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The role of policy labels, keywords and framing in transitioning waste policy

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ABSTRACT

The last decade has seen a new wave of ambitious policies in order to address the mounting ecological damage caused by high levels of consumerism and the depletion of resources to manufacture short life-cycle products. In this paper 'Zero Waste' and 'Sustainable Materials Management' are examined as prominent labels of an evolving waste policy discourse towards waste prevention and reduction and material cycles. Using discourse analysis key documents are comparatively assessed, presenting the origins of these two concepts and how they entered the waste policy domain. The different framing tactics and governance models are then presented. The findings demonstrate that the different discourse paradigms around the concept of 'waste' and 'materials', influences what policy initiatives, measurement tools and outcomes are pursued. Although Zero Waste and Sustainable Materials Management are gaining popularity as indicators of shifting waste policy towards Sustainable Production and Consumption Policy, particularly with increasing discussion and application of Circular Economy governance models in Europe and China, a distinction still exists between the conceptualisation and implementation within and across the two concepts. It is in this transition towards a Circular Economy that it is valuable to review the role of policy labels, keywords and framing context in waste policy and the ability of enhanced waste management to assist in the development of more sustainable and environmentally acceptable economic and social behaviour models.

1. Introduction

Environmental protection has been widely debated since the 1960s. It has closely informed the notions of sustainable development and sustainability which seek to integrate the often conflicting ideologies of environment conservation, social equity and economic growth (Brundtland et al., 1987). The concept of sustainable urbanisation in cities has received a great deal of attention in the last few decades, prompting actors across a wide range of sectors to explore sustainability case studies, projects, movements and directives. Although improvements are ongoing, notable sustainable achievements have already been realised in energy, transport, housing and water management. Waste is a prime example of a sector where environmental, social and economic considerations need to be further integrated in policy to achieve sustainability. Waste exists as a guaranteed component of any urbanised city landscapes with studies indicating 70% of the world waste emerges from cities (Zaman and Lehman, 2013). In addition the rapid and decentralised manufacture of complex consumer products, such as electronics, is having immense environmental impact. Recently, the management of waste and material flows has also become more tightly embedded in the sustainability agenda and associated governance models, particularly around sustainable production and consumption (SPC) and the Circular Economy.

As a consequence of the Rio 20+ 10-Year Framework of Programmes on Sustainable Consumption and Production (10YFP on SCP), sustainable innovation in waste and materials management is now recognised as an urgent task in addressing the mounting ecological damage caused by high levels of consumerism and the depletion of resources to manufacture short life-cycle products. Furthermore, policy direction in the European Union and China in particular, have supported the development of Circular Economy (CE), which like SPC focuses on enhancing resource productivity and eco-efficiency in order to reduce the environmental impacts

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associated with production and consumption activities. CE's inherent focus on waste management involves the closed loop consideration of all material/energy flows in order to achieve enhanced resource productivity.

Circular Economy frameworks are working towards incorporating Zero Waste and Sustainable Materials management policies and governance structures within the development of an economic framework and business model that focuses on increasing the amount of energy and materials that can be recovered from waste. Encouraging new opportunities for business development in closing the loops in industrial production, ensures material and energy efficiency and the reduction of environmental impacts. It is in this transition towards a Circular Economy type model of sustainability management that it is valuable to review the role of policy labels, keywords and framing context in waste policy.

However there has been a lag in identifying adequate disposal options; policy directives, for the most part, have failed to provide viable solutions. The decrease in available land and raw materials and the increasing concern about CO_2 emissions have together made obsolete conventional incineration and landfill solutions. This evolving political challenge has instigated an opportunity to reconceptualise and reframe waste policy ideology, objectives and visions, as a new wave of ambitious policies and targets aimed at waste reduction and resource recovery is now gaining momentum (Cramer, 2013; Lauridsen and Jørgensen, 2010; Loorbach and Rotmans, 2010).

Key international documents produced in the last decade by key institutions such as Organisation for Economic Co-Operation and Development (OECD), US, Environmental Protection Agency (EPA) United Nations Environmental Programme (UNEP) the European Environmental Agency (EEA) the Group of Eight (G8) and the Group of Twenty Major Economies (G20) as well as industry reports reviewing recent waste policies, and the actual waste policies themselves, were reviewed. It is observed that two distinct general discourse orientations are emerging within the waste policy domain; the concepts of '*waste prevention and reduction*' and '*materials cycles*'. These concepts have been presented across many policy documents, under a diverse array of banners and titles. However amongst the variety of waste policy arrangements 'Zero Waste' has emerged as a common label for '*waste prevention and reduction*' and 'Sustainable Materials' as a prominent label for '*materials cycles*'. Although these concepts appear popular in their use and dissemination, some ambiguity exists as to what these key terms actually mean and how they are currently implemented practically.

Discourse is powerful not only in its capacity to communicate but also in activating concepts and understanding around environmental issues (Hajer, 1995). A central function in articulating environmental public policy and effectively disseminating the policy's messages is the selection of policy labels, keywords and associated frames. Although some work has been done to investigate waste discourse as well as the discourse around sustainable consumption and production (Lilja, 2009), no recent studies have comparatively investigated the 'Zero Waste' and 'Sustainable Materials Management' policy innovations by using discourse analysis.

This paper examined how these two discourses are represented in key policy reviews and in the academic literature. Using the keywords 'zero waste' and 'sustainable materials management' the first endeavour is to present the origins of these terms and how and when they entered the waste policy domain. Then using comparative waste policy programmes across cities, regions and industry, this paper aims to determine whether the contrasting sets of use of different keywords also indicate notable differences in policy objectives, governance structures and eventual outcomes. Finally, analysing how the different keyword and framing tactics inform different discourse paradigms around the concept of 'waste' and 'materials', which in turn influence what policy initiatives, measurement tools and outcomes are pursued.

2. Sustainability, waste and discourse: a theoretical framework

The role of environmental policy in the transition towards sustainability as well as the significance of discourse in the policy process has been highlighted (see Coffey and Marston, 2013; Dryzek, 2005; Hajer and Versteeg, 2005; Oels, 2005; Späth and Rohracher, 2010; Takahashi and Meisner, 2012; Vink et al., 2013). Furthermore, it has been argued that the position of public policy makers as architects of discourse make them the most legitimate, urgent and powerful stakeholder group in enabling environmental protection (see Fineman and Clarke, 1996; Gago and Antolin, 2004; Murillo-Luna et al., 2008; Silva and Kingshott, 2011). The policy process often involves contested and negotiated narratives that eventually inform and construct the policy itself. Indeed, it is suggested "that discourses are constitutive of policy processes, rather than exogenous to them" (Paul, 2009, p. 249).

According to discourse analysts (Fairclough et al., 2011; Fairclough and Wodak, 2005; Hajer, 1995; Howarth et al., 2000; Jensen, 2012; Van Dijk, 1997) the accepted viewpoint across the field is that, first, language does not exist as an innate cognitive or neutrally representative construct. Rather it is indicative of socio-cultural, ideological and power paradigms. Second, written, spoken and multimodal discourse is perceived as a form of social practice, assuming a dialectical relationship between discursive events and the enveloping social structures. This implies that language is a mode of action that is embedded within a historical and social context (Fairclough, 2002).

As Lakoff (2008) stated in his work 'The Political Mind; why you can't understand 21st century politics with an 18th century brain'

> "*language does not merely express identity: it can change identity. Narratives and melodramas are not mere words and images: they can enter our brains and provide models that we not merely live by, but that define who we are … Language has a political force … What makes language powerful is its capacity to activate, communicate, regulate, and even change all aspects of our understanding!*" (p. 231).

