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Commentary

Exploring the Phenomenon of Zero Waste and Future Cities

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Abstract: The evolving phenomenon of zero waste encompasses the theory, practice, and learning of individuals, families, businesses, communities, and government organisations, responding to perceptions of crisis and failure around conventional waste management. The diverse and growing body of international zero waste experience, can be portrayed as both, an entirely new and alternative waste management paradigm, and or, interpreted as overlapping, extending, and synergetic with a general evolution towards more sustainable waste/resource management practices. Combining the terms zero and waste provokes creative, intellectual, and pragmatic tensions, which provide a contemporary axis for necessary debate and innovation in this sphere of resource management. This commentary draws on an interdisciplinary perspective and utilises some elements of the critique of zero waste, as a lens to examine and better understand this heterogeneous global community of practice. In particular, how the concept and implementation of a zero waste goal can increase community engagement and be a catalyst for the design and management of a more circular urban metabolism and hence, more adaptive, resilient, and sustainable future (zero waste) cities.

Keywords: waste; zero waste; resource conservation; recycling; urban metabolism; circular economy; future cities

1. Introduction

The evolving concept and emerging practice of zero waste is a controversial sphere of discussion across urban development, manufacturing, and waste management [1–3]. However, the ideal and goal of zero waste continues to be embraced by individuals, families, communities, business organisations, as well as, local municipal and national levels of government responding to the issue of waste [1,4,5]. A significant tranche of popular, industry and academic literature evidences how the concept of zero waste is being practically outworked and also, how this practice is evolving, as strategies, policies, and programmes are implemented, "reality checked", reviewed and revised in further cycles of innovation seeking [1,4,6].

This commentary article will examine the phenomenon of zero waste in respect of the concept, planning, and design of future cities and will clarify some of the ambiguity that occurs when the terms, zero and waste, are combined [3]. The article will also discuss some of the learning emerging from key zero waste experiences, relative to selected elements of critique around the zero waste movement. This article is derived from the methodology of interdisciplinary literature review, which encompasses discourse and practice (such as circular economy, urban metabolism, living labs, and bio-economy) related to waste and zero waste.

As a real world context for exploring the phenomenon of zero waste, this article also draws upon relevant aspects of a recently completed analysis of New Zealand's waste → zero waste story. This analysis, entitled "Changing Behaviour: (New Zealand's delay & dysfunction in utilising)

Economic Instruments in the Management of Waste?" [7], was developed and published under the auspices of the New Zealand Product Stewardship Council and examines the politics, campaigning, and eventual outcome of a two decade period of waste management policy in New Zealand, during which zero waste was adopted and then abandoned as a strategic driver. The resulting experience reinforces the value of developing and communicating an effective understanding of the phenomenon of zero waste in respect of community aspiration and the design and implementation of future zero waste cities.

2. Global Waste Issues and Cities: Why Zero Waste?

Resources from all over the biosphere are described as being, "funneled" into the world's cities to meet the rising consumption, driven by accelerating globalisation, urbanisation, and affluence [8,9]. A commonly cited metric illustrating the associated imbalance and exploitation is that cities occupy just two per cent of the earth's land surface, yet use over 75 per cent of its resources and discharge corresponding proportions of waste [9]. Similarly, urban communities currently account for over 70 per cent of global energy-related CO_2 emissions [10]. Extrapolating this exploitation-discharge correlated further, cities appear as the apex of the "anthroposphere", which Manahan articulates as centrally embedded in a rubric of material, energy and waste exchange within the dynamic interaction of atmosphere, biosphere hydrosphere, and geosphere [11].

Such reporting draws a stark distinction between the extractive, carbon intensive, lineal, disposal orientated human systems, and the "biological analogy" [12] and "ecosystem" design metaphor [13,14] offered in, what are popularly interpreted as the infinitely sustainable, solar powered, zero emissions, circular metabolism of natural systems [15,16]. The functionality of urban systems is said to determine whether the waste outputs of cities, discharge to atmosphere, or gets deposited in dumps/landfills, or accidentally/deliberately litters the landscape, before accumulating in rivers and the ocean [17,18]. In respect of more sustainably managing the globally significant urban resource/waste stocks, flows, and sinks, the development of sustainable future cities is cited as requiring a regenerative design mind-set and fostering new technical and organisational solutions, which bio-mimic nature's inherently successful—circular design [19–21].

Striving for zero-carbon transport, energy and building systems (i.e., "nZEB") [22], resource conservation and efficiency, and the beneficial recycling and reabsorbing non-toxic non-polluting water [23] and waste flows, as a resource (hence enhancing quality of life and the long-term environmental sustainability of the whole system) are identified as critical challenges within future city discourse [23–25]. Zero waste (inclusive of future zero waste city models) has been described as a pathway being "forged" towards a desirable long-term goal [26] and in some sectors almost achieved [24]. However, zero waste is also regarded negatively by some, as a potentially harmful myth [27]. Notwithstanding this spectrum of reporting, a range of integrated green urban design principles, such as sustainable design and circular urban metabolisms, have been discussed as being central to realising the concept of a zero waste city [15,16]. Given the conflicting assertions that the phenomenon of zero waste affords a critical opportunity to address waste issues [2], a starting point in exploring these claims, is to examine current global "progress to date" in managing waste.

A cluster of international reports describe the issues that are associated with waste, as of becoming a globalised public and environmental health emergency, necessitating an urgent, internationally coordinated, comprehensive, and effective response [28,29]. The environmental and social consequence of humanities failure to effectively manage waste, has resulted in some of the most polluted and poverty stricken places on Earth [29]. Whilst this syndrome is often localised and most concentrated around (mega) cities [30–32], the interrelated aquatic and atmospheric dimensions of impacts of terrestrially generated waste is now being registered across the entire global biosphere [33–37].

The World Bank reported that, the 2012 baseline of 1.3 billion tonnes of municipal solid waste (MSW) generated by cities globally, is projected to double by 2025 to 2.2 billion tonnes pa [18]. The current trajectory of growing population, urbanisation and consumer demand, underwrite such

projections [32,38,39]. Given this, it seems unlikely that the critical challenge of reducing waste generation (i.e., located as the top priority of the "5R" waste hierarchy (i.e. firstly: reduce, reuse, recycle, recover energy and then lastly residual disposal)) is, under "business as usual" conditions, immediately achievable. Concerningly, it has been reported that, unless aggressive sustainability scenarios are successfully implemented, "global peak waste" might not occur until 2100 [40]. Increasingly, the interrelated dimensions of the waste issue, (i.e., ocean plastics, disaster waste management, chemical toxicity and dissipation, food-waste, organised crime, nuclear waste, and emerging "NBRIC" (i.e. nanotechnologies, biotechnologies, information and communication technologies (i.e. WEEE), robotics and cognitive sciences [41])) is attracting media reporting and a correlated escalation in public awareness and alarm. This breadth and diversity of waste issues, is overlain by systemic causalities, such as history, geography, infrastructure and technology, vested interests and ideology (i.e., privatisation [42]), and individual and collective cultural and socio-economic imperatives [43–47], which adds to associations of "super wicked" [48–50] complexity and intransigence.

In terms of the global provision of "residual disposal" (i.e., the supposed least priority, at the bottom of the 5R waste hierarchy) the efficacy and outcome to date of the conventional waste management paradigm and practice, also raises questions. The International Solid Waste Association's (ISWA)—"Global Waste Management Outlook" (GWMO) aligns with other similar reporting, in estimating that, between 2 and 3 billion people live below the most basic waste management system benchmarks of collection and controlled disposal [51,52]. Aggravating concerns around the pollution and climate change impacts of systemic failings in global waste management, reporting indicates that the default disposal "treatment" for approximately 41% of global waste is uncontrolled burning [35,36].

The critically important global ISWA programme seeking to rectify this syndrome [29] has set challenging goals (i.e. "As an initial step, aim to: achieve 100% collection coverage in all cities with a population more than 1 million, eliminate open burning of municipal solid wastes and similar wastes, and close large open dumps, replacing them with controlled disposal facilities" [53]). Achieving these goals represents a key initial benchmark in modern "integrated solid waste management" [54, 55]. However, it is important to recognise that achieving those baselines, is just the starting point for the envisioned transition to holistic, sustainable resource conservation, and material circularity, which advocated in, for example, "circular integrated waste management systems" (CIWMS), zero waste and a circular economy discourse [17,56–59].

Whilst it can be accepted that "the world can't recycle its way out of waste" [60]. Equally, the common scientific rhetoric offered by the USEPA [61] underwrites the growing ubiquity and popularity of recycling today. Keynote environmental commentators similarly link the benefit of recycling to the challenge of addressing climate change. Stern argues that, because recycling makes such major and under-appreciated contributions to reducing GHG emissions it is one of the "best kept secrets in energy and climate change" policy [62]. Such glowing appraisals has been more recently "reality checked" by China's successive "Green Fence", "National Sword", and "Blue Sky" import policies applying to recycled materials, which has sent shockwaves through global recycling markets [63]. Overall, the importance and positive opportunity of "recycling citizenship" demonstrated by the informal sector and communities across the global spectrum of socio-economic development, is now well established [3,58,64–68].

However, in spite of the significant environmental and social opportunities that are attributed to recycling, it is estimated that globally, currently only one-quarter to a third of the total 3.4–4 billion tonnes of MSW and industrial waste produced annually, is recycled [69]. So in summary, international waste data indicates that, after over four decades of significantly investing in the widely accepted principles of the "waste hierarchy", there are still significant barriers in realising the stated: top (reduce), middle (recycle), or even lowest (residual disposal) priorities. Whilst conventional waste management theory, distilled into the near universal rubric of the waste hierarchy, clarifies our priorities and can be

seen as having catalysed a measure of progress, overall we are yet to globally actualise this principle and appear to be "entangled/trapped" in limitations of this paradigm [6,70–72].

