1851	Maria Lourdes Nancy S. Binay	UNA	13/6/18	Primary Committee on Environment and Natural Resources; Secondary Committee on Trade, Commerce and Entrepreneurship - 24/7/18
	17th	HB07276	Luis Raymund "Lray" Jr F. Villafuerte	NP	27/2/18	Pending with Committee on Ecology - 5/3/18
<b>Plastics Bags – Regulation Continued</b>	17th	HB04542	Maximo Jr. B. Rodriguez	ABAMIN	29/11/16	Substituted by
	17th	HB03579	Gloria Macapagal Arroyo	Lakas– CMD	13/9/16	Substituted by
	17th	HB03130	Strike B. Revila	NUP	18/8/16	Substituted by
	17th	SBN-650	Paolo Benigno "Bam" Aquino IV	LP	20/7/16	Primary Committee on Environment and Natural Resources; Secondary Committee on: Trade, Commerce and Entrepreneurship; Finance - 9/8/16
	17th	SBN-430	Loren B. Legarda; Maria Lourdes Nancy S. Binay	NCP UNA	19/7/16	Primary Committee on Environment and Natural Resources; Secondary Committee on: Trade, Commerce and Entrepreneurship; Finance - 8/8/16
	17th	HB00983	Lawrence Lemuel R. Fortun	LP	4/7/16	Substituted by

16th	SBN-2613	Ramon Bong Revilla Jr.	Lakas– CMD	2/2/15	Primary Committee on Trade, Commerce and Entrepreneurship ; Secondary Committee on: Environment and Natural Resources; Ways and Means; Finance - 3/2/15
16th	SBN-2415	Loren B. Legarda	NCP	18/9/14	Primary Committee on Environment and Natural Resources; Secondary Committee on: Trade, Commerce and Entrepreneurship; Finance - 22/9/14
16th	HB03600	Marlyn L. Primicias-Agabas	NCP	11/12/13	Pending with Committee on Ecology - 16/12/13
16th	HB03511	Leah S. Paquiz	ANG NARS	4/12/13	Pending with Committee on Ecology - 10/12/13
16th	HB03227	Ronald V. Singson	NP	22/10/13	Pending with Committee on Ecology - 18/11/13
16th	HB03153	Raymond Democrito C. Mendoza	TUCP	16/10/13	Pending with Committee on Ecology - 22/10/13
16th	SBN-1454	Joseph Victor G. Ejercito	NPC	29/8/13	Primary Committee on Environment and Natural Resources; Secondary Committee on: Trade, Commerce and Entrepreneurship; Finance - 9/9/13
16th	HB01624	Rufus B. Rodriguez	CDP	23/7/13	Pending with Committee on Ecology - 31/7/13
16th	SBN-419	Ferdinand "Bong-Bong" R. Marcos	NP	3/7/13	Primary Committee on Trade and Commerce; Secondary Committee on Environment and Natural Resources - 5/8/13
16th	HB00106	Lani Mercardo-Revilla	Lakas– CMD	1/7/13	Pending with Committee on Ecology - 23/7/13
16th	HB00359	Lawrence Lemuel R. Fortun	LP	1/7/13	Pending with Committee on Ecology - 23/7/13
16th	HB00394	Susan A. Yap	NCP	1/7/13	Pending with Committee on Ecology - 23/7/13
15th	SBN-2942	Manny Villar	NP	18/8/11	Primary Committee on Ways and Means; Secondary Committee on Trade and Commerce - 22/8/11
15th	HB05138	Ronald V. Singson	NP	16/8/11	Pending with Committee on Ecology - 23/8/11
15th	HB04840	Oscar G. Malapitan	UNA	8/6/11	Substitutes 11 filed bills. Transmitted and received by Senate - 10/8/11
15th	HB04462	Mark Aeron H. Sambar	PBA	23/3/11	Pending with Committee on Ecology - 9/5/11
15th	SBN-2749	Ferdinand "Bong-Bong" R. Marcos	NP	17/3/11	Primary Committee on Trade and Commerce; Secondary Committee on Environment and Natural Resources - 21/3/11
15th	HB03511	Ronald V. Singson	NP	13/10/10	Pending with Committee on Ecology - 15/10/19
15th	HB03452	Juan Edgardo M. "Sonny" Angara	LDP	6/10/10	Pending on Subcom on National Internal Revenue - 25/1/11