A central function in articulating environmental public policy and effectively disseminating a policy's messages is the selection of policy labels, keywords and associated frames by actors within governments, media, NGOs, academic institutions, and private corporations (Leitch et al., 2014). It is also suggested that repetition, increased visibility and intertextual links of certain terms directly contribute to the overall problem identification and wider sense making, hence shaping the solution space and the environmental policy in question (Dryzek, 2005). This is especially prevalent in a world dominated by keyword computational query log searches (Segev, 2010) and multi-channel bombardment of salient headlines such as the well documented keyword: 'terrorism' (Jackson, 2007). Pioneering the analysis of keywords in his 1976 book "Keywords, a vocabulary of culture and society," Raymond Williams demonstrates the significance of keywords and the vocabulary of meaning, in shaping and navigating cultural and societal processes (Williams, 1985). Although it has been argued that some keywords act as empty signifiers, purely used as communication strategies, other keywords are indicative of replicated memes such as specific frameworks, models or equations (Davidson, 2010; O'Halloran et al., 2011). The keywords associated with an environmental policy are often clearly visible in the title or description of the

responsible government agency or the specific policy document. Keywords may also appear as words with a high frequency rate in a policy document.

Just as important to public policy as policy label and keyword selection, is the selection of frames. Framing of policy is achieved by selecting a position linked to a particular set of values. Usually the frame is reflective of the prevalent values of the policy making group (Benford and Snow, 2000; Goffman, 1974; Dewulf et al., 2009). The framing process often involves interactive consultation with policy stakeholders in order to determine what themes resonate and where the policy is best situated within a larger narrative (Johnson et al., 2006). The policy process relies on framing tactics, not only to communicate and assimilate the policy to a wider audience, but also to steer the policy direction (Lieshout, 2014; Rein and Schön, 1996). For example, framing environmental policy may take the form of economic rationalism, such as 'resource efficiency' and 'resource security' or a more societal orientation, such as 'conservation for future generations'. Despite the tactic, framing significantly positions the policy and its associated conceptions.

The implication of specific keywords and framing tactics presented within environmental policy documents have been investigated in more recent years (Beunen, and Hagens, 2009; Pei-Chun and Hsin-Ning, 2010; Pralle, and Boscarino, 2011). In a study investigating the changing titles of New Zealand's science policy agency Leitch et al. (2014) conclude that "the titles given to government agencies arguably constitute the most public means of framing science policy" and "the loss of keywords from the titles of government agencies is potentially significant if it signals a change in the core purpose and focus of an agency" (Leitch et al., 2014, p. 123).

Discourse theorists and communications strategists have successfully demonstrated that ideologies inform keywords, title words and frames that then shape perceptions of what constitutes good or bad directions, actions and outcomes (Burr, 2003; Lakoff, 2005). Policy labels, keywords and frames thus inform story-lines and augment particular discourses which are both scientifically and politically important: through these our knowledge of the world is regulated (Jerneck and Olsson, 2011). For Snow and Benford (1988), conditions constraining successful framing resonance include careful and deliberate framing efforts to identify problems, provide suitable solutions and strategies and rationalise motivational plans of action. These policy labels, keywords and frames need credibility and narrative fidelity for the social changes to be achieved. Stewart et al. (2012) refer to the adoption of languaging strategies and tactics, which include the use of identification, framing, narrativisation and sloganising to transform perceptions, legitimise and sustain movements and prescribe courses of action, especially via the use of emerging communication technologies. This link of association between a text and its ability to indicate purpose and action is a central point in our discussion.

2.1. The evolving discourse of waste policy

Waste management has for the most part provided end of pipe solutions dictated by a kind of 'out of sight, out of mind' or 'swept under the rug' mentality. Until the mid-1980s waste and discarded materials were mostly buried, shipped out to sea or turned into ash, requiring further raw materials to be extracted and leaving wasteful consumerism to continue unchecked. The economic primacy given to consumption and capitalist growth models dominated political rhetoric. Any suggestion to decrease consumption was likely met with great contention, thus dealing with increasing tangible outputs via waste management was seen as the way forward.

The discourse shaping earlier waste ideologies and framing consequent solutions lacked an environmental orientation. Rather, they were often linked to human health concerns such as disease risks, stench and unsightliness that resulted from inappropriate waste disposal practices (Rootes, 2009). Prominent keywords within the waste discourse included: *cleanliness*, *disposal*, *dumping*, *garbage*, *throw away*, *rubbish*, *litter* and *landfill*, words that focus thinking far from the concepts of reusable materials and valuable resources. Keeping places 'clean' was the main doctrine of societal perceptions and government interventions in managing waste (Paredis, 2011).

Traditional governance strategies and policy directives relevant to waste management often fell under the responsibility of the local municipalities within cities and regions, thus management of waste was geographically constrained. The nature of waste generation and management was seen as geographically situated, that is, waste (municipal, industrial or commercial) generated at specific localised sites was managed by geographically local logistics companies which physically removed the waste to specific localised landfill sites (Boyle, 2001). Waste management was also bounded by a Not In My Back Yard (NIMBY) culture, so disposal solutions often negotiated around the least resistant, powerless and vulnerable communities (D'Amato et al., 2013). However as production and consumption patterns changed and waste volumes increased considerably in volume and complexity, the established waste management policies as well as the waste discourse required a makeover.

2.1.1. Focussing on 'end of life solutions' as a paradigm

During the sustainability movements of the early 1980s, environmental concerns start to penetrate the waste discourse. Increasing local landfill site costings as well as public contestation focused attention on alternative end of pipe solutions and *recycling* became the new keyword that is linked to reducing environmental impacts. From a linguistic perspective, the term indicates an action, with the pre-object being recyclables and the post-object being recycled materials. The term was quickly disseminated and adopted across many geographical borders and waste management policy documents, leading to numerous recycling programmes. Recycling was especially popular in developed economies that could more easily adjust and expand the available waste collection infrastructure and systems to incorporate a recycling programme (Karani and Jewasikiewitz, 2007). At the same time these developed economies also tipped the higher end of consumption but were disconnecting from manufacturing and production creating a large geographical distance in the supply chain. This also induced new governance systems as waste and recycled goods started to flow according to market demands and capabilities. D'Amato et al. (2013) found price did not impact waste trade movements but rather landfill and recycling limitations increased exports while imports were dictated by proximity in conjunction with a lack of environmental policy and low domestic wages.

This saw the flow of materials beyond localised jurisdiction and across to Asia, Africa and South America. Waste governance and management also shifted from an isolated, localised and centralised structure to one that was inclusive of wider stakeholder involvement (Davies, 2005). Governance also widened to include the embedding of municipal and city waste policy within regional and national directives (Davoudi and Evans, 2005).

Although the recycling concept remained central to numerous waste policies' environmental goals (and can still be seen as one of the major waste management solutions implemented today), a necessitating extension of the recycling concept was that of the 3

R's: reduce, reuse, and recycle. Landfill diversion and increased recycling rates became prominent policy indicators of waste reduction success. At the same time, incineration capacity enabled a decline in landfill reliance, especially in Europe (Davies, 2005). However, two significant issues have emerged; the first is the inability for recycling, as an end of pipe initiative, to address increasing generated household and commercial material output (waste generation). The second is a lack of market incentives that truly economically validate and valorise recycled materials, both from a manufacturing and end consumer perspective (Hamzaoui Essoussi and Linton, 2010). It is becoming increasingly evident that diverting waste from landfill, even to recycling, is a reductionist mechanism that falls short of offering a long term holistic solution.