The net result is that, most of the resources which flow through the global economy still transit via the destructive and polluting linear model, variously described as—"take-make-waste" [73]/"dispose" [6,56]. Evidencing this, socio-metabolic research, which assessed the degree of circularity of materials flowing through the global economy, describes this as currently, only in the early stages [74,75]. Currently, the development of a more "circular economy" is limited by a rapid growth in "socio-economic stocks", a focus on recycling rather than reuse/reduction and an estimated 44% of processed materials that are incinerated to "provide energy" [6,75], and hence, exit rather realise economic circularity.

The zero waste movement [76] can be viewed as one of a cluster of sustainability actors, which both highlight and respond to the nexus of failure, inertia, and growing sense of crisis, that is associated with the conventional waste management paradigm [3,58,77]. The zero waste movement encompasses a range of perspectives and approaches [1,4] and can be regarded as a neologism, residing in a busy "eco-ideas marketplace", alongside interrelated and complementary theses on how sustainable development can be engineered [3,58,78]. For example, whilst disciplines, such as industrial ecology (IE), urban metabolism (UM), and bioeconomy (BE), and the movements for a "circular economy" (CE) and zero waste each arise out of differing: perspectives, personalities, and intellectual traditions, the appearance of shared cognitive DNA seems clear [79]. These movements are conceptually aligned and complimentary in seeking to confront and re-design and replace the current "exploitative", lineal economic model with progressively more cyclical and sustainable resource management, where anthropogenic systems "bio-mimic" the modelling of natural systems [19,57,80].

However, in this sphere, zero waste also has a unique identity and assumes a distinctive role, articulated in the broadly accepted, peer-reviewed definition offered by the Zero Waste International Alliance (ZWIA) [81]. In the adoption of provocative terminology, a campaign posture and in advocating for a hyper-aspirational continuum of innovation, zero waste seeks to confront the perceptions of normalcy and intractability around waste. The embrace of dissent and activism in the framing of zero waste, alongside the embrace of community/NGO involvement and the economically redistributive aspects, is why the movement is simultaneously controversial, and arguably indispensable [72,82].

Encompassed in the prickly opposition to incineration and landfill, zero waste seeks to refute and disrupt the prevailing normalisation of waste and our "throw-away society, as a relatively recent socio-economic construction, which can and must, be redesigned [17,83,84]. Zero waste directly confronts the waste management industry's twin bury and burn profit centres, on the basis that perpetuating our "flame, flush or fling" [85] disposal mentality, ultimately binds human society to linear material flows, rather than enables the development of a more circular economy. Rather than extoling the supposed technical progress of reforming disposal systems (such as sanitising, or optimising landfill or extracting energy from incineration) zero waste regards these "developments" as confirmation of societal capture to a failing and unsustainable socio-economic model [82,85,86]. The thwarted global progress toward genuinely sustainable material resource management, is the central provocation catalysing the global search for alternative modes for generating innovation and progress. Within this spectrum of activity, a growing cohort of organisations and practitioners choose to self-identify, under the heterogeneous brand of zero waste.

3. Current and Future Cities: A Crucible of Issues—A Milieu for Innovation and Opportunity

Historically, the creativity, social connectivity, and productivity that are facilitated by cities have been central to human advancement and technological development. However, this progress is also associated with negative environmental consequences, including waste related issues [22]. The confluence of globalisation, megacities and waste management provides a lens into anthropogenic dysfunction and crisis [87]. It appears likely future cites (including and especially African and Asian megacities [32,87–90]) will be a critical focal point for addressing the challenges associated with

population growth, globalisation, climate change and sustainable development. Conversely, cities will remain the prime locus, where negative consequences manifest and further undermine environmental sustainability, social and economic stability and wellbeing [22,32,87]. Illustrating the problem-solution dichotomy of future cities, the triangulation of "city, people, planet" is also cited as providing a hotbed of waste related liveable city innovation [9].

As the culmination of multiple system vulnerabilities (i.e., acute poverty, accentuated by extreme social inequality, escalating urbanisation, socio-economic development latent proximity to geographical hazard zones and regional environmental degradation, appended to the consumption of material resources, energy, and water) (mega)cities form apices of global risk [91]. However, despite the exceeding ecological footprint and concentration of systemic social issues, it is wrong to assume that cities are automatically bad for the environment. In contrast, future (mega) cities should be understood as a crucible of opportunity and "political ecology" necessary for research led hyper-innovation and the enabling social cohesion, which might underwrite necessary reform and progress [38,87,91,92]. For example, there appears to be a positive correlation between addressing waste alongside other critical "future city" issues, such as sustainable food systems. Illustrating this, urban agriculture is posited as providing an opportunity to reduce the outright generation of food waste (and the associated expending embodied energy), as well as by being the receiving environment (hence enabling localised nutrient cycling) for the compost and other products of organic recycling systems [93].

Cities provide, almost irrespective of geography, location, culture, and history, etc, a characteristic "template" of environmental and social problems [8]. As such, cities become vectors for the cognition and design rhetoric of aspiration and solution seeking (aka "eco/solar/smart-city", "green-urbanism", "bionic", or similarly with water as a focus, "spaceship") [8,94,95]. Within such futuristic and envisioning design paradigms, future cities are seen offering the disruptive new formations of social-political ecology and as providing living laboratories of, for example: innovative and transformative governance/management, smart technologies/infrastructure (i.e., ICT enabled internet of things—inc. in respect of waste [96]) to foster zero-energetic, zero-waste, environmentally sustainable self-sufficient food security, and symbiotic industrial ecologies [8,94,97,98].

In respect of the design imperative for future cities, zero waste can be viewed as a "creative milieu", functioning across the spectrum between, the ZWIA's formal definition and a "wild-west" of interpretive miscellany. Zero waste exists in a tension between the ZWIA's genuine attempts to quality assure and preserve the integrity of the concept and the creative freedom that is required to drive the quantum innovation that is needed to address the escalating spectrum of waste issues, which demand a continuum of locally appropriate responses [52,99]. Leveraging off the mutability and envisioning function of zero—as a "stylistic" for innovation, zero waste can be seen as an optimistic meme, for a "future and solutions focused" freedom of thinking [77].

For example, spheres of acute innovation with potentially far consequence, which are colonising, re-interpreting and are simultaneously manipulating, stretching and actualising the plausibility of zero waste are: nanotechnology [100–102] 3D printing [103–105] and in the context of space travel [106,107], clothing [108,109], housing [110]. Zero waste can also be interpreted as being part of a sixth wave of innovation in waste management systems and clearly continues to be debated, contested, and to evolve across its globalised contexts and interpretations [1,17].

Described historically as a "dangerous idea", the paradox of zero is cited as inspiring the disruptive "zeronautics" that are capable of breaking the sustainability barrier [111,112]. The idiosyncratic coinciding of the terms waste and zero, signifies a direct challenge and the deliberate confrontation of both, the normative function and implication of the non-neutral language of waste [3] and the deeply vested industrial triumvirate (aka "Take-Make-Waste" [6,56,73]), dominating the core of the global current economic system. The discourse and community of zero waste in the respective theoretical nurture and actual participation in waste activism, denotes a rejection and stark disassociation from the entrenched role of traditional waste management, as an enabler of the economic primacy given to consumption and capitalist growth models [3,72]. Even before encountering any of

the numerous actual practical barriers to influencing "modes of governance", the word couple—zero and waste, directly contests the embedded connotation of waste, relative to the dominant political rhetoric and reality [3,72,79,113].

The complex challenge of facilitating social cohesion, environmental sustainability, and economic success in the face of mass urbanisation [90], means that cities represent a development milieu and potential "living laboratory", for experimenting with the "fresh politics" and "imaginative infrastructure" for generating the new innovation and knowledge required for social and technical transformation [114]. Cities (and regions) are cited as potential "ideapolis" [115], embodying key dimensions in which living laboratory research theory and practice is seeking to provide alternative, participatory, democratised, user integrated/co-generated, innovation milieu, for cogenerating solutions, via bottom-up, long-term collaborations amongst diverse stakeholders [116–119].

"Smart spaces" (of all scales from household living environments, to cities, to territories), sustainable product and service system (PSS), small to medium enterprises (SME), and larger business models (including public-private-people-partnerships i.e. PPPP), as well as, optimising rural/regional/national and international development (and innovation within all policy spheres) are amongst the work areas, where the subjects of waste and future cities intersect and living labs are cited as contributing to innovation seeking [118,120–124].

Whilst evidencing employment across diverse spheres of application, the discourse mapping the developmental trajectory of living labs, also illustrates the emergence of integrative themes. For example: "quantum innovation in response to failure/issue", co-creation within partnerships/networks, the innate pragmatism of constructing locus in "reality", and responsiveness and orientation towards meta-imperatives, such as sustainable development, all emerge as defining characteristics of living labs, correlated with the challenge of future zero waste cities [125].

Notably, the proliferation of living labs concepts, practices, and organisations, can be observed as having occurred within the growing global acceptance of the reality of climate change and with that, cognition around the requirement for disruptive innovation and transformative "real world" sustainable development [98,120]. Perceptions of failure attached to the conventional waste management paradigm and the associated socio-environmental consequences impacting most acutely in (mega)cities, converge and precipitate demand for "quantum innovation" and the aspiration, concept, planning, and practices seeking to actualise future zero waste cities. Consequently, the constituent elements conceived as critical to the realisation of future zero waste cities, are emerging as foci amongst contemporary international living labs networks and other open innovation apparatus [120,126].

An example of a living lab initiative engaged in the future zero waste city—development milieu, is the strategic collaboration between the ZW SA Research Centre for SD + B and the "Adelaide Living Laboratory" (ALL) program [127,128] (NB: there are a range of other Australian living labs engaged in fostering open innovation networks to support environmental and socio-economic sustainability of people, communities and cites [129]). The ZWSA Research Centre for SD + B focusses on an "upstream" conception of zero waste, i.e., the design underwriting products, production, consumption, and urban systems [130]. A similar example, operating as part of a broader institutional approach to living labs [131], is the New Zealand based Zero Waste Academy (ZWA-LL), which is seeking to explore, outwork, and share living labs based waste-zero waste research and education in support of city—university sustainability [125]. These situational contexts and evolving living labs models, which seek to support inter-disciplinary research based learning and an extension between a university, the host city, and external partners, can be seen as coinciding with much of the defining rubric of contemporary living lab theory and practice [117,132].