15th	SBN-2547	Miriam Defensor Sanitago	PRP	28/9/10	Primary Committee on Environment and Natural Resources; Secondary Committee on Trade and Commerce - 29/9/10
15th	HB02862	Raymond Democrito C. Mendoza	TUCP	26/8/10	Substituted by HB04840
15th	SBN-1543	Miriam Defensor Sanitago	PRP	19/7/10	Pending on Primary Committee on Trade and Commerce; Secondary Committee on Environment and Natural Resources - 6/9/10
15th	HB00127	Al Francis C. Bichara	NP	1/7/10	Substituted by HB04840
15th	HB02286	Al Francis C. Bichara	NP	1/7/10	Substituted by HB04840

**Plastics Bags  
– Regulation  
Continued**

<b>R.A. 7160 - Amend Section 17 to include IWS</b>	18th	SBN-695	Ramon Bong Revilla Jr.	Lakas– CMD	22/7/19	Pending on Primary Committee on Local Government; Secondary Committee on Environment and Natural Resources - 13/8/19
	16th	SBN-370	Jinggoy P. Ejercito-Estrada	PDP-Laban	3/7/13	Pending on Committee on Local Government - 31/7/13
	15th	SBN-820	Jinggoy P. Ejercito-Estrada	PDP-Laban	8/7/10	Pending on Committee on Local Government - 16/8/10
<b>R.A. 8749 - Amend Section 20 to include "Siga" as a prohibited activity</b>	18th	HB03344	Bernadette "BH" Herrera-Dy	BH	1/8/19	Pending with Committee on Ecology - 6/8/19
	17th	HB04271	Bernadette "BH" Herrera-Dy	BH	7/11/16	Pending with Committee on Ecology - 16/11/16
<b>R.A. 8749 - Repeal</b>	18th	SBN-879	Manuel "Lito" M. Lapid	NCP	7/8/19	Primary Committee on Environment and Natural Resources; Secondary Committee on Ways and Means - 19/8/19

<b>Section 20 to Promote WTE</b>	18th	SBN-491	Vincente "Tito" C. Sotto III	NCP	15/7/19	Primary Committee on Environment and Natural Resources; Secondary Committee on Ways and Means - 15/8/19
	18th	SBN-363	Win Gatchalian	NCP	11/7/19	Pending on Primary Committee on Energy; Secondary Committee on Environment and Natural Resources - 31/7/19
	18th	SBN-401	Francis "Tol" N. Tolentino	PDP-Laban	11/7/19	Pending on Primary Committee on Energy; Secondary Committee on: Environment and Natural Resources; Ways and Means - 5/8/19
	18th	HB01938	Michael Odylon L. Romero and Enrico A. Pineda	1PACMAN	10/7/19	Pending with Committee on Ecology - 24/7/19
	18th	HB00933	Manuel DG. Cabochan III	Magdalo	2/7/19	Pending with Committee on Ecology - 24/7/19
	17th	SBN-2076	Vincente "Tito" C. Sotto III	NCP	15/10/18	Primary Committee on Environment and Natural Resources; Secondary Committee on Ways and Means - 12/11/18
	17th	HB07099	Gary C. Alejano	Magdalo	1/2/18	Pending with Committee on Ecology - 6/2/18
	17th	HB06893	Estrellita B. Suansing; Dakila Carlo E. Cua; Carlito S. Marquez; Carlos O. Cojuangco.	PDP-Laban; PDP-Laban; NCP; NCP.	13/12/17	Approval in substitution of H.B. 2286. Transmitted and received by Senate - 31/1/18
	17th	HB02286	Carlito S. Marquez	LP	2/8/16	Substituted by HB06893
	17th	SBN-506	Antonio "Sonny" F. Trillanes,	Magdalo	16/7/16	Pending on Primary Committee on Environment and Natural Resources; Secondary Committee on Energy - 8/8/16
	16th	SBN-792	Antonio "Sonny" F. Trillanes,	Magdalo	16/7/13	Pending on Committee on Enviroment and Natural Resources - 12/8/13
	16th	HB03161	Edgar R. Erice	LP	1/7/13	Pending with Committee on Ecology - 24/7/13
	15th	HB04370	Carmelo F. Lazatin	Lakas–CMD	14/3/11	Pending with Committee on Ecology - 21/3/11
	15th	SBN-225	Antonio "Sonny" F. Trillanes,	Magdalo	6/7/10	Pending on Committee on Enviroment and Natural Resources - 3/8/10; Conducted joint committee meetings/hearing - 19/9/11.
<b>R.A. 9003 - Institutionalise</b>	17th	HB07970	Jose "Kuya" Antonio R. Sy-Alvarado	NUP	30/7/18	Pending with Committee on Ecology - 6/8/18