2.1.2. Shifting towards a new paradigm of sustainable production and consumption

It is now argued that waste management should not focus on diversion of waste from landfill and increased recycling rates, but rather through front end solutions that prevent over-consumption and waste generation (Andrews-Speed et al., 2012; Buijs and Sievers, 2011; EEA, 2014a,b; UNEP, 2010). The consequent evolution of the waste hierarchy (prevention, reuse, recycle, recovery, and disposal) has downgraded 'recycling's' position and promoted 'prevention'. Consequently we are now seeing policy frameworks that are shifting from an end of pipe paradigm towards a SPC paradigm (European Commission, 2011). The latter emergent paradigm is represented by two major competing discourses: 'Waste Prevention and Reduction' and 'Materials Cycles'.

Coinciding with the sustainability agenda on material and natural resource scarcity, the mid 2000s witnessed a surge in political debate and initiatives that shifted away from the 'throw away' culture towards SPC (Andrews-Speed et al., 2012; Buijs and Sievers, 2011; EC, 2014a; EEA, 2014a,b; UNEP, 2010; PBL, 2011). The reasoning for this shift has been linked to volatile material prices and increased global demand for resources (Happaerts, 2014), a greater awareness and acknowledgement of the scarcity of some raw materials, a growing concern for national resource and materials security, and the emerging unwillingness and incapability of countries such as China to deal with the West's discarded materials (such as China's Green Fencing movement)[1] (Tibbetts, 2015). These contextual conditions can also be recognised through the realignment of the policy discourse that is moving beyond waste management towards resource and materials cycles.

The emergence of a range of new evaluation tools, such as life-cycle assessment, cradle to cradle production, materials flow analysis, resource efficiency indicators, full cost accounting in addition to wider systems thinking such as the Circular Economy principles, industrial ecology and material chain management, have all combined as a driving force towards a new waste discourse paradigm. Perhaps not surprisingly the EU, China and Japan, relying heavily on raw material imports, have emerged as front runners in this waste prevention and materials policy narrative. This emerging ideology about SPC is no longer based on linear systems thinking but rather a shift to cyclical systems thinking (UNEP, 2010, 2011). Inherently focussing on preventing further waste related environmental degradation, whilst conserving scarce resources, in China in particular, the Circular Economy model and its call for sustainable materials management was seen as critical in allowing China to leapfrog into a more sustainable economic system (Su et al., 2013).

[1] http://www.theguardian.com/sustainable-business/china-green-fence-global-recycling-innovation and http://www.theguardian.com/sustainable-business/china-recycling-waste-Circular-economy.

3. Methods

Undertaking an analysis of key international, regional and corporate documents produced in the last decade, such as OECD, EPA, UN, Government and industry reports reviewing recent waste policies, as well as the waste policies themselves, two key discourse orientations were identified: 'waste prevention and reduction' and 'materials cycles'. Then focussing in on two respective waste policy labels: 'Zero Waste' and 'Sustainable Materials Management', based on an understanding of keywords and frames as reflective of ideologies and policy objectives, these two concepts were comparatively analysed.

The key documents, on which the analysis is based, were selected on the grounds of their authoritative standing and level of influence. These include policy instruments, political documents and significant research and industry reports discussing the waste transitions in question. Although several corporate documents were explored, this paper focuses on city and regional programmes as they were perceived to have larger overall implications. The selected documents are produced within the timeframe of 2004–2014, as this is when significant waste policy changes emerged. These documents were combined, enabling two corpuses to be built for analysis. Each corpus was then uploaded into an online corpus analysis tool (ANTConc), as well as manually evaluated and coded to determine the key findings.

Each concept (zero waste and sustainable materials management) was analysed by identifying the dominant, goals, key success indicators and measurement tools emerging out of the principal documents promoting each concept, as well as the governance structures in place to manage the waste transition in question. How the dissemination of the keywords: 'zero waste' and 'sustainable materials management', have also lead to shared interpretations and therefore policy outcomes was also explored.

4. Results

In the below sections a deeper analysis is presented of the above two concepts by developing two case studies of the new approaches to a waste transition programme: 'Zero Waste' and 'Sustainable Materials Management'.

4.1. Waste prevention and reduction

Prevention and reduction are dominant philosophies dictating how environmental policies are positioned. The philosophies underpin the goals of becoming 'carbon neutral' or having 'zero impact' and are the guiding vision for numerous sustainability policies that seek to prevent and reduce the impact of human activities on the environment. Central to prevention and reduction is the keyword 'zero': 'zero carbon', 'zero growth', 'zero ecological footprint', 'zero emissions', 'mission zero' and 'get zero'. In his recent book Zeronauts, John Elkington (2012) describes the commercial viability of the term 'zero', which has been used to promote 'zero injuries', 'zero tolerance', 'zero defaults', 'zero defects' and 'zero waste'. Elkington (2012) suggests that perhaps 'zero' is symbolic of an idealist counterpoint to western society's preoccupation with high levels of growth and production. The numerical reference to 'zero' may be viewed as an idealist ambition as well as a subjective term open to multiple interpretations of action. However it has been stated that preoccupation with environmental policy solutions that aim at becoming 'less bad is not good enough' (Braungart et al., 2007).

The waste prevention and reduction discourse has also informed policy documents that use the terms directly, such as the EU's Waste Prevention (WPr) goals, as set out in the 2008 European

Commission's Waste Framework Directive. The term waste prevention is a signifier of goals to prevent waste before it emerges, usually using success indicators that relate to Material Flow Accounts (MFA) and household waste generation and consumption (Bortoleto, 2014). However, the EEA's 9th report (2014) assessing WPr in the EU, found the majority of WPr objectives are embedded in policy plans using alternative labels, such as resource efficiency, Circular Economy and environmental strategies. Only Flanders and Brussels have integrated WPr throughout their waste management plan (EEA, 2014a,b), Indicating that WPr outcomes normally emerge outside of policy labels using the term 'waste'. Although using WPr as a policy label is notable, zero waste has received wider promotion and acquisition outside of the EU as a waste prevention and reduction moniker. For this reason the focus is on zero waste.

In the below section this paper introduces the commonly referred to waste prevention and reduction strategy 'Zero waste', and discusses the policy direction and outcomes this concept induces.

4.1.1. Zero waste

Although the term 'zero waste' (ZW) emerged in the 1970s, evidence of increased momentum in the last decade is evidenced by its use across a vast range of waste management documents, reports, visions, policy directives and grassroots efforts within both government and non-government agencies alike (Krausz, 2012). "Like establishing zero defect goals for manufacturing or zero injury goals in the workplace … zero waste is a revolution in the relationship between waste and people" (GAIA, 2012, p. 2). The familiarity and managerial application of the term 'zero' may have inspired major transnational organisations such as Toyota, DuPont, General Motors and Dell to adopt the keyword in promoting their recently initiated 'zero waste' programmes.

In 1996 Canberra, Australia pioneered the first serious attempt at a 'zero waste' programme at a city level. The campaign was labelled 'No Waste' and aimed to have zero waste sent to landfill by 2010. In this sense, the policy reflected an 'end of pipeline' paradigm. Almost inevitably, their objective was not achieved and the programme was dropped. However, this initial movement inspired many other 'zero waste' projects to arise. Today 'zero waste' is a keyword that is universally recognised across languages and translations. Importantly, the term has now become explicitly linked to the new waste prevention and material cycle paradigm rather than to the old end of pipeline paradigm.