Additionally, in this sphere, the "ECO LivingLab@Chamusa" in Portugal, is an example of a living lab structured for co-generating industrial symbiosis (IS) and other related environmental and socio-economic development strategies, outworked in the setting of an urban eco-industrial park (EIP) [133,134]. The development of resource recovery centres/networks, EIP, and IS (alongside

other industrial ecology tools and approaches) provide a framework for measuring, evaluating, and enhancing the ecological health of anthropogenic metabolism at commercial, community, city, and regional scales [132]. In this genre, another related community based social configuration for co-generating innovation, is the "Zero Waste Research Centre" [135,136] in Capannori, Italy. Accumulating case studies validate this collaborative, participatory bottom-up approach for mobilising real-world outcomes and progress [137,138]). Given the interest and alignment of zero waste and living labs seeking to "innovate innovation" [139] in real world development milieu of future zero waste communities/cities, it interesting to consider the emerging value proposition and to explore the conceptual symmetry between zero waste and other contributors to this design ethos and aspiration.

The following graphic (Figure 1) provides an illustration of a model of interdisciplinary alignment, which is informing the development of the New Zealand based, Zero Waste Academy (ZWA-LL), which is one example of a living lab approach, focussing on the concept of future zero waste cities [125].

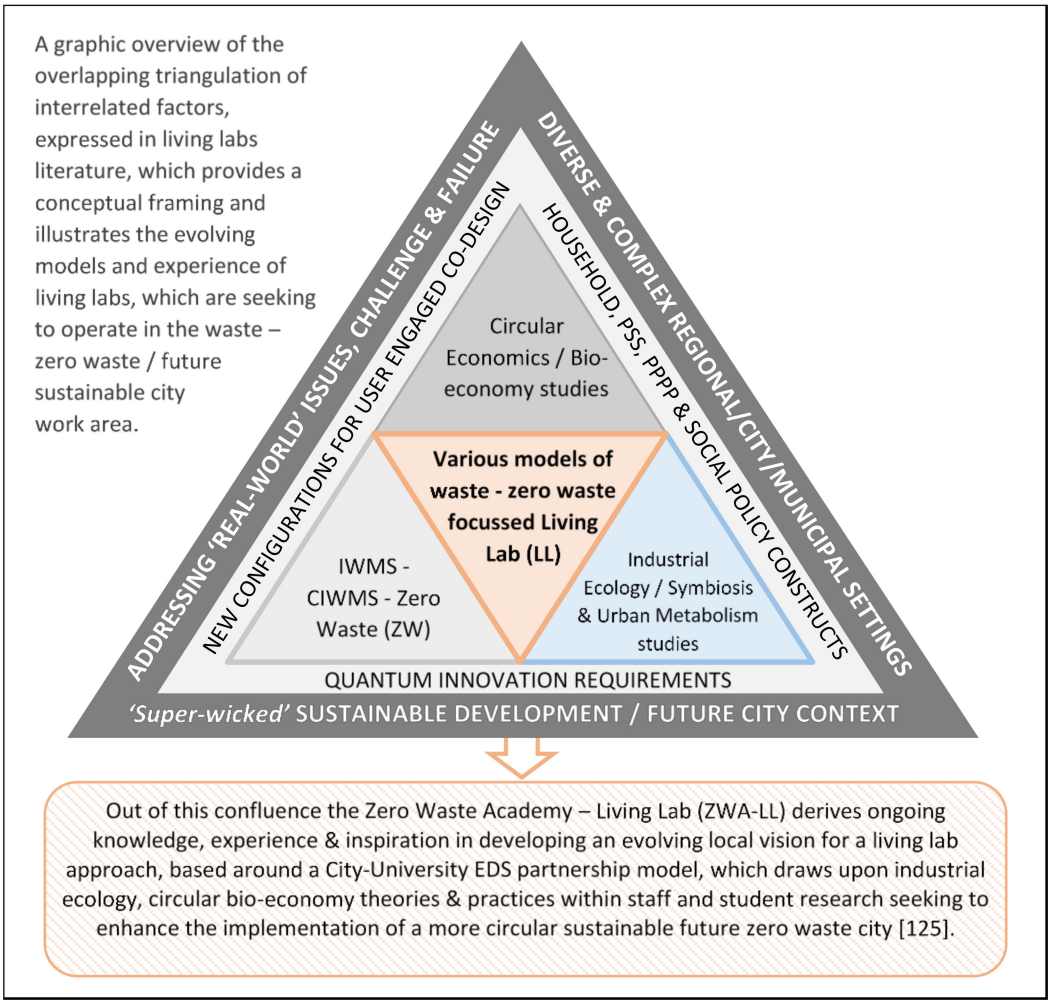

Figure 1. A graphic overview of the living lab—industrial ecology/urban metabolism—circular bio-economy—zero waste, synergy model, which underpins the past and proposed future development model of the New Zealand based, Zero Waste Academy (ZWA-LL) [125].

4. Zero Waste: Formation, Convergence, Circularity and Critique

Zero waste is also described as a unifying concept that embraces the diversity of measures, experiences, and interpretations arising in industrial, municipal, activist/community, development, and policy/government spheres of practice [6,77]. It can be argued that the truest holistic comprehension of all that zero waste is perceived to be, is expressed cumulatively across all the

various respective media (Inc. social) and other avenues of publication, including, but not exclusively, academic literature. However, in the latter respect, there is now a cluster of substantive review articles, providing an improving summation of the evolving and overlapping descriptions of the continuing flux in zero waste development [1,6]. It can also be recognised that deeper analysis, further clarity, and case study research [1,6,140] is required. For example, specifically around policy implications, quantifiable success factors and the relational distinction to "zero waste to landfill" (ZWtL) and waste to energy (W2E) [3,58,141–144].

Given the innate challenge, complexity, and formative inconsistencies of this sphere [2,6], alongside recognition of the role that "contested and negotiated narrative" plays in policy formation [3], to what extent are critiques, such as that zero waste is populist, over-simplified, reactionary, and/or too extreme [145–148] justified? Interestingly, there is now nothing too unique or special about the ideal of zero waste. Illustrating this, the mainstream International Solid Waste Association's (ISWA) vision (See: [149]) is to work towards an "earth where no waste exists" [47]. Similarly, the Solid Waste Association of North America (SWANA) both acknowledges "the paradigm shift towards of zero waste . . . " and offers training (See: [150]) in support of zero waste as " . . . real trend" [151]. The world's largest waste management company is cited as framing zero waste service provision within an integrative, synergistic future perspective [152]. So, whilst many seem to adopt and agree with a generalised vision and some of the rhetoric of zero waste, there is clearly a spectrum of interpretations and debate around what represents, "faux" [153] versus "authentic" [154] zero waste, in what is a globalised "free-market" of ideas and activity.

It can be argued that "business as usual", token, or even outwardly positive incremental change to the deeply embedded causalities and the manifest issue of waste, perpetuates the growing risk of stumbling over a tipping point into irreversible pollution and climate change impacts [155–157]. In contrast to the risks that are associated with the status quo, effectively tackling, even just the most acute baseline waste issues, has been associated with the potential, across the global economy, to reduce "GHG emissions by 15–20%" (This is only one of many benefits for example: Aside from the significant opportunities to reduce toxicity, pollution, the "estimate of worldwide potential for new jobs in the circular economy is 9 to 25 million . . . Prevention of the 1.3 billion tonnes of food waste generated per annum enough to feed all the undernourished people in the world twice over" [53]), whilst addressing "more than half of the high-level sustainable development goals within the Post-2015 Development Agenda" [52].

Whilst, accepting that the global problem of waste is an extreme challenge, it is also important to recognise that the cost to society of not addressing the most acute issue of dumpsites is cited as exceeding the "financial cost per capita of proper waste management by a factor of 5–10" [52,53]. Relative to the wasteful status quo, generating progress presents as a sound economic investment [2,5, 158,159]. The apparent strength of the socio-economic and environmental opportunity of addressing waste issues, highlights an important question. Why has positive progress has been so difficult to catalyse in this sphere? Key international thinkers now reconceptualise waste as a symptom and physical artefact of a fundamental and unresolved failure in socio-economic design [21,57,80]. The roots of this design failure originate in the post WWII reconstructionist period, where faulty perceptions of infinite resources, consumerism, and the "throw-away society" were socially engineered into the DNA of what has become the dominant political and economic ideology [58,160].

Today, the movements for zero waste and a circular economy advocate for a transition away from this wasteful and polluting socio-economic model, premised on lineal resource flows, environmental exploitation, and excessive disposal [7]. A "circular economy" has been articulated as being: "regenerative by intention and design... eliminates the use of toxic chemicals . . . aims for the elimination of waste through the superior design of materials, products, systems, and, within this, business models" [56]. Advocates of a circular economy note that: "nature operates according to a system of nutrients and metabolism in which there is no such thing as waste" [21].

Similarly, the discipline of industrial ecology, like zero waste, also seeks to emulate the "ecosystem metaphor" [13,14], which recognises that "nature is a zero waste system . . . Nature recycles everything . . . " [161]. In rejecting the "concept of waste" [41] and seeking to loop the "technosphere back on to itself" [162] industrial ecology can be seen as combining a bio-mimicry of natural systems [19] and the syntax of recycling, in progressing the "ultimate industrial ecology goal of zero waste" [7,163]. Similarly, the discourse and practice attributed to the global bioeconomy movement shares in and illustrates the ubiquity, ideal, and rhetoric (i.e., "green", "cycles", "zero", "nature", etc) of this sustainability construct [164–167].

There is an emerging recognition in bioeconomy literature around the potential to reconceptualise and repurpose bio-technologies/processes (which my be otherwise, just framed in the conversion/exploitation of biogenic resources and wastes [168–170]), in order to contribute toward resolving the ubiquitous challenges of excessive urbanisation, diminishing biodiversity, resource exploitation, post-fossil energy and chemical transition, and climate change and inequitable and unsustainable economic development [171–174]. For example, by cascading levels of extraction of, initially high-value-added chemicals and products, then bio-materials and finally 100% (aka zero waste [168,175–177]) bioprocessing of residual biomass and further a CO_2 biosequestration, closed loop, zero emission bio-refinery [178–180].