**Rewards for Compliance With Section 32**

17th	HB05915	Michelle M. Antonio	AGBIAG!	27/6/17	Pending with Committee on Ecology - 25/7/17
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**R.A. 9003**

**Section 4 to include representative from DepEd join the NSWMC**

17th	HB05087	Rodel M. Batocabe, Alfredo Jr. A. Garbin and Christopher S. Co	AKO BIKOL	20/2/17	Pending with Committee on Ecology - 28/2/17
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**R.A. 9003**

**Section 49 to provide stiffer fines and sanctions for non-compliance**

18th	HB01598	Michael Odylon L. Romero and Enrico A. Pineda	1PACMAN	8/7/19	Pending with Committee on Ecology - 24/7/19
17th	HB08748	Pepito M. Pico	DIWA	10/12/18	Pending with Committee on Ecology - 12/12/17
17th	HB05668	Michael Odylon L. Romero and Enrico A. Pineda	1PACMAN	17/5/17	Under deliberation by Mother Committee - 17/1/18
17th	HB00770	Emmeline Yan Aglipay-Villar	DIWA	30/6/16	Under deliberation by Mother Committee - 17/1/18
16th	HB02741	Evelina G. Escudero	NCP	3/9/13	Pending with Committee on Ecology - 9/9/13

**Recyclable or Biodegradable Packaging of Consumer Goods**

18th	HB01837	Rufus B. Rodriguez	CDP	9/7/19	Pending with Committee on Ecology - 24/7/19
17th	SBN-2149	Maria Lourdes Nancy S. Binay	UNA	15/1/19	Primary Committee on Environment and Natural Resources; Secondary Committee on: Trade and Commerce; Ways and Means - 16/1/19
17th	HB08657	John Marvin "Yul Servo" C. Nieto	PDP-Laban	27/11/18	Pending with Committee on Ecology - 28/11/18
17th	HB08497	Gary C. Alejano	Magdalo	11/10/18	Pending with Committee on Ecology - 11/10/18
17th	HB05774	Maximo Jr. B. Rodriguez	ABAMIN	29/5/17	Pending with Committee on Natural Resources - 31/7/16
17th	HB04626	Juan Edgardo M. "Sonny" Angara	LDP	7/12/16	Pending with Committee on Ecology - 13/12/16
16th	SBN-1975	Jinggoy P. Ejercito-Estrada	PDP-Laban	27/11/13	Primary Committee on Environment and Natural Resources; Secondary Committee on: Trade, Commerce and Entrepreneurship; Ways and Means - 12/3/13
16th	HB02504	Rufus B. Rodriguez	CDP	27/8/13	Pending with Committee on Trade and Industry - 2/9/2013

	15th	SBN-1191	Manny Villar	NP	12/7/10	Primary Committee on Environment and Natural Resources; Secondary Committee on: Trade and Commerce; Ways and Means - 24/8/10
	15th	HB01053	Rufus B. Rodriguez	CDP	8/7/10	Pending with Committee on Ecology - 2/8/10
	15th	SBN-444	Jinggoy P. Ejercito-Estrada	PDP-Laban	6/7/10	Primary Committee on Environment and Natural Resources; Secondary Committee on: Trade and Commerce; Ways and Means - 8/4/10
	15th	HB00651	Juan Edgardo M. "Sonny" Angara	LDP	1/7/10	Pending with Committee on Ecology - 27/7/10
<b>Single-Use Plastics - Phase Out</b>	18th	HB00136	Geraldine B. Roman	LP	1/7/19	Pending with Committee on Ecology - 23/7/19
	18th	HB00546	Rozzano Rufino B. Biazon	LP	1/7/19	Pending with Committee on Ecology - 23/7/19
	17th	HB07903	Rozzano Rufino B. Biazon	LP	4/7/18	Pending with Committee on Ecology - 30/7/18
<b>Single-Use Plastics - Regulation</b>	18th	SBN-954	Juan Edgardo M. "Sonny" Angara	LDP	27/8/19	Pending on Primary Committee on Environment and Natural Resources; Secondary Committee on: Trade, Commerce and Entrepreneurship; Finance - 28/8/19
	18th	SBN-880	Manuel "Lito" M. Lapid	NCP	7/8/19	Primary Committee on Environment and Natural Resources; Secondary Committee on: Trade, Commerce and Entrpreneurship; Finance - 19/8/19
	18th	HB03140	Jumel Anthony I. Espino		30/7/19	Pending with Committee on Ecology - 5/8/19
	18th	HB02484	Estrellita B. Suansing; Horacio Jr. P. Suansing	PDP- Laban; PDP-Laban	23/7/19	Pending with Committee on Ecology - 30/7/19
	18th	SBN-333	Cynthia A. Villar	NP	11/7/19	Primary Committee on Environment and Natural Resources; Secondary Committee on: Trade, Commerce and Entrpreneurship; Ways and Means; Finance - 31/7/19
	18th	SBN-40	Francis "Kiko" N. Pangilinan	LP	1/7/19	Primary Committee on Environment and Natural Resources; Secondary Committee on: Trade, Commerce and Entrpreneurship; Ways and Means; Finance - 27/7/19
	18th	HB00103	Lawrence Lemuel R. Fortun	LP	1/7/19	Pending with Committee on Ecology - 23/7/19
	18th	HB00574	Greg G. Gasataya	GP	1/7/19	Pending with Committee on Ecology - 23/7/19
	18th	HB00635	Loren B. Legarda	NCP	1/7/19	Pending with Committee on Ecology - 23/7/19
	17th	HB09178	Ronald S. Ang		11/4/19	Pending with Committee on Trade and Industry - 20/5/2019