The marketability of the term zero becomes increasingly apparent when accounting for the numerous ZW networks and platforms that have since emerged including: Zero Waste Europe, Zero Waste International Alliance, Zero Waste Institute, Zero Waste Network, Zero Waste San Francisco, Zero Waste California and Zero Waste Australia. Multiple grassroots projects have also been realised such as the Zero Waste Ohio Stadium, Zero Waste Youth, Spain's Gipuzkoa Province Local Zero Zabor (zero waste) groups and the Zero Waste Alaminos project. The dissemination of the ZW concept and its apparent dominance in representing waste transitions over spatial and geographical boundaries is unquestionable and it is often referred to as an ambitious approach to minimise the effects of waste on the planet.

The commonly referred to definition of ZW as adopted by the Zero Waste International Alliance and Zero Waste Europe states that:

> "*Zero Waste is a goal that is both pragmatic and visionary, to guide people to emulate sustainable natural cycles, where all discarded materials are resources for others to use. Zero Waste means designing and managing products and processes to reduce the volume and toxicity of waste and materials, conserve and recover all resources, and not burn or bury them. Implementing Zero Waste will eliminate all discharges to land, water, or air that may be a threat to planetary, human, animal or plant health.*" (ZWIA, 2013)

Despite the term's interpretative openness, our analysis shows that the main principles and the intentions in the concept's definition are clearly to establish this waste preventative, holistic and Circular approach of materials cycles. Linking the ZW construct to that of the waste hierarchy and 3 R's mirrors the merging global trends to limit landfill capacities and reduce the environmental burden caused by current waste management practices (Zero Waste Australia, 2013).

However, somewhat perversely, it is evident that in the actual implementation of policy and the delivery of outcomes generated through the ZW vision, the term 'zero waste' is actually commonly misinterpreted to imply a goal of zero waste sent to landfill and incineration[2] much like the initial aim of Canberra's 'No Waste' campaign. The result observed is also consistent with other studies (see Karani and Jewasikiewitz, 2007; Krausz, 2012; Zaman, 2015). This goal towards waste diversion and reduction of waste to landfill is repeated and endorsed by most of those using the ZW moniker, particularly the ZW programmes at the city and corporation level. This interpretation is also especially apparent within the ZW strategies for regions with already existing well-developed recycling infrastructure. For example Table 1 below developed from Krausz (2012), demonstrates this trend clearly.

It should be noted that those promoting the ZW concept are also embracing a range of other frames and drivers: from the social justice ambitions of waste pickers in the Philippines to the economic efficiency goals of major transnational companies such as Toyota and DuPont. The evidence presented in Table 1 is supported by other evidence suggesting that economically advanced countries with extensive waste infrastructure and collection processes most closely adhere to the ZW goal of eventual 100% diversion from landfill (GAIA, 2012).

Of the ZW corporate documents explored (Toyota, DuPont General Motors and Dell) all referred to Zero Waste to Landfill or Landfill Free objectives. Dell was the only corporate that explicitly provided other ZW objectives beyond a landfill diversion, including a strategic packaging initiative that saw a 12% reduction in notebook packaging in 2008. Although it is assumed here that other companies, especially those heavily invested in manufacturing and production, have implemented preventative waste mechanisms beyond landfill diversion, there were few that explicitly linked this to a ZW plan, opting instead to use terms such as eco-efficiency or resource efficiency in labelling their plans.

The link between the term ZW and the diversion from landfill policy direction is significant in demonstrating the correlation of discourse orientation and action. Unlike other keywords that are argued to be empty signifiers or attempts at green washing (see Davidson, 2010), ZW has a strongly associated measurement that has transferred across policies. Unless significant reconceptualisation is promoted around the term, it can also be assumed future waste programmes adopting ZW will also establish a landfill diversion strategy.

From the main ZW promotional campaigns analysed for, Table 1 it is evident that a key measurement tool used to determine the success or failure of the zero waste to landfill objective is that of a diversion rate. This diversion rate is often presented as an overall

[2] Grassroots movements that strongly contested incineration as a diversion from landfill option contributed to incineration being removed from the Zero Waste definition and also downgrading it from the EU's Waste Hierarchy (Davies, 2005).

Table 1
This table provides examples of zero waste initiatives with diversion from landfill targets.

Location	Stated zero waste objective
Canberra, Australia	Zero waste to landfill by 2010 (Australian Capital Territory, 1996)
Christchurch, New Zealand	Zero waste to landfill by 2020 (Christchurch City Council, 2006)
Toronto, Canada	Zero waste to landfill by 2012 (City of Toronto (2005)
San Francisco, USA	Zero waste to landfill by 2020 (SF Environment, 2003)
Austin, USA	Zero waste to landfill by 2040 (City of Austin (2005)
Kamikatsu, Japan	Zero waste to landfill by 2020 (Hill et al., 2006).
Scotland	95% diversion of waste from landfill by 2025 (The Scottish Government, 2010).
Buenos Aires, Argentina	Zero waste to landfill by 2020 (Lacunza, 2013).

percentage of waste being diverted from landfill (Table 2 below for the formula).

Research exploring landfill diversion emerging out of the EU (although often devoid of the term zero waste) has identified a large disparity between EU states, asserting high diversion rates often correlate to a high population density with economic incentives and waste collection systems in place (Mazzanti et al., 2011). Diversion from landfill is commonly driven by regionally diffused policy instruments with an economic orientation such as waste tariffs, landfill tax, landfill levies and pay-as-you-throw charges. Softer policy mechanisms such as recycling educational programmes community outreach programmes and or improved separation and collection facilities are also regionally diffused and managed. The issue of waste management autonomy is discussed by Mazzanti and Montini (2014), who demonstrate the performance gap existing between EU, national and local waste policy objectives. Exploring waste policy in Italy, they show how socio-economic factors differ across regions within a country, exposing poor performance hot spots and better performing regional clusters. For this reason holistic waste management evaluation at the national level may be misleading.

The overall EU aim to decouple absolute waste generation from GDP and the difficulty in providing umbrella solutions while offering autonomous EU waste directive implementation may together explain why ZW as a large scale centralised waste prevention goal has been less popular in the EU.

The European Commission's (2014b) communication to the European Parliament, Councils and Committees, 'Towards a Circular Economy: A zero waste programme for Europe' is the one of the few recent EU documents using the ZW label within the title. However notably the term is not used again throughout the entire 6064 word document, whereas materials is mentioned 36 times and Circular Economy 31 times. Perhaps this is evidence of an effort to link the popularity of the ZW term within the 'waste' to 'materials' discourse transition and the overarching and increasingly discussed, Circular Economy narrative.

Sceptics of the ZW movement argue that an increase in diversion rates is often also associated with an increase in the overall weight of waste being produced, demonstrating that reducing goods consumption in economic systems that promote it is a far greater challenge than implementing diversion and recycling policies. As stated by Zaman and Lehmann (2013) the inaccuracy inherent in cities using their "waste diversion rate as a tool to measure the performance of their waste management systems … as it does not give a holistic picture of zero waste performance" (p. 123). An alternative indicator is provided by Zaman and Lehmann (2013): the 'zero waste index'. This aims to assess a city's ZW performance by forecasting "the amount of virgin materials, energy, water and greenhouse gas emissions substituted by the resources that are recovered from waste streams" (Zaman and Lehmann, 2013, p. 123).