In a similar manner, as the theories and practices of zero waste, industrial ecology/symbiosis, urban metabolism, and a circular economy are reflected in national and international policy documents [181] (NB: the author cites [182–185]), accumulating publications spanning environmental economic and social perspectives report on seeking to realise "sustainability" benefits from the bioeconomy. Specifically, positive sustainable development opportunities are variously attributed to enhancing: global [167], national, regional [176,181,186], local and SME scales of the bioeconomy [168,187], as well as specific bioeconomic sectors [188,189]. In additon, a spectrum of industry reporting and academic literature is now emerging around keynote organisations [166], strategies, technologies [169,175], production [190] and product [174,190] level bioeconomy initiatives.

Given evidence of a degree or commonality, integration, and a broad recognition of a generalised vision of zero waste [1,191–193], crucial questions then arise, such as how specifically can society manage this transition? How steep should the trajectory of change be? What regulatory instruments and programme tools will drive progress? How can barriers to progress be overcome [72]? Zero waste argues, not only for radical change making policies and programmes, but also for structuring an ongoing continuum of aspiration, beyond the current boundaries of known technical and socio-economic, possibility [7]. The UNEP guidance for national waste management strategies specifically identifies a "zero waste target" as underwriting a necessary continuum of aspiration in addressing the: "never-ending nature of waste management tasks—a recognition that there will always be a need for improvement, and that once one target has been achieved, others, more demanding and difficult, will still remain to be tackled" [99].

However, why continually strive after the seemingly impossible [144,194–197]? Increasingly, it is argued that all technological-socio-economic capital is dependent on natural capital [71] and that without a transformational scale of intervention and remediation, the anthroposphere is at risk of continuing to degrade and potentially collapse [198,199]. Zero waste discourse argues for shifting beyond a techno-centric, "end of pipe" focus, predicated on disposal [3,5], into a more values based (including those of indigenous peoples), ethical approach, which recognises the human centred, sociological basis of waste [200–203]. In a zero waste construct, this includes refocussing on the criticality of consumer—producer responsibility [1,15,26,113,204,205] and community participation and leadership [68,82].

So, whilst in broad symmetry with other environmental "brands/policy labels/keywords" speaking to the issue of waste and resource management [3], zero waste voices a distinctive call to action, positioned in the radically optimistic end of the debate around the need and opportunity of socio-economic reform [62,80,160,206]. Accordingly, the zero waste movement promotes the most

assertive regime of policy instruments and interventions aiming to conserve and cycle resources, avoid pollution, address climate change, and to actualise sustainable development [1,77].

5. Who-How-What-Why: Zero Waste?

It has been argued that solid waste management in the world's cities is not only "the most important municipal service", but because of issues, such as relative cost, projected increases in generation rates, and the interrelationship with other local considerations (i.e., transport, informal sector, flooding, pollution, and public health), effective waste management in cities is viewed as a key prerequisite enabling other sustainable urban development activity [18,207]. This and other insights into the city—waste issue nexus, support the view that globally, waste is amongst the most challenging and complex anthropogenic problems confronting communities today [7]. Zero waste case studies provide a degree of both, sagacity and future optimism around the challenges of solid waste management in the worlds cities, in particular when community involvement and responsibility is recognised and enabled in the quest for local solutions and progress [30,68,208]. So, amongst the spectrum of theories, imperatives, and investment directed at waste issues globally, how significant and effective is the zero waste contribution?

From the name down, the zero waste movement deliberately embodies confrontational terminology and appears to embrace the risk of confusing infinite inspiration with enigma and antagonism. Given the depth of international consultation, which underwrites the terminology selected for the ZWIA definition, it seems that the movement strategically accepts controversy and embraces the attendant criticism and push-back. Whilst, some of the criticism that was directed at zero waste appears overwrought and misguided, a review of the critique of zero waste illuminates debate, which informs and challenges both conventional waste and zero waste schools of thought. In spite of the appearance of being "black n white", the zero waste movement appears to catalyse a spectrum of new activity, experience, and learning, which spans "revolutionary" to "evolutionary" worldviews [26,80,209–211].

Whilst the critical importance of the 3Rs is widely accepted and is clearly supported in the practice of zero waste, conceptually zero waste seeks to be reframed beyond the constraints of conventional waste management perspectives [1,58,81,212]. This aspiration is expressed in the ideal of seeking to "eliminate", rather than forever just managing waste, as discarded material flow preordained for disposal [161,213,214]. Zero waste seeks to reimagine the default setting by which waste is inevitably characterised a "problem" (i.e., something to be quickly gotten rid of) into being reconceptualised, as a "resource" framed opportunity to be exploited [6,72,113].

Zero waste directly challenges the assumption of waste as a valueless and an unavoidable by-product of consumption. In contrast, zero waste considers the whole of product lifecycle and whole of economic system viewpoint. Accordingly, commentators describe zero waste as a "manifesto for the redesign of the material economy" [57], which seeks to culminate in a "2nd green industrial revolution", [57,215,216]. Speaking from the perspective of an industrial economist, Murray's challenge is that waste has become an issue, which is "too important to be left to the waste industry" [57]. The author compellingly interweaves the idiom of waste, into the mainstream conversations of climate change and resource management in observing that, "as a pollutant waste demands control. As an embodiment of accumulated energy and materials it invites an alternative" [57].

Derivative of the way the word waste, simultaneously functions as a noun, verb, and adjective, zero waste is used and interpreted differentially, according to worldview, context, and objective. Interpreted inclusively, the zero waste movement is a heterogeneous global community of practice, demonstrating many of the tensions and contradictions incumbent to an emergent, holistic, and heavily contested worldview [1,76,77]. An overview of zero waste literature shows zero waste arising out of industrial, municipal and activist/community experiences with apparent precedence and emphasis in that order [1,77,217]. Each distinct worldview contributes to and shapes the narrative, as well as a sense of juxtaposition attributable to zero waste. Whilst, it can be recognised that the origins of zero waste

success was pioneered in an industry setting, [57,77] today endorsing and empowering the informal sector and grass roots-community based initiatives, is seen as instrumental to the future of zero waste [30,68,218–221]. Adding to this diversity and debate, zero waste policies and programmes are being developed across the spectrum from developing to developed socio-economic settings [68,222].

At its most deconstructed, zero waste strategy can be understood as involving phased and synergetic "upstream" (designing for prevention-avoidance) and "downstream" (confronting and reforming waste policy and industry practice) conceptions [1,77]. The upstream sphere of zero waste is where the issues around current products, production, consumption, and urban systems are sought to be addressed through transformative design and social innovation [130,223]. Allied to this, the downstream expression of zero waste, is where conventional waste management's theory, policies, and practices are contested and sought to be radically reimagined and reformed [72].

In practice, the implementation of zero waste in a holistic community—municipal setting, has also been cast in a variety of frameworks, for example, as a "10 step" [86] and as a 3 phase, 21 action (pre-conditional on six core infrastructure supports) community "roadmap" [82]. Zero waste has also been described as contingent on the integration of five key principles for transforming existing, wasteful and polluting systems of production, consumption, and disposal [17,224].

Alongside extending and formalising producer responsibility and revising legislation to support recovery and recycling vs disposal (including for waste material flow data) [113], the transition to a cradle-to-cradle—zero waste economic model, also requires transformation in our concept of citizenship, globally, so as to include sustainable and responsible patterns of purchase and consumption [1,17]. In this modality, traditional "end of pipe" waste management will be reshaped by the new environmental services demanded by closed-loop recovery and recycling systems. A core function of future (zero)waste management systems, is to cycle resources between producers and consumers, in a resource efficient and circular zero waste economy [1]. In this framing, it can be argued that zero waste is less of a competitor to traditional solid waste theory than it is a synergist, catalysing a shift up into the top, "largely uncharted" priorities of the waste hierarchy [4].

The absolutist misnomer, promoted in some of the criticism of zero waste, is perhaps the easiest misinterpretation to clarify. Put simply, zero waste is less about absolute zero, than it is about generating focus and urgency for progress. This is evidenced in the following quotes, by recognised zero waste commentator: "It's important not to get hung up on the zero. No system is 100% efficient" [161] "We have got to get over this idea that we are talking about 100% diversion" [225]. "Beyond Recycling! Zero Waste . . . Or Darn Near" [226]. "Zero waste is not a literal target. It may not be possible to eliminate every item of waste stream—but we will not know how far we can get unless we try. If do not strive for zero waste, we will continue to make only incremental progress to stem this tide of waste" [227]. "Zero waste is a goal that we know we can't really get to. But it also is a process with very clear environmental, social and economic benefits. By working through the process you get closer to the goal" (Seldman cited in [225]).

Nor do zero waste advocates seek to redraft the second or fourth laws of thermodynamics, according to their own flight of impossible/unscientific fancy [27,228]. Put simply, it can be assumed that nature does not defy her own thermodynamic laws. Zero waste's injunction is not to exceed or de-bunk thermodynamic principles, it simply aligns with the now ubiquitous IE/UM/BE/CE rhetoric, which society should rectify failing economic principles and practices in order to conform to the sustained success and circularity modelled by nature.

Whilst, arguably flirting with oxymoron and absolutism [197,229], the concept of an accelerated transition from a lineal, waste based, throwaway society—towards a zero waste circular economy is increasingly anchored in science [1,2,6,62], economics [5,158], indicators of social and cultural benefit [53,230,231], learning and success [30,68,159,218]. Zero waste's employment of a "stretch target" is no more or less grounded in virtue or reality than, for example, the International Solid Waste Association's (ISWA) "Global Waste Management Outlook" report goal of 100% collection and controlled disposal for urban populations globally [53]. Relative to the scientific evidence linking very

important health risks, to the "tragedy of dumpsites", serving 3.5–4 billion people [28], all goal setting, whether framed at the 0 or 100 percentile, represents a confronting and aspirational "call to action".