	17th	HB08853	Greg G. Gasataya	GP	17/1/19	Pending with Committee on Ecology - 23/1/19
	17th	HB07239	Manuel F. Zubiri	Independen t	22/2/18	Pending with Committee on Ecology - 28/2/18
	17th	HB03577	Estrellita B. Suansing	PDP-Laban	13/9/16	Pending with Committee on Ecology - 20/9/16
<b>Single-Use Plastics Ban</b>	18th	HB03725	Joy Myra S. Tambunting	PDP-Laban	8/8/19	Pending with Committee on Ecology - 14/8/19
	18th	HB03536	Precious Hipolito Castelo	HNP	6/8/19	Pending with Committee on Ecology - 13/8/19
	18th	HB03338	Bernadette "BH" Herrera-Dy	BH	1/8/19	Pending with Committee on Ecology - 6/8/19
	18th	HB02969	Lorenz R. Defensor	PDP-Laban	29/7/19	Pending with Committee on Ecology - 5/8/19
	18th	HB02396	Lord Allan Jay Q. Velasco	NUP	18/7/19	Pending with Committee on Ecology - 29/7/19
	18th	SBN-557	Emmanuel "Manny" D. Pacquiao	PDP-Laban	16/7/19	Primary Committee on Environment and Natural Resources; Secondary Committee on: Trade, Commerce and Entrpreneurship; Ways and Means; Finance - 7/8/19
	18th	HB00499	Robert Ace S. Barbers	NP	1/7/19	Pending with Committee on Ecology - 23/7/19
	17th	HB08692	Winston "Winnie" Castelo	LP	13/12/18	Pending with Committee on Ecology - 5/12/18
	17th	HB08120	Rodel M. Batocabe, Alfredo Jr. A. Garbin and Christopher S. Co	AKO BIKOL	16/8/18	Pending with Committee on Ecology - 28/8/18
	17th	SBN-1873	Juan Edgardo M. "Sonny" Angara	LDP	16/7/18	Primary Committee on Environment and Natural Resources; Secondary Committee on Trade, Commerce and Entrpreneurship - 25/7/18
	17th	SBN-1866	Risa Hontiveros	ACAP	5/7/18	Primary Committee on Environment and Natural Resources; Secondary Committee on Trade, Commerce and Entrpreneurship - 25/7/18
	17th	HB07902	Harlin Neil J. Abayon III	Aangat tayo	3/7/18	Pending with Committee on Ecology - 30/7/18
	17th	HB07718	Manuel F. Zubiri	Independen t	16/5/18	Pending with Committee on Ecology - 25/3/18
	17th	HB4183	Gus S. Tambunting	UNA	20/10/16	Substituted by
	16th	HB04341	Gus S. Tambunting	UNA	5/5/14	Pending with Committee on Ecology - 12/5/14
	15th	HB03516	Lani Mercardo-Revilla	Lakas– CMD	14/10/10	Substituted by HB04840
	15th	HB02676	Raymond V. Palatino	Kabataan	18/8/10	Pending with Committee on Ecology - 25/8/10