Other critics of the term ZW suggest that policy solutions that start by reaffirming waste's existence at the centre, gravitate towards forming waste based solutions. Similar criticism applies to the term Waste Prevention instead of Material efficiency (MEf) (see Lilja, 2009). Lilja (2009) concludes that "based on more than a decade of experience in Finland, it seems that the avoidance of waste is not a sufficient driving force for a transition in the consumption and production patterns" (p. 135). Suggesting that "MEf more naturally brings on board the life-cycle approach than WPr" and thus be more highly promoted in the BREF-Documents (Best Available Technique Reference Document) (p. 135). Our study also finds WPr data beyond waste diversion (such as material inputs, outputs, production and consumption) is more applicable to national directives at the macro-level and households at the micro-level. This may explain why cities, local councils and industry have more readily applied the term ZW.

The aim of "turning waste into a resource is part of the 'closing the loop' in Circular Economy systems" (EC, 2014b, p. 8). Considering the legal definitions of waste as an unwanted output with no perceived economic value, using the term in policy plans that wish to change perceptions in society seems counterproductive (Pongrácz, and Pohjola, 2004). This type of criticism suggests that the ZW concept requires further conceptual development, more inclusive of cyclical based policy and implementation than is currently the case. Alternatively it should be accepted that the term results in an emphasis on landfill diversion and is ambiguous, unachievable and therefore inappropriate in promoting sustainable production and consumption and Circular Economy closed loop sustainable materials management practice.

4.1.2. Governance

When investigating examples of ZW programmes, initiatives, frameworks and policy directives, a spatially confined governance structure and a central focus on physically viable proximity are commonly found, coinciding with other research on innovation and proximity (Boschma, 2005; Cox, 1998). Often the programme is initiated and managed by the city government, or a corporation's waste management personnel, in partnership with a major waste/

Table 2
This table presents the key success indicators for Zero Waste.

	Key measurement tools equation	Target
Zero Waste = diverting waste from landfill and incineration	$\frac{\text{Diversion} = \text{weight of recyclables}}{\text{Weight of waste} + \text{Weight of recyclables}} \times 100$ Source: Zaman and Lehmann (2013, p. 122).	100% Landfill diversion
Policy instrument examples • Waste tariffs • Pay-as-you-throw • Landfill levy and taxes • Improved collection and separation rollouts		

recycling contractor and the public. This is consistent with the geographically bounded waste management configurations evident in traditional waste management practices and processes (Davies, 2005; Rootes, 2009).

Although this governance model seems fairly centralised with limited actor inclusion, it can also be considered as decentralised from regional and national policy programmes. Other studies show that the success of waste diversion often relies on quantity for economies of scale, reached through highly dense populous areas or amalgamation of separate regional areas (Nicolli et al., 2012). Although this local geographically confined and relatively centralised governance structure enables rapid dissemination and implementation of some policy directives, limitations may include a lack of ownership and inclusivity amongst major industry players and other relevant stakeholders outside of the governance structure's periphery. This may explain the tendency for ZW programmes to adopt a landfill diversion goal: the governance structure of ZW falls in the hands of actors separated from manufacturing or production processes and wider material flow systems (Clay et al., 2007).

Thus the challenge to implement these types of full-cycle material policy innovations remains because material flows and economic activities lie outside a Zero Waste city's jurisdictional control. If the ZW movement's goal of moving towards a full cycle approach is to be realised then the current 'three tier' governance model will need to be expanded to include a multitude of additional actors.

4.2. Materials cycles

The concept of 'materials' is well established; it builds upon the resources and capital stock narrative, and recently reconstructs 'waste' as a valuable economic commodity. Numerous reports and investigations have alluded to the significant role of material flows in constructing our current mainstream capitalist growth model. However the term 'material' remained relatively absent from the waste management discourse and only made a noteworthy emergence in the last decade. Although initially the shifting discourse appeared to be driven by environmental concerns, economic primacy quickly dominated.

In 2011, some prices of raw materials (also referred to as rare earth elements (REEs) skyrocketed at the influence of China's REE export controls. This trend quickly raised concerns and tensions across the globe, including several complaints of a breach of trade made to the World Trade Organisation (WTO) against China (Wübbeke, 2013; Binnemans et al., 2015). Subsequently the term 'materials' has becoming increasingly visible within policy documents such as EU WPr plans and attempts to decouple waste generation from economic growth, as set out in the 2008 European Union Waste Directive and Japan's 2008 Fundamental Plan for Establishing a Sound Material-Cycle Society. This is leading to a booming interest in 'Secondary Raw Materials' (SRMs) industries, providing a potential avenue to resolve national resource security concerns as well as opportunities to relieve raw material costs to manufactures (Binnemans et al., 2015). Across 10 industries, material input costs averaged 42% of total turnover, a large proportion of overall business expenditure (Clay et al., 2007).

Thus from a corporate perspective, especially those with both manufacturing and retailing capabilities, Extended Producer Responsibility (EPR) should not be framed as a restriction but as an opportunity to bring back material assets in to the organisations processes and reduce costs over the long term.

Although material recovery through end of life product recycling has existed as a well-established source of SRMs, other less explored sources of SRMs such as 'technospheric mining' of landfill stocks and industrial process residues have become more viable (Johansson et al., 2014; Binnemans et al., 2015). However under current market conditions extractive raw material mining is significantly subsidised by governments worldwide, which masks the true costs, not only economically, but socially and environmentally (see Johansson et al., 2014). For SRMs to truly gain momentum, market drivers as well as new governance models are required that incentivises a reduction in raw materials inputs and an increase in SRM use. Central to this process is valuing and labelling 'waste' as 'materials' in order to reconceptualise policy solutions.

The risk of this materials solution is that it may deflect from sustainable consumption by supplying additional material sources. As stated by Krook and Baas (2013):

> "*Urban and landfill mining are not necessarily disruptive to existing resource extraction systems but could even be catalytic by offering complementary sources for feeding the ever-increasing market demand for materials and energy*" (p. 7).

In order to holistically address current consumption and production concerns, policy solutions require long term visions that cognitively and practically transform waste into materials.

The below section introduces the recent materials based narrative, 'Sustainable Materials Management'. This represents policy innovations that shift beyond the objective of waste management, end-of-pipe solutions and diversion from landfill, by emphasising the value of waste as materials and emphasising the full-life cycle framework.

4.2.1. Sustainable materials management

Sustainable Materials Management (SMM) can be recognised as an umbrella policy approach[3] that dictates how materials are managed from production to disposal. Replacing the term waste entirely, the label 'materials management' automatically suggests expanding beyond the concepts of waste and end-of-pipe solutions which is also recognisable in the published available definitions. For example the United States' Environmental Protection Agency (EPA) defines sustainable material management as an

> "*approach to serving human needs by using/reusing resources most productively and sustainably throughout their life cycles, generally minimising the amount of materials involved and all the associated environmental impacts*" (EPA, 2009, p. 11).