6. Exploring the New Zealand Zero Waste Story

In a New Zealand context, a long term aspirational goal for zero waste, which for example, as has been adopted by Auckland, New Zealand's largest city [232], is essentially no different, or less plausible, than other high level national statements of aspiration, such as New Zealand being smoke-free [233] by 2025, or predator-free [234] by 2050 or the goal of zero suicide [235,236]. These are just a few examples where extreme aspiration coalesces around acute desperation in the face of issues, so critical they require a paradigm shift and transformational response. All such "zeroisms" are theoretically possible (and are situations where all progress is worthwhile), however each can be rendered into failure and fallacy, unless followed up by a plausible plan of action and the financial resources that are necessary to fund the change process.

The accumulating case studies of zero waste approaches are contributing to a broad compendium of learning and innovation needed to address waste issues in future cities. Amongst the global zero waste community of practice, the New Zealand experience reinforces the value of the continuum of assertion and urgency that are embodied in the goal of zero waste [99]. New Zealand was formerly, internationally recognised as a key example of zero waste leadership [86]. In 2002, the New Zealand government adopted a national strategy entitled "Towards zero waste and a sustainable New Zealand" [237] which was, at its peak supported by 70% of local councils [238] who adopted and began implementing local zero waste policies and programmes.

However, after the 2008 general election and resulting change of government, the national policy pendulum swung away from the environmentally assertive zero waste policy setting. Given the prior high levels of community and local council support, this policy reversal seems not to be on democratic preference, but it is an apparent response to vested interest business lobbying and push-back. An example of the lobbying of this period, was the influential "Waste or Rationality" report, whose key recommendation was to: "Replace references to 'resource use efficiency' in all policy documents with 'economic efficiency' ... Remove all references to 'zero waste' from documents expounding serious waste policy" [239]. In effect, this report superimposed a business centric view, supposedly framed in the "economics" of waste, over the democratic consensus of the period, which accepted the inclusion and balancing social, cultural, and environmental considerations in understanding and addressing the impacts of waste [237,240,241].

This specific example of anti-zero waste lobbying illustrates how, in selectively ignoring a swath of real, but externalised environmental costs from the economic calculus, the theory, practice, and successful track-record of zero waste can be misrepresented and marginalised from political influence. New Zealand's zero waste experience shows how effective lobbying can be in manipulating political process and subverting the public good aspiration of waste policy and programmes, beneath the vested interests of powerful actors in the private sector [7]. Recent data now makes apparent the net outcome of New Zealand abandoning the national zero waste imperative, Despite since 2009, investing "$192 million" of the funding generated by the national waste levy, specifically to "reduce" waste, the opposite has occurred and between 2014 and 2017 the waste off-loaded at levied disposal sites has actually increased by a nett 20.1% [242]. Alongside this collective national metric, New Zealanders' per person waste generation rate "continues to increase and is among the highest in the OECD". This is because, New Zealanders', on average, each produce "734 kg waste per year" [243].

In contrast to, what can now be recognised as a period of public policy failure at the national level [63,244–246], it is interesting to observe the contrasting performance at city/community level. Auckland, New Zealand's largest city bucked the national trend by adopting and beginning to successfully implement the "long-term aspirational goal of zero waste by 2040" [232]. Further, in identifying zero waste as a critical element of Auckland's future vision of becoming the most "liveable" global city, this strategy has seen Auckland locally reported as being "crowned

zero-waste world champ" [247]. Auckland city was accorded global recognition in the form of the "Cities4ZeroWaste" prize, as part of the C40 Cities Bloomberg Philanthropies Awards [248], which recognise cities that demonstrate climate action leadership.

Similarly, in the New Zealand community/NGO context, the grass-roots Para Kore (For more information see: [249]) programme was, in 2016, selected from over 170 participating countries and over 1500 project submissions, as the winner of the "Energy Globe Award", which is one of the most prestigious environmental prizes worldwide [250]. "Te Reo Pūtaiao", the "Māori Language Dictionary of Science" offers the following definition of "Para Kore"—"Zero Waste" [251]. The cited negative waste data, evidencing what can be regarded as a regressive phase [252–254], in which New Zealand's central government abandoned zero waste as a national strategic driver, contrasts directly with the success and recognition that were accorded to these New Zealand city/community level zero waste initiatives. This highlights, not only an apparent correlation with success and excellence, but also the importance of properly understanding the phenomenon of zero waste, as part of the "biodiversity" of approaches seeking to circularise material flows, address pollution and climate change, and realise more sustainable forms of development globally.

The New Zealand zero waste case study, provides a window into the real world "rough n tumble" of competing interests and influence in the politics around waste—and more broadly, environmental policy. New Zealand provides a salient reminder of the value of zero waste as a driver for assertion, focus, progress in waste policy—and conversely, what can happen when this is undermined and abandoned. Maintaining a sound understanding of the practice and promise of zero waste, is a critical opportunity to establish and maintain political and general public buy-in for this and other related environmental practices. Looking ahead, the 2017 general election resulted in the first ever "Green Party" formally established as part of a New Zealand coalition government. It will be interesting to see if the cited efficacy, in respect of pollution reduction [255], of having "green voices", not only in parliament, but in power, now transpires in the New Zealand context [255].

7. Conclusions: Zero Waste and the Design of Future Cities

Cities are typically, concentrated "hot-spots" of production and consumption, which results in an unsustainable ecological footprint (i.e. greatly in excess of bio-capsity), concentric environmental impacts (i.e., altered land-use and bio-chemical cycles) and embedded dependencies on other cities and regional hinterlands for the supply of materials, energy and for the disposal of waste [256,257]. However, cities are being re-conceptualised as a critical locus of future resilience and sustainability, through for example, the potential of "urban harvesting"/"above ground mining" to recirculate the globally significant reservoirs/sinks and flows of secondary resources embodied in the dynamic of cites [256,258–260].

The urban design ethos of future zero waste cities extends beyond just the technical engineering of renewable energy and closed-loop circular material eco-systems (aka the tripartite aims of "zero waste/fossil fuel use/emissions") to also encompass holistic environmental, and social sustainability and instrumental principles for healthy communities [95]. Designing for sustainability, permeates all fifteen interrelated principles of "green urbanism" [95] and seeks to embed change and ongoing evolution in every aspect of designing, building, operating, maintaining, and renewing and recycling in future zero waste cities [15]. The holistic design process for future zero waste cities, prioritises social transformation focussed on consumption (to in the first instance avoid creating waste) and reconceptualises (and accordingly seeks to enable the analysis and management of) "waste streams" as a valuable flow of material resources [95,261]. Strong industry and political leadership, new regulatory and policy frameworks, affordable technologies, infrastructure and programmes, and effective education/awareness raising and R&D are cited amongst the requirements for the zero waste city concept to be realised, rather than subverted as shallow, "technical quick fix, idealistic utopianism" [15,82,224,261,262].

As attention shifts from just focussing on reducing supply-side industry emissions, toward understanding the equally significant and commercially attractive demand-side emission reduction opportunities (i.e., "as much as 296 million tonnes CO2 per year in the EU by 2050, out of 530 in total—and some 3.6 billion tonnes per year globally. Demand-side measures thus can take us more than halfway to net-zero emissions from EU industry" [263]) inherent to a more circular economy (i.e., facilitating better use and reuse of existing material resources), the financial benefits are becoming more clearly recognised and understood [263]. Accordingly, as the meta societal shift from traditional, linear, sanitary treatment/disposal based "Integrated Waste Management Systems" (IWMSs), towards "circular IWMSs" (aka CIWMSs i.e., combining waste and materials management) and then further still, into authentic, holistic future zero waste cities, and circular economies, the "business case" for the social and regulatory interventions to drive this transition will continue to emerge and strengthen [59]. The zero waste movement, whether reflected in the upstream aspiration of the zero waste design community (i.e., seeking to transform future materials and products which become discards), or the reformative downstream activity of zero waste practitioners (seeking to circularise and upcycle discarded material flows), appears as an integral to, and as an instrumental driver of future sustainability [223,264].

Possibly the best argument for the confrontation, innovation, learning, and progress that the zero waste movement contributes to the long-term global challenge of sustainable resource management is non-technical. Inherent to the naturalistic ecosystem metaphor, which inspires so much of the "design think" in this sphere, are the interrelated concepts of bio-diversity and system resilience. A fundamental argument in favour of what the zero waste movement adds to the broad community of effort seeking to resolve waste issues, is conveyed in statements such as: "there is no right or wrong answer" [53] or "no one size fits all" [30]. Consistent with this advocacy, the zero waste movement can be interpreted as, enhancing the "bio-diversity" of ideation focussed on waste and as, expanding reach and resilience of innovation seeking, to address waste issues.

It can be argued that, in a post normal era of science (PNS), "uncertainty, value loading, and a plurality of legitimate perspectives" should be accepted and normalised, rather than rejected, stigmatised, and marginalised, as can occur when traditional disciplinary worldviews dominate science practice [265]. The zero waste movement demonstrates the PNS outsider characteristics of: "learning by doing and doing by learning", a sense of transgression and re-assemblage, a multi-actor heuristic and a lack of fixed typology. In these and the associated practical contradictions and cognitive tensions around transcending, "futuring", and "continuum" above normative short-term, tactical obsequiousness to disposal, zero waste can be recognised as fitting the PNS descriptor, of being a post normal sustainable technology [266,267].

Contemporary descriptions of, and guidance for, future zero waste practices evidences both, "pick and mix adopting and adapting solutions" [30] and endorses local creativity, community engagement, and critical thinking in the outworking core principles [1,68,82]. The heterogeneous and evolving global spectrum of industry and community based zero waste practice reflects local diversity and expands the reach and resilience of the "ecosystem" of responses, seeking to address the human derived waste crisis. Given the previously discussed, limited "progress to date" reported in global waste data, it appears humanity is yet to categorically resolve the challenge of waste. Until we do—more open mindedness and other avenues of exploration and innovation, appear essential. In adding grist and diversity to the necessary spectrum of debate and practical initiatives, exploring future change [2], zero waste is part of the more and the other.