Source: House of Representatives (Republic of the Philippines, n.d.)(Accessed: ); Senate of the Philippines (Republic of the Philippines, n.d.)  
(Accessed: )

*Appendix 2. Executive and Legislative Leadership and Political Affiliations of 15<sup>th</sup>- 18<sup>th</sup> Congress*

Leadership	Position	Congress			
		Fifteenth 26/7/10 - 6/6/13	Sixteenth 22/7/13 – 6/6/16	Seventeenth 25/7/16 – 4/6/19	Eighteenth 22/7/19 - 2022
Executive	President	Benigno Aquino III (LP)	Benigno Aquino III (LP)	Rodrigo Duterte (PDP)	Rodrigo Duterte (PDP)
	Vice President	Jejomar Binay (UNA)	Jejomar Binay (UNA)	Leni Robredo (LP)	Leni Robredo (LP)
Legislative: Senate	Senate President	Juan Ponce Enrile <sup>9</sup> (UNA)	Franklin M. Drilon (LP)	Aquilino Koko Pimentel <sup>10</sup> (PDP) Vicente C. Sotto III <sup>11</sup> (NCP)	Vicente C. Sotto III (NCP)
	President Pro Tempore	Jinggoy Ejercito Estrada <sup>12</sup> (UNA)	Ralph G. Recto (LP)	Franklin M. Drilon <sup>13</sup> (LP) Ralph G. Recto <sup>14</sup> (NP)	Ralph G. Recto (NP)
	Majority Leader	Vicente C. Sotto III (NCP)	Alan Peter Compañero S. Caytano (NP)	Vicente C. Sotto III <sup>15</sup> (NCP) Juan Miguel "Migz" F. Zubiri <sup>16</sup> (PDP)	Juan Miguel "Migz" F. Zubiri (PDP)
	Minority Floor Leader	Alan Peter Compañero S. Caytano (NP)	Juan Ponce Enrile	Ralph G. Recto <sup>17</sup> (LP) Franklin M. Drilon <sup>18</sup> (LP)	Franklin M. Drilon (LP)
				Pantaleon Alvarez <sup>19</sup> (PDP)	
Legislative: House of Representative	Speaker	Feliciano Belmonte, Jr. (LP)	Feliciano Belmonte, Jr. (LP)	Gloria Macapagal Arroyo <sup>20</sup> (PDP)	Alan Peter Compañero S. Caytano (NP)
	Majority Leader	Neptali Gonzales, Jr. (LP)	Neptali Gonzales, Jr. (LP)	Rodolfo Fariñas <sup>21</sup> (PDP) Fredennil Castro <sup>22</sup> (NUP)	Ferdinand Martin G. Romualdez (Lakas)

<sup>9</sup> Resigned 5/6/13

<sup>10</sup> 25/7/16 – 21/5/18

<sup>11</sup> 21/5/18 – 4/6/19

<sup>12</sup> Appointed acting Senate President 5/6/13

<sup>13</sup> 25/7/16 – 27/2/17

<sup>14</sup> 27/2/17 – 4/6/19

<sup>15</sup> 25/7/16 - 21/5/18

<sup>16</sup> 21/5/18 – 4/6/19

<sup>17</sup> 25/7/16 – 27/2/17

<sup>18</sup> 27/2/17 - 4/6/19

<sup>19</sup> Unseated 25/7/16 – 23/7/18

<sup>20</sup> 23/7/18 - 4/6/19

<sup>21</sup> 25/7/16 – 23/7/18

<sup>22</sup> 23/7/18 – 30/7/18; 21/1/19 – 4/6/19

			Rolando Andaya Jr. <sup>23</sup> (PDP)	
Minority Leader	Edcel Lagman <sup>24</sup> (Lakas) Danilo Suarez <sup>25</sup> (Lakas)	Ronaldo Zamora (NP)	Danilo Suarez (Lakas)	Bienvenido Jr. M. Abante (NUP)

Sources: (Republic of the Philippines, n.d.) (Accessed: ); (Republic of the Philippines, n.d.); Accessed: ); (“15th Congress of the Philippines,” 2019; “16th Congress of the Philippines,” 2019; “17th Congress of the Philippines,” 2019; “18th Congress of the Philippines,” 2019)

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<sup>23</sup> 30/7/18 - 21/1/19

<sup>24</sup> 27/7/10 – 19/1/12

<sup>25</sup> 20/1/12 – 6/6/13