The OECD working definition for sustainable materials management is

> "*an approach to promote sustainable materials use, integrating actions targeted at reducing negative environmental impacts and preserving natural capital throughout the life-cycle of materials, taking into account economic efficiency and social equity*" (OECD, 2012b, p. 6)

The term has most prominently been adopted within the European states, particularly the Netherlands, Belgium and Germany, although some US authorities such as the EPA have also made use of the terminology (Happaerts, 2014). The Japanese also adapt the

[3] Identifying SMM policy instruments as specifically under the SMM label is difficult as a large breath of policies exist that address aspects of SMM and fall under the sustainable production and consumption definition, whether deliberately or not. Even if the policies are not designed as specific SMM policy instruments they none the less contribute to the SMM vision objectives.

term by introducing their 'Fundamental Plan for Establishing a Sound Material-Cycle' Society (SMCS). This is consistent with other studies that describe the materials transition as prevalent within regions that no longer have rare-earth material deposits domestically (Binnemans et al., 2015). Beyond national agendas, SMM has also gained considerable traction within the larger international governance bodies such as the OECD, UNEP, G8 and G20.[4] Significant work on SMM started in 2005 with such programmes as the OECD's *Green Growth Strategy* holding meetings in Seoul (South Korea), Tel Aviv (Israel) and Mechelen (Belgium). At a regional level Flanders, Belgium's Plan C has most explicitly incorporated the notion of materials into their waste management plans.

The basis of economic, national and state sovereignty driving the SSM transition is evident in several of the assessed document's stated key principles, such as strengthening national capacity to measure and analyse material flows, reduce material outputs and increase material life-cycle longevity within geopolitical boundaries (Happaerts, 2014; OECD, 2012a; UNEP, 2011). Also highlighted across the SMM texts were references to volatile raw material prices due to protectionism and global increases in demand (Happaerts, 2014; Ministry of the Environment Japan, 2008; OECD, 2012a). For example in the EU a key objective of SMM is "to turn the European Union into a resource-efficient, green and competitive low carbon Economy" (EC, 2011). This is no surprise considering the EU and Japan depend on imports for most of their material needs (Binnemans et al., 2015).

For this reason, framing the SMM label as a concept has been closely aligned to elements of resource scarcity, raw material security, resource productivity and efficiency and global competitiveness as well as climate change and CO_2 emissions (Happaerts, 2014). Emerging from this new materials cycle discourse, strong market based economic rationalism is found, observed through a keyword and framing analyses. Studies suggest that environmental policies offering market-based monetary incentives resulted in stronger technological and sector progression towards SMM (Requate, 2005; Vollebergh, 2007). However policy design, stringency, predictability and timing are also direct determinants of policy efficacy (Kemp and Pontoglio, 2011). This is also leading policy makers to focus on market based instruments such as material resource taxation to encourage SMM. Policy design, stringency, predictability and timing are also direct determinants of outcomes (Kemp and Pontoglio, 2011).

Environmental discourse is no stranger to the paradigms of 'economic speak' and framing environmentally based initiatives are often subservient to economic sense making. One only has to critically review the common terminology used, such as '*sustainable development*', '*ecological capital*', '*resource efficiency*' and '*degrowth*' to grasp this point (Jessop, 2000). Connecting SMM to other already existent but structurally independent frames is known within the discourse literature as 'frame bridging'. This strategy enables unconnected frames to be closely associated together building a more powerful narrative and shared discourse ideology (Benford and Snow, 2000). This approach has enabled the SMM concept to resonate with other regional and national agendas beyond environmental groups, building traction and legitimacy.

The deployment of the SMM transition provisions built upon a range of case studies on specific materials, such as aluminium, copper, wood fibres and plastics and established a variety of instruments, principles and reforms to further progress the SMM agenda (OECD, 2012b). The European Commission in 2010 also published a list of materials[5] susceptible to instability, labelling these 'critical raw materials' (CRMs) (Massari, and Ruberti, 2013). This has linked the SMM transition with concepts such as urban, landfill and technospheric mining.

The tendency to divide and classify output as specific material streams reverts back to describing them as they were at input, assisting in the promotion and value of SRMs as well as policy instruments that target specific materials. For example the fertiliser tax in Austria was aimed at reducing phosphate use and associated negative environmental impacts. This is different from waste, which linguistically classifies output as one collective unwanted object. However this approach on its own does not fulfil material reduction (also known as dematerialisation) and waste prevention. Encouraging solutions based on individual material flows, expands solutions beyond just critical raw materials to include regionally managed materials such as bio and food waste materials. Evidently these different material streams will also drive towards different policy solutions.

A recent assessment by the European Topic Centre Sustainable Consumption and Production and the European Topic Centre on Waste and Materials in a Green Economy, explores taxation opportunities at different levels of the supply chain for selected non-renewable materials (iron, steel, copper, phosphorous). The potential implications of an extraction tax, material input tax and a consumption tax were explored. With all three instruments the suggested taxation mechanism was to help achieve more resource efficiency in production and design, the substitution of resource-intensive materials and more sustainable consumption behaviours (ETC/SCP and ETC/WMGE, 2015). Other ideas on improving non-renewable material use have included additional higher taxes on the sale of all single-use one way material products using current tax mechanisms such as the Goods and Service Tax (GST) and Value Added Tax (VAT) (Silva and Raphaely, 2015).

Although still very much at an informational and voluntary stage, the main documents reviewed in this study were: 'Sustainable Materials Management: the Road Ahead' (EPA, 2009) 'Roadmap towards a Resource Efficient Europe' (EU Commission, 2011), 'Sustainable Materials Management; Green Growth Policy Brief' (OECD, 2012a), 'Sustainable Materials Management; Making better use of resources' (OECD, 2012b), 'Fundamental Plan for Establishing a Sound Material-Cycle' (Ministry of the Environment Japan, 2008) and Plan C (Flanders, 2012). They all specifically address the need for waste policy to put a higher value on resource reduction by focussing on the earlier stages of the material life cycle. The short history of SMM is yet to provide extensive examples of actual policy implementation. However some progressive steps worth mentioning include the Integrated Product Policy rollouts in Denmark and Sweden, the EU Directive on Eco-Design for Energy Using Products, The EU Directive on Green Public Procurement and Germany's and the Netherlands's Dematerialisation initiatives (OECD, 2012a). These SMM experiments and findings integrated and expanded the already existing waste policies, uniting the

[4] However it should be noted that although the specific SMM label is being applied across multiple agencies, policy directives and official documents, the existing framing tactics and actual policy outcomes do differ. The Policy Research Centre for Sustainable Materials Management recently published a report 'International Discourses and Practices of Sustainable Materials Management' (2014) in which a variety of framing and policy directions are discussed. Four major international organisations are identified as significant to the SMM discourse (UNEP, OECD, G8 and G20) as well as a regional exploration of SMM in the European Union (EU). The report concludes that the framing tactics and outcomes can be differentiated.

[5] 12 Materials are on the list; antimony, beryllium, cobalt, fluorspar, gallium, germanium, graphite, indium, magnesium, niobium, tantalum and tungsten: as well as two groups of platinum group metals; iridium, osmium, palladium, platinum, rhodium and ruthenium (EC, 2011).

Table 3
This table presents the key success indicators and policy instrument examples for Sustainable Materials Management.[a]

	Key measurement tools	Targets
Sustainable Materials Management = closing material loops and incorporating full life-cycle thinking	• Life cycle impact assessment results • Multi criteria analysis • Matrix of high potential areas for waste prevention: • Decoupling GDP from waste generation (tonnes) • General waste statistics • Composed complex indicators • Total material requirement • Material flow accounting derived indicators • Direct material input • Material input per unit service • Substance flow analysis • Domestic processed output	Too complex to be specified (see OECD, 2012b 'Sustainable Materials Management: Making Better Use of Resources')
Policy instrument examples • Integrated product policy • Extended producer responsibility • Directive on eco-design for energy using products • Green public procurement • Material resource taxation (extraction, production input, consumption) • Increased goods tax (through GST or VAT)		

[a] Due to the complexity of some of the mathematical equations and workings of these KPI's and measurement tools and the limited scope of this paper; the above table superficially introduces some of the key success indicators and measurement tools associated with the EU's Sustainable materials management transition. For a detailed explanation please refer to OECD (2012).

traditionally separate policy paradigms of manufacturing and production management with waste management.