As a grass-roots, countercultural movement, for the most part, zero waste operates on the economic periphery, outside of the dominant "modes of governing" (still firmly adhered to the "disposal paradigm") and in the face of intense competition from vested interests with pejorative control over material flows and flux of ideas in media and policy [3,72]. This makes the emerging achievements and experience of zero waste practitioners, all the more interesting and potentially valuable, as we do not yet know what individual, or combination initiatives might catalyse the

requisite breakthroughs and wholesale environmental progress. The New Zealand zero waste story suggests, treating with caution, the voices seeking to dissuade and cull the "biodiversity" in our mix of approaches to community and industry engagement in environmental sustainability.

Emerging case studies of zero waste innovation and good practice highlight that, this is potentially a sphere of environmental action, where significant progress can be generated [6,268]. It can be argued that the zero waste movement's growing track record (i.e., promoting and progressing towards stated goals, in relatively short timeframes [82], makes this an important sphere of activity [2,7,82] for mitigating climate change, implementing UN's SDGs and progressing toward a more circular economy [18,30,269]. New Zealand's polarised experience around zero waste, underscores the importance and purpose of this article, which is to, further explicate the interdisciplinary phenomenon of zero waste. In illustrating formative examples of waste/zero waste focused "living labs" approaches, seeking to cogenerate innovation in support of the concept planning and practice of future zero waste communities/cities, the authors reiterate prior calls for further elaborated case study analysis and interdisciplinary research and development in this sphere [1,6,140].

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References

1. Zaman, A.U. A comprehensive review of the development of zero waste management: Lesson learned and guidelines. *J. Clean. Prod.* **2015**, *91*, 12–25. [CrossRef]
2. Zaman, A.U.; Swapan, M.S.H. Performance evaluation and benchmarking of global waste management systems. *Resour. Conserv. Recycl.* **2016**, *114*, 32–41. [CrossRef]
3. Silva, A.; Stocker, L.; Mercieca, P.; Rosano, M. The role of policy labels, keywords and framing in transitioning waste policy. *J. Clean. Prod.* **2016**, *115*, 224–237. [CrossRef]
4. Song, Q.; Li, J.; Zeng, X. Minimizing the increasing solid waste through zero waste strategy. *J. Clean. Prod.* **2014**, *104*, 199–210. [CrossRef]
5. Zaman, A.U. A comprehensive study of the environmental and economic benefits of resource recovery from global waste management systems. *J. Clean. Prod.* **2016**, *214*, 41–50. [CrossRef]
6. Pietzsch, N.; Ribeiro, J.L.D.; De Medeiros, J.F. Benefits, challenges and critical factors of success for Zero Waste: A systematic literature review. *Waste Manag.* **2017**, *67*, 324–353. [CrossRef] [PubMed]
7. Hannon, J. Changing Behaviour: (New Zealand's Delay & Dysfunction in Utilising) Economic Instruments in the Management of Waste? New Zealand Product Stewardship Council: Palmerston North, New Zealand, 2018.
8. Krzemińska, A.E.; Zaręba, A.D.; Dzikowska, A.; Jarosz, K.R. Cities of the future—Bionic systems of new urban environment. *Environ. Sci. Pollut. Res.* **2017**, 1–9. [CrossRef] [PubMed]
9. Girardet, H. Cities, people, planet. In *Urban Sustainability Schumacher Lectures*; Wiley: Liverpool, UK, 2000.
10. Edenhofer, O.; Pichs-Madruga, R.; Sokona, Y.; Farahani, E.; Kadner, S.; Seyboth, K.; Adler, A.; Baum, I.; Brunner, S.; Eickemeier, P.; et al. *Climate Change 2014: Mitigation of Climate Change. Contribution of Working Group III to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change*; Cambridge University Press: Cambridge, UK; New York, NY, USA, 2014.
11. Manahan, S.E. *Industrial Ecology: Environmental Chemistry and Hazardous Waste*; Lewis Publishers: Boca Raton, FL, USA, 1999.
12. Ayres, R.U.; Ayres, L.W. (Eds.) *A Handbook of Industrial Ecology*; Edward Elgar Publishing Company: Cheltenham, UK, 2002.

13. Isenmann, R. Further efforts to clarrify industrial ecology's hidden philosophy of nature. *J. Ind. Ecol.* **2008**, *6*, 27–48. [CrossRef]
14. Korhonen, J. Industrial ecology in the strategic sustainable development model: Strategic applications of industrial ecology. *J. Clean. Prod.* **2004**, *12*, 809–823. [CrossRef]
15. Lehmann, S. Optimizing urban material flows and waste streams in urban development through principles of zero waste and sustainable consumption. *Sustainability* **2011**, *3*, 155–183. [CrossRef]
16. Lehmann, S. Resource Recovery and Materials Flow in the City: Zero Waste and Sustainable Consumption as Paradigms in Urban Development. *Sustain. Dev. Law Policy Sustain. Dev. Urban Environ.* **2010**, *11*, 28–68. [CrossRef]
17. Zaman, A.U.; Lehmann, S. Challenges and Opportunities in Transforming a City into a "Zero Waste City". *Challenges* **2011**, *2*, 73–93. [CrossRef]
18. Hoornweg, D.; Bhada-Tate, P.; Anderson, C. *What a Waste: A Global Review of Solid Waste Management*; World Bank: Washington, DC, USA, 2012.
19. Benyus, J. *Biomimicry: Innovation Inspired by Nature*; Harper Collins Publishers Inc.: New York, NY, USA, 1997.
20. Garcia-Serna, J.; Perez-Barrigon, L.; Cocero, M.J. New trends for design towards sustainability in chemical engineering: Green engineering. *Chem. Eng. J.* **2007**, *133*, 7–30. [CrossRef]
21. McDonough, W.; Braungart, M. *Cradle to Cradle: Remaking the Way We Make Things*; North Point Press: New York, NY, USA, 2002.
22. Riffat, S.; Powell, R.; Aydin, D. Future cities and environmental sustainability. *Future Cities Environ.* **2016**, *2*, 1–23. [CrossRef]
23. Verstraete, W.; Vlaeminck, S.E. ZeroWasteWater: Short-cycling of wastewater resources for sustainable cities of the future. *Int. J. Sustain. Dev. World Ecol.* **2011**, *18*, 253–264. [CrossRef]
24. Mezher, T. Building future sustainable cities: The need for a new mindset. *Constr. Innov.* **2011**, *11*, 136–141. [CrossRef]
25. Porse, E.C. Stormwater Governance and Future Cities. *Water* **2013**, *5*, 29–52. [CrossRef]
26. Bartl, A. Barriers towards achieving a zero waste society. *Waste Manag.* **2011**, *31*, 2369–2370. [CrossRef] [PubMed]
27. Premalatha, M.; Tauseef, S.M.; Abbasi, T.; Abbasi, S.A. The promise and the performance of the world's first two zero carbon eco-cities. *Renew. Sustain. Energy Rev.* **2013**, *25*, 660–669. [CrossRef]
28. Mavropoulos, A.; Newman, D.; ISWA. *Wasted Health: The Tragic Case of Dumpsites*; International Solid Waste Association: Vienna, Austria, 2015.
29. Mavropoulos, A.; Chohen, P.; Greedy, P.; Plimakis, S.; Marinheiro, L.; Law, J.; Loureiro, A. *A Roadmap for Closing Waste Dumpsites: The World's Most Polluted Places*; International Solid Waste Association (ISWA): Vienna, Austria, 2017.
30. UN-Habitat. *Solid Waste Management in the Worlds's Cities*; Earthscan: London, UK, 2010.
31. Abarca Guerrero, L.; Maas, G.; Hogland, W. Solid waste management challenges for cities in developing countries. *Waste Manag.* **2012**, *33*, 220–232. [CrossRef] [PubMed]
32. Mavropoulos, A. *Globalization, Megacities and Waste Management*; ISWA–White Paper: Athens, Greece, 2010.
33. Ryan, P.G.; Moore, C.J.; van Franeker, J.A.; Moloney, C.L. Monitoring the abundance of plastic debris in the marine environment. *Phil. Trans. R. Soc. B* **2009**, 1999–2012. [CrossRef] [PubMed]
34. Moore, C.J. Synthetic polymers in the marine environment: A rapidly increasing, long-term threat. *Environ. Res.* **2008**, 131–139. [CrossRef]
35. Wiedinmyer, C.; Yokelson, R.J.; Gullett, B.K. Global emissions of trace gases, particulate matter, and hazardous air pollutants from open burning of domestic waste. *Environ. Sci. Technol.* **2014**, *48*, 9223–9530. [CrossRef] [PubMed]
36. Thompson, A. Burning Trash Bad for Humans and Global Warming. Scientific American, September 2014. Available online: http://www.scientificamerican.com/article/burning-trash-bad-for-humans-and-global-warming/ (accessed on 14 September 2018).
37. Hodzic, A.; Wiedinmyer, C.; Salcedo, D.; Jimenez, J.L. Impact of trash burning on air quality in Mexico City. *Environ. Sci. Technol.* **2012**, *46*, 4950–4957. [CrossRef] [PubMed]
38. Mavropoulos, A. Waste Management 2030+. Waste Management World, 2010. Available online: http://www.waste-management-world.com/articles/print/volume-11/issue-2/features/waste-management-2030.html (accessed on 14 September 2018).

39. Troschinetz, A.M.; Mihelcic, J.R. Sustainable recycling of municipal solid waste in developing countries. *Waste Manag.* **2009**, 915–923. [CrossRef] [PubMed]
40. Hoornweg, D.; Bhada-Tata, P.; Kennedy, C. Peak Waste: When is it likely to occur? *J. Ind. Ecol.* **2014**, *19*, 117–128. [CrossRef]
41. Graedel, T.E.; Allenby, B.R. *Industrial Ecology and Sustainable Engineering*; Prentice Hall: Upper Saddle River, NJ, USA, 2010.
42. Iskandar, L.; Tjell, J.C. Editorial–Cairo: A colossal case of waste mismanagement to learn from. *Waste Manag. Res.* **2009**, *27*, 939–940. [CrossRef] [PubMed]
43. Wilson, D.C. Development drivers for waste management. *Waste Manag. Res.* **2007**, *25*, 198–207. [CrossRef] [PubMed]
44. Marshall, R.E.; Farahbakhsh, K. Systems approaches to integrated solid waste management in developing countries. *Waste Manag.* **2013**, *33*, 998–1003. [CrossRef] [PubMed]
45. Gutherlet, J. Waste, poverty and recycling. *Waste Manag.* **2010**, *30*, 171–173. [CrossRef] [PubMed]
46. Pongrácz, E.; Pohjola, V.J. Re-defining waste, the concept of ownership and the role of waste management. *Resour. Conserv. Recycl.* **2004**, *20*, 141–153. [CrossRef]
47. ISWA. *ISWA Annual Report*; International Solid Waste Association: Vienna, Austria, 2015.
48. Krausz, R. *All for Naught? A Critical Study of Zero Waste to Landfill Initiatives*; Lincoln University: Christchurch, New Zealand, 2012.
49. Levin, K.; Cashmore, B.; Bernstien, S. *Playing It Forward: Path Dependency, Progressive Incrementalism, and the "Super Wicked" Problem of Global Climate Change. In Climate Change: Global Risks, Challenges and Decisions Congress*; International Nuclear Information System: Copenhagen, Denmark, 2009.
50. Levin, K.; Cashore, B.; Bernstein, S.; Auld, G. Overcoming the tragedy of super wicked problems: Constraining our future selves to ameliorate global climate change. *Polcy Sci.* **2012**, *45*, 123–152. [CrossRef]
51. D-Waste. Waste Management for Everyone. 2013. Available online: http://www.d-waste.com/ (accessed on 14 September 2018).
52. Wilson, D.C.; Rodic, L.; Modak, P.; Soos, R.; Carpintero, A.; Velis, C.; Iyer, M.; Simonett, O. *Global Waste Management Outlook*; ISWA & UNEP: Vienna, Austria, 2015.
53. Wilson, D.C.; Rodic, L.; Modak, P.; Soos, R.; Carpintero, A.; Velis, C.; Iyer, M.; Simonett, O. *Global Waste Management Outlook: Summary for Decision-Makers*; ISWA & UNEP: Vienna, Austria, 2015.
54. UNEP. *Developing Integrated Solid Waste Plan: ISWM Plan–Training Manuals Volume 1–4*; United Nations Environmental Programme Division of Technology, Industry and Economics, International Environmental Technology Centre: Osaka/Shiga, Japan, 2009.
55. ISWA; ABRELPE. *Solid Waste: Guidelines for Successful Planning*; ISWA & ABRELPE: Sao Paulo, Brazil, 2003.
56. Ellen MacArthur Foundation. *Towards the Circular Economy 1: Economic and Business Rationale for an Accelerated Transition*; Ellen MacArthur Foundation: Cowes, UK, 2013.
57. Murray, R. *Zero Waste*; Greenpeace Environmental Trust: London, UK, 2002.
58. Silva, A.; Rosano, M.; Stocker, L.; Gorissen, L. From waste to sustainable materials management: Three case studies of the transition journey. *Waste Manag.* **2017**, *61*, 547–557. [CrossRef] [PubMed]
59. Cobo, S.; Dominguez-Ramos, A.; Irabien, A. From linear to circular integrated waste management systems: A review of methodological approaches. *Resour. Conserv. Recycl.* **2018**, *135*, 279–295. [CrossRef]
60. Mace, M.; Szaky, T. TerraCycle: Recycling Won't Solve the Waste Dilemma, but Consumers Can. Edie.Net, 2016. Available online: https://www.edie.net/news/5/We-can-t-recycle-our-way-out-of-the-waste-crisis--says-TerraCycle-founder/ (accessed on 14 September 2018).
61. USEPA. Solid Waste Management Hierarchy. 2013; Available online: http://www.epa.gov/wastes/nonhaz/municipal/hierarchy.htm (originally accessed 2013) or alternatively https://www.epa.gov/smm/sustainable-materials-management-non-hazardous-materials-and-waste-management-hierarchy; (accessed on 14 September 2018).
62. Stern, N. *A Blueprint for a Safer Planet: How to Manage Climate Change and Create a New Era of Progress and Prosperity*; The Bodley Head: London, UK, 2009.
63. WasteMINZ; Eunomia Research & Consulting. *Rebooting Recycling—What can Aotearoa do? A Discussion Paper Presented by the Waste Management Institute of New Zealand (WasteMINZ)*; Eunomia Research & Consulting: Auckland, New Zealand, 2018.

64. Gutherlet, J. *Recovering Resources–Recycing Citizenship: Urban Poverty Redcution in Latin Amercia*; Ashgate Publishing Ltd.: Aldershot, UK, 2008.
65. Wilson, D.C.; Araba, A.O.; Chinwah, K.; Cheeseman, C.R. Building recycling rates through the informal sector. *Waste Manag.* **2009**, *29*, 629–635. [CrossRef] [PubMed]
66. Wilson, D.C.; Velis, C.; Cheeseman, C. Role of informal sector recycling in waste management in developing countries. *Habitat. Int.* **2006**, *30*, 797–808. [CrossRef]
67. Velis, C.A.; Wilson, D.C.; Rocca, O.; Smith, S.R.; Mavropoulos, A.; Cheeseman, C.R. An analytical framework and tool ("InteRa") for integrating the informal recycling sector in waste and resource management systems in developing countries. *Waste Manag. Res.* **2012**, *30*, 43–66. [CrossRef] [PubMed]
68. Allen, C.; Gokaldas, V.; Larracas, A.; Ann Minot, L.A.; Morin, M.; Tangri, N.; Tyler, B.; Walker, B. *On the Road to Zero Waste: Successes and Lessons from around the World*; Global Anti-Incinerator Alliance: Quezon City, Philippines, 2012; pp. 1–88.
69. Chalmin, P.; Gaillochet, C. *From Waste to Resources*; Veolia & Cyclope: Paris, France, 2009.
70. Bartl, A. Editorial: Ways and entanglement of the waste hierarchy. *Waste Manag.* **2014**, *34*, 1–2. [CrossRef] [PubMed]
71. Van Ewijk, S.; Stegemann, J.A. Limitations of the waste hierarchy for achieving absolute reductions in material throughput. *J. Clean. Prod.* **2016**, *132*, 122–128. [CrossRef]
72. Pollans, L.B. Trapped in trash: "Modes of governing" and barriers to transitioning to sustainable waste management. *Environ. Plan.* **2017**, *49*, 2300–2323. [CrossRef]
73. Jessen, M. *Discarding the Idea of Waste: The Need for a Zero Waste Policy Now*; Zero Waste Services: Nelson, BC, Canada, 2003.
74. Ghisellini, P.; Cialani, C.; Ulgiati, S. A review on circular economy: The expected transition to a balanced interplay of environmental and economic systems. *J. Clean. Prod.* **2016**, *114*, 11–32. [CrossRef]
75. Haas, W.; Krausmann, W.; Wiedenhofer, D.; Markus Heinz, M. How Circular is the Global Economy? An Assessment of Material Flows, Waste Production, and Recycling in the European Union and the World in 2005. *J. Ind. Ecol.* **2015**, *19*, 765–777. [CrossRef]
76. Anderson, C. *Dealing with Zero Waste*; MSW Management: Santa Barbara, CA, USA, 2011; pp. 1–5.
77. Hannon, J. *Waste vs. Zero Waste: The Contest for Engaging and Shaping Our Ambient "Waste-Making" Culture in Unmaking Waste 2015: Transforming Production and Consumption in Time and Place*; Zero Waste SA Research Centre for Sustainable Design and Behaviour and the University of South Australia: Adelaide, Australia, 2015.
78. Glavic, P.; Lukman, R. Review of sustainability terms and their definitions. *J. Clean. Prod.* **2007**, 1875–1885. [CrossRef]
79. Veleva, V.; Bodkin, G.; Todorova, S. The need for better measurement and employee engagement to advance a circular economy: Lessons from Biogen's "zero waste" journey. *J. Clean. Prod.* **2016**, *154*, 517–529. [CrossRef]
80. Hawken, P.; Lovins, A.B.; Lovins, H. *Natural Capitalism: Creating the Next Industrial Revolution*; Little Brown and Co.: Boston, MA, USA, 1999; p. 396.
81. ZWIA. *Global Principles for Zero Waste Communities*; Zero Waste International Alliance (ZWIA): Brighton, UK, 2009.
82. Lombardi, E.; Bailey, K. *The Community Zero Waste Roadmap*; Eco-Cycle Soutions: Bolder, CO, USA, 2015.
83. Waste Watch, UK. *History of Waste and Recycling, in Wasteonline Information Sheet*; Waste Watch UK: London, UK, 2004.
84. Herbert, L. *The History of the Institute of Wastes Management 1898–1998: Celebrating 100 Years of Progress*; Warwick Publishing Co. Ltd.: England, UK, 1998.
85. Seadon, J.K. Sustainable waste management systems. *J. Clean. Prod.* **2010**, 1639–1651. [CrossRef]
86. Connett, P. *The Zero Waste Solution: Untrashing the Planet One Community at a Time*; Chelsea Green Publishing: White River Junction, VT, USA, 2013.
87. Mavropoulos, A. *Megacities Sustainable Development and Waste Management in the 21st Century*; ISWA: Vienna, Austria, 2014.
88. Cohen, B. Urbanization in developing countries: Current trends, future projections, and key challenges for sustainability. *Technol. Soc.* **2006**, *28*, 63–80. [CrossRef]
89. Oyoo, R.; Leemans, R.; Mol, A.P.J. Future Projections of Urban Waste Flows aand their Impacts in African Metropolises Cities. *Int. J. Environ. Res.* **2011**, *5*, 705–724.