The SMM is a relatively new approach and therefore investigating the success of outcomes at this stage is difficult. However, the work that has already been done positions SMM as a holistic, integrated life cycle approach that can incorporate the economic component of SRMs. This also exposes the transition to a more complex array of key success indicators and measurement tools than that of the ZW transition. Therefore most SMM documents only provide a general overview of the SMM tools, equations and targets (see Table 3 below).

The Japanese 'Fundamental Plan for Establishing a Sound Material-Cycle' is perhaps the most elaborate in providing descriptive and detailed measurements and specific assigned targets (see Table 4 below).

Due to the geopolitical nature of national and union state boundaries (such as that of the EU and Japan) the flow of materials via import and export values and statistics are more readily available than that of city material flow indicators.[6] This enables the development of measurement tools and KPIs that address the complexity of the SMM agenda in creating solutions for full product life cycle efficiencies.

Although the SMM agenda is still very much at an assessment stage, in terms of developing and evaluating conceptual frameworks applied to materials management, it should be noted that the principles informing the SMM discourse and directions paint a very different picture to that of the ZW agenda. Even at an early stage it is still possible to assert that the SMM has so far been based more on a cyclical systems perspective than has the ZW transition.

4.2.2. Governance

The governance structure in place to manage a SMM transition is still very much emerging. Many aspects of the SMM discourse correlate to future material security and assurances for Japan and the EU's economic and political safeguarding. Therefore, policy communication and recommendations are being promoted by the centralised governance bodies at national and state levels. The necessary positioning of SMM outside the scope of a particular traditional sector (waste management, recycling or manufacturing and production) may have induced a more systematic approach than has been the case for ZW. Another positive of this centralised model is if economies of scale are required to legitimate solutions, then investment and governance at this level may be practical.

However, from a public good provision perspective, raw material governance is affected by the countries and regional states where raw materials are initially deposited (mainly Australia, Brazil, Canada, China, Dominican Republic of Congo, United States and Russia). Materials then become the property of the privatised extractive company, manufacture, producer, and finally the end consumer. When these materials are discarded as "waste", in current systems, they then fall back under the governance and ownership of the regional councils where the waste output is produced. For this reason the centralised institutions may be able to affect shifts towards SMM but will rely on the cooperation of many smaller regional and non-regional actors, necessitating a decentralised implementation plan. This will especially be relevant in governing more locally produced and managed material streams such as discarded food and bio materials (Mazzanti and Montini, 2014). This poses a major governance and policy implementation challenge.

SMM implementation strategies at a micro-level resemble the centralised governance model of zero waste, in terms of the regional confinement and proximity of the significant involved actors. However SMM governance has to be much more complex and less centralised than that commonly found within the local city approach to the ZW transition. The number and diversity of the actors involved in the SMM transition, taking in to account the full material life-cycle, is much greater. This is especially true in relation to the required inclusion of manufacturing and production entities still largely outside of Japan's and the EU's legal jurisdictions. The transition will necessitate international centralised governance bodies and agreements at the top, in conjunction with decentralised implementation models at grassroots: a governance partnership will be required. The governance re-modelling of a complex array of actors established to manage linear material systems will be required in order for a cyclical material system to emerge, playing a crucial role in the SMM transition being realised.

[6] Border protection and legislative impositions require that under most circumstances information can be retrieved in correlation to what enters and leaves these jurisdictional boundaries, differing from city processes that experience unrecorded mobility and material movement.

Table 4
This table presents the key success indicators for Japan's Sound Material Cycle Society.

	Key measurement tool equation	Target
Resource productivity	GDP/Natural resources input	60% Improvement on 2000s figures by 2015 (420,000 yen per ton by 2015)
Cyclical use rate	Amount of cyclical use/(amount of cyclical use + natural resource input	14–15% by 2015
The quantitative final disposal amount		60% Reduction from 2000 to 23 million tonnes by 2015

Source: Ministry of the Environment Japan (2008).

The differences and similarities amongst and in between the policy documents upholding the ZW and SMM discourse, demonstrates how different discourse orientation can also emerge into different policy realities. Table 5 below provides a comparative summary.

4.3. Perspectives for future research

Although ZW and SMM are gaining popularity as signifiers of shifting waste policy towards SPC Policy, distinction exists between conceptualisation and implementation within and across the two concepts.

ZW discourse explicitly links to the new waste prevention and material cycle paradigm at an ideological level. However is commonly implemented through governance models that were built to manage linear material streams, therefore is actioned as a diversion from landfill policy goal. This explains why the 'zero waste' label was found to have greater resonance with agents pursuing waste transition from a relatively centralised and localised governance structure such as; businesses, universities, schools, stadiums and cities that adopt the diversion from landfill conception. These actors often do not control production or manufacturing processes, therefore are limited in pollicising beyond managing their material outputs. Although effort has been made to evolve this policy label beyond landfill diversion outcomes, it is argued here that by reinstating the term 'waste', reaffirms waste as the starting problem identification, leading to policy directions that manage the problem rather than reconceptualise it.

SMM advances the new waste prevention and material cycle paradigm by establishing 'materials' as the cornerstone of policy objectives. However so far this has evolved the notion of sustainable production: by seeking to reduce raw material inputs and incorporating emerging SRM opportunities. Notably neglecting ideas of managed sustainable consumption and possibly incentivising a continuation of over consumption. The circumstances driving sustainable materials management increases governance complexity as well as the associated frameworks; this may explain the label's popularity amongst larger and more complex governance bodies such as, the UNEP and OECD.

Table 5
This table provides a comparative summary of the key findings.

Keywords	Documents included in the corpus	Key frames	Key performance Indicators	Governance structure
Zero Waste	On the road to zero waste. Successes and lessons from around the world (GAIA, 2012)	Limited land-fill capacity or land-fill closure	Diversion rate from landfill	Centralised
	San Francisco Zero Waste Policy (SF Environment, 2014)	The 3 R's: waste reduction, reuse and recycle		Small number of official players
	No Waste by 2010: Action Plan 2004–2007 (Australian Capital Territory, 2004)	Becoming a waste free society		Initiated at the city, organisational or state level
		Becoming a green city exemplar		
	Toward Zero Waste – Waste Management Plan 2006 (Christchurch City Council, 2006)	Reducing the impact of waste on the environment		
	City of Toronto's Waste Diversion Initiatives: Zero Waste to Landfill by 2012 (City of Toronto (2005))	Recovering resources from waste streams		
Sustainable Materials Management	Sustainable Materials Management: the Road Ahead (EPA, 2009)	Current unsustainable production and consumption	Resource productivity	More decentralised
	Roadmap towards a Resource Efficient Europe (EU European Commission, 2011)	Volatile resource availability and price due to protectionism and increases in demand	Reduction in raw material inputs	Large number of official players
	Sustainable Materials Management; Green Growth Policy Brief (OECD, 2012a)	National resource management and security	Cyclical use rates	Initiated at a regional, state, national or international level
	Sustainable Materials Management; Making better use of resources (OECD, 2012b)	Minimising national reliance on resource imports	Final disposal amounts	
	Fundamental Plan for Establishing a Sound Material-Cycle (Ministry of the Environment Japan, 2008)	Reducing environmental impacts		
	Plan C (Flanders, 2012)	Preserving natural capital		

The SMM policy objective, framed towards alleviating resource scarcity and import reliance, does not incentivise or incorporate resource abundant regions and countries that currently seek to maximise on their extractive industries and resource exports. This also supports why the EU, and Japan, as raw resource deficient regions, are driving this kind of policy shift.

In order to holistically address current production and consumption concerns, policy solutions require long term visions that cognitively and practically transform waste into materials, while considering externalities such as unsustainable consumption. This involves erecting governance and business development models that address the challenges of cross boundary governance and merge currently distinct policy arenas. Looking forward, how can we instigate frameworks and linguistic symbols that more holistically deal with the challenges of cross boundary waste prevention, material cycles and conservation of raw materials? Especially if these new semiotic structures need to inclusively overlap trade discourse and embed global production and supply chains.

Although currently ZW and SMM have been treated as two distinctly separated policy areas, integrating them together and under the umbrella narrative of CE would likely merge the implementation challenge of waste and materials policy across different geographical scales. Similarly and by comparison, the main focus of the Circular Economy model, particularly in China, has evolved from a narrow waste recycling narrative to a broad material efficiency oriented closed loop system including all stages of production, distribution and consumption (Su et al., 2013). Furthermore, governance and governments are seen as critical players in the strategic development and promotion of the Circular Economy, by reforming existing laws and policies, enacting new regulations, promoting the application of new environmental technologies and organising public education (Geng and Doberstein, 2008).

On one hand, ZW could continue to be used to increase collection and recycling, diverting waste from landfill and incineration at local, retailing industry and regional levels. Whilst on the other hand, SMM could establish markets and infrastructure to handle these outputs and reduce overall raw material requirements at national and multi-national levels. Beyond this, the three key principles driving CE;

- *Reverse logistics* develops systems and infrastructure to encourage material flows back to the producer,
- *Functional Economy* incentivises the sale of a service over the sale of a tangible product (see Philips initiative; selling light not light bulbs[7]) and
- *Industrial symbiosis* encourages industrial partnerships to trade waste materials as resources amongst each other.

Provide an opportunity to more systematically incorporate sustainable production and the often missing link to sustainable consumption.

This is especially prevalent to the notions of a functional economy (also referred to as servitisation or product-service systems) whereby a business model adapts to selling the function of a product (while keeping ownership) instead of selling the tangible product itself. This establishes a strong case against inbuilt product obsolesce which consequently encourages the purchase of a new tangible good, disregarding the product deemed obsolete. As when ownership remains with the producer, product innovation towards longevity is more valuable. The significant appeal of this model for industries aiming to dematerialise and minimise on the impacts of volatile resource costs associated with large economies of scale production (Heck et al., 2014), as well as the wider environmental and social benefits are extensively discussed (see Beuren et al., 2013; Tukker and Tischner, 2006). However this body of research remains relatively absent from waste policy transitions.

The opportunities presented by the Circular Economy model in both increasing business opportunities, decreasing environmental impact, improving resource efficiency and strengthening business competitiveness involve the objectives of both the Zero Waste and Sustainable Materials Management discourse. This recent adoption of the Circular Economy model encourages design for re-use and improved material recovery representing a closer association with Sustainable Production and Consumption thinking and focus (Genovese et al., 2015). Intrinsically this move towards a Circular Economy will involve, significantly different and more innovative ways of collecting, processing and reutilising materials, new forms of waste related governance, policy and metrics and a more holistic understanding of how to motivate both consumers and industry in their uptake of closed loop production materials management.

The recent proliferation of Chinese research and publication in Circular Economy design, frameworks and application (Geng et al., 2012; Park et al., 2010: Su et al., 2013), is confirmation of the value of enhanced waste policy being a key area of future research in sustainable development.

Other future considerations should explore the changes in production and manufacturing technology. Particularly prevalent is the emergence of 3-D printing, enabling production at the realms of individual consumers, impacting current material flows and governance frameworks. Perhaps insights drawn from the decentralisation of the energy markets, through localised instillation of solar polyvinyl chloride (PVC) and battery systems, may be of significance to the possible end of large scale centralised production and manufacturing.

The growing connectivity and consumer market trends such as the service, experience and sharing economies, propelled by expanding peer to peer and open source platforms may also provide insights into policy directions aiming to drive economic growth while pursuing a reduction in the consumption and output of raw materials.

5. Conclusions

This review and analysis examined the evolving discourse of waste policy by identifying '*waste prevention and reduction*' and '*materials cycles*' as two distinct general discourse orientations to have emerged in the last decade. 'Zero Waste' has emerged as a common label for 'waste prevention and reduction' and 'Sustainable Materials Management' as a prominent label for 'materials cycles'. The waste transitions presented also support the notion of an overall discourse adaptation within the waste arena; where the concept of waste and how it is managed are seen to be on an evolutionary track, moving away from the end-of-pipe linear based models of the past towards a future understanding of resource recovery, reusable materials and life cycle thinking. It is in this transition towards a Circular Economy type model of closed loop waste management that this paper has considered the role of discourse in both supporting and or detracting from the development of waste policy.

The results demonstrate that the difference in policy label, keywords and framing tactics has also resulted in different discourse paradigms around the concept of 'waste' or 'materials', which in turn influences what policy initiatives, measurement tools and outcomes are pursued, validating the importance of deeper

[7] "Philips is already selling light as a service – where customers pay for the performance of lumens, measures of light output, rather than the physical hardware of a light bulb or light fitting" http://www.philips.com/a-w/innovationandyou/article/extended-story/Circular-economy.html.

consideration when selecting labelling and keywords to promote policy reforms. This paper suggests that policy practitioners and academics should refrain from using the single term 'waste' within policy development, with an aim to strategically take this important discussion away from 'wasteful' end-of pipe solutions. Alternative terms, such as "materials", "resources" or "tangible output" help widen the applicability and inclusivity of important actors and industry players currently outside the waste paradigm, encouraging the much needed reformation and transition of current waste governance structures and the reconceptualisation of waste policy as the management of underutilised or unutilised materials. Waste prevention and reduction is clearly a complex policy and governance challenge. However, it is also an opportunity to reframe policy solutions with ideologies, strategies and paradigms that build capacity for waste management to move from its current wasteful focus on end-of-pipe solutions to the provision of sustainable consumption and production material flow and waste utilisation. The real meaning of Zero Waste and Sustainable Materials Management.

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Abbreviations

10YFP on SCP: Rio 20+ 10-Year Framework of Programmes on Sustainable Consumption and Production
3 R's: reduce, reuse, and recycle
BREF: Best Available Technique Reference
CE: Circular Economy
CRMs: critical raw materials
EEA: the European Environment Agency
EPR: Extended Producer Responsibility
G8: the Group of Eight
G20: the Group of Twenty Major Economies
GDP: gross domestic product
GST: goods and service tax
KPIs: key performance indicators
MEf: material efficiency
MFA: material flow accounts
NGOs: Non-Governmental Organisations
OECD: Organisation for Economic Co-Operation and Development
PVC: polyvinyl chloride

REEs: rare earth elements
SMM: sustainable materials management
SPC: sustainable production and consumption
SRMs: secondary raw materials
SMCS: Fundamental Plan for Establishing a Sound Material-Cycle' Society
UNEP: United Nations Environmental Programme
VAT: value added tax
WPr: waste prevention
WTO: World Trade Organisation
ZW: zero waste