90. Swapan, M.S.H.; Zaman, A.U.; Ahsan, T.; Ahmed, F. Transforming urban dichotomies and challenges of South Asian megacities: Rethinking sustainable growth of Dhaka, Bangladesh. *Urban Sci.* **2017**, *1*, 31. [CrossRef]
91. Cook, I.R.; Swyngedouw, E. Cities, social cohesion and the environment: Towards a future research agenda. *Urban Stud.* **2012**, *49*, 1959–1979. [CrossRef]
92. Earth Science for Society. *Megacities—Our Global Urban Future*; Earth Science for Society Foundation: Leiden, The Netherlands, 2005.
93. Ackerman, K.; Conard, M.; Culligan, P.; Plunz, R.; Sutto, M.-P.; Whittinghill, L. Sustainable food systems for future cities: The potential of urban agriculture. *Econ. Soc. Rev.* **2014**, *45*, 189–206.
94. Fairburn, S.; Imhof, B.; Mohanty, S. Rethinking Water: A CAAS (City As A Spaceship) design approach. *Des. J.* **2014**, *20*, 1904–1915. [CrossRef]
95. Lehmann, S. Green Urbanism: Formulating a series of holistic principles. *Sapiens* **2010**, *3*, 2.
96. Batty, M.; Axhausen, K.W.; Giannotti, F.; Pozdnoukhov, A.; Bazzani, A.; Wachowicz, M.; Ouzounis, G.; Portugali, Y. Smart cities of the future. *Eur. Phys. J. Spéc. Top.* **2012**, *214*, 481–518. [CrossRef]
97. Bach, B.; Wilhelmer, D.; Palensky, P. Smart buildings, smart cities and governing innovation in the new millennium. In Proceedings of the 8th IEEE International Conference on Industrial Informatics, Osaka, Japan, 13–16 July 2010; pp. 8–14.
98. Naphade, M.; Banavar, G.; Harrison, C.; Paraszczak, J. Smarter cities and their innovation challenges. *Computer* **2011**, *44*, 32–39. [CrossRef]
99. UNEP; UNITAR; Hyman, M.; Turner, B.; Carpintero, A. *Guidelines for National Waste Management Strategies: Moving from Challenges to Opportunities*; United Nations Environment Programme (UNEP) & United Nations Institute for Training and Research (UNITAR) & Inter-Organisation for the Sound Management of Chemicals (IOMC): Osaka, Japan, 2013.
100. Tsuzuki, T. *Nanotechnology Commercialization*; CRC Press: Boca Raton, FL, USA, 2010.
101. Nanotechnology Development Blog. Green Refineries Will Offer Zero Waste Products. 2013. Available online: http://www.nanotechnologydevelopment.com/news/green-refineries-will-off-zero-waste-products.html (accessed on 8 December 2014).
102. Gibbs, B. Green Nanotechnology. In *Green Technology: An A-to-Z Guide*; Mulvaney, D., Robbins, P., Eds.; SAGE Publications: London, UK, 2011; p. 226.
103. Campbell, T.; Williams, C.; Ivanova, O.; Garrett, B. Could 3D Printing Change the World? Technologies, Potential, and Implications of Additive Manufacturing. Retrieved from Washington DC, USA. 2011. Available online: http://www.cbpp.uaa.alaska.edu/afef/Additive%20MFG%20.pdf (accessed on 14 September 2018).
104. Chonga, S.; Chiub, H.-L.; Liaob, Y.-C.; Hungc, S.-T.; Pand, G.-T. Cradle to Cradle®Design for 3D Printing. *Chem. Eng. Trans.* **2015**, *45*, 1669–1674. [CrossRef]
105. Taylor, S. *Waste Management Implications of 3D Printing*; EcoMENA: Doha, Qatar, 2014.
106. ESA. *3D Printing for Space: The Additive Revolution*; European Space Agency: Paris, France, 2013.
107. Morgan, J. Amaze project aims to take 3D printing "into metal age". In *BBC News: Science and Environment*; BBC News, Science and Environment: London, UK, 2013.
108. Electrolux. *Zero Waste: Always Trendy: Body Scan Creates Your New Wardrobe*; Electrolux Design Lab: Stockholm, Sweden, 2014.
109. Korge, K. The King's New Clothes; Yanko Design: 2014. Available online: http://www.yankodesign.com/2014/07/25/the-king%E2%80%99s-new-clothes/ (accessed on 14 September 2018).
110. Wainwright, O. Work begins on the world's first 3D-printed house. In *The Guardian: Architecture and Design Blog*; The Guardian, Architecture and Design Blog: London, UK, 2014.
111. Seife, C. *Zero: The Biography of a Dangerous Idea*; Penguin Group: New York, NY, USA, 2000.
112. Elkington, J. *The Zeronauts: Breaking the Sustainability Barrier*; Routledge: New York, NY, USA, 2012.
113. Murphy, S.; Princetl, S. Zero waste in Los Angeles: Is the emperor wearing any clothes? *Resour. Conserv. Recycl.* **2013**, *81*, 40–51. [CrossRef]
114. Evans, J.; Karvonen, A. Living laboratories for sustainability. In *Cities and Low Carbon Transistions*; Bulkeley, H., Castan Broto, V., Hodson, M., Marvin, S., Eds.; Routledge: New York, NY, USA, 2011; Volume 35, pp. 126–141.
115. Kulkki, S. Towards an Ideapolis: the Creative Helsinki Region. 2004. Available online: http://www.hel.fi/hel2/tietokeskus/kvartti/2004/3/towards_an_ideapolis.pdf (accessed on 14 September 2018).

116. Bjorgvinsson, E.; Ehn, P.; Hillgren, P.-A. Participatory design and "democratizing innovation". In Proceedings of the 11th Biennial Participatory Design Conference 2010, Sydney, Australia, 29 November–3 December 2010.
117. Molinari, F.; Schumacher, J. *Best Practices Database for Living Labs: Overview of the Living Lab Approach & Living Lab Best Practice Database Specification*; Alcotra: New York, USA, 2011.
118. Bergvall-Kåreborn, B.; Ihlström Eriksson, C.; Ståhlbröst, A.; Svensson, J. A Milieu for Innovation–Defining Living Labs. In: Stimulating Recovery: The Role of Innovation Management: Proceedings of the 2nd ISPIM Innovation Symposium, New York City, USA, 2009. Available online: https://pdfs.semanticscholar.org/a210/711d9b9bc0a28daa8bb03cfa0f9813a01210.pdf (accessed on 14 September 2018).
119. Hronszky, I.; Kovács, K. Interactive Value Production through Living Labs. *Acta Polytech. Hung.* **2013**, *10*, 89–108.
120. Schaffers, H.; Almirall, E.; Feurstein, K.; Gricar, J.; Judson, J.-P.; Sallstrom, A.; Santoro, R.; Schumacher, J.; Stahlbrost, A.; Serra, A.; et al. *CO-LLABS: Community Based Living Labs to Enhance SME's Innovation in Europe*; EC ICT Policy Support Programme: Maribor, Slovenia, 2009.
121. Almirall, E.; Wareham, J. Living Labs: Arbiters of mid- and ground-level innovation. *Technol. Anal. Strat. Manag.* **2011**, *23*, 87–102. [CrossRef]
122. Clermont, F.; Fionda, F.; Molinari, F.; Molino, F.; Nossen, V. *Guidelines on Cross Boarder Living Labs*; ALCOTRA Programme 2007–2013; European Regional Development Fund: London, UK, 2012.
123. Liedtke, C.; Welfens, M.J.; Rohn, H.; Nordmann, J. LIVING LAB: User-driven innovation for sustainability. *Int. J. Sustain. High. Educ.* **2012**, *13*, 106–118. [CrossRef]
124. Garcia-Ayllon, S.; Miralles, J.L. New strategies to improve governance in territorial management: Evolving from "smart cities" to "smart territories". *Procedia Eng.* **2015**, *118*, 3–11. [CrossRef]
125. Hannon, J.; Zaman, A.U.; Rittl, G.; Meireles, S.; Demore-Palandi, F.E. Moving Toward Zero Waste Cities: A Nexus for International Zero Waste Academic Collaboration (NIZAC). In Proceedings of the 2nd Symposium on Sustainability in University Campuses (SSUC-2018), Florence, Italy, 10–12 December 2018.
126. Niitamo, V.-P.; Kulkki, S.; Eriksson, M.; Hribernik, K.A. State-of-the-Art and good practice in the field of living labs. In Proceedings of the 12th International Conference on Concurrent Enterprising: Innovative Products and Services through Collaborative Networks, Milan, Italy, 20 November 2015; pp. 349–357.
127. University of South Australia. China-Australia Centre for Sustainable Urban Development. Available online: http://www.unisa.edu.au/research/zerowastecentre/ (accessed on 8 December 2014).
128. Venn, W. Living Labs to Stimulate Low Carbon Living. Available online: http://w3.unisa.edu.au/unisanews/2015/April/story8.asp (accessed on 8 December 2014).
129. Australian Living Lab Innovation Network. Expression of Interest. Available online: https://openlivinglabs.net.au/ (accessed on 8 December 2014).
130. Lehmann, S.; Crocker, R. (Eds.) *Designing for Zero Waste: Consumption, Technologies and the Built Environment*; Earthscan Series on Sustainable Design; Earthscan: London, UK, 2012.
131. Wilson, R.; Ryan, A. Living Lab a Fresh Approach to Sustainable Research. Available online: http://www.massey.ac.nz/news/?id=5161/ (accessed on 8 December 2014).
132. Schumacher, J. *Alcotra Innovation Project: Living Labs Definition, Harmonization Cube Indicators & Good Practices*; Alcotra: New York, NY, USA, 2013.
133. Rodrigues, J. ECO LivingLab@Chamusca. Available online: http://www.openlivinglabs.eu/livinglab/eco-livinglabchamusca (accessed on 14 September 2018).
134. Carrinho, M. The Eco Industrial Park (EIP) of Chamusca. Available online: http://ecoteste.blogspot.co.nz/2007/10/eco-industrial-park-eip-of-chamusca.html (accessed on 8 December 2014).
135. Simon, J.M. The first European Zero Waste Research Center—Capannori, Italy. Available online: http://www.zerowasteeurope.eu/2011/05/the-first-european-zero-waste-research-center-capannori-italy/ (accessed on 14 September 2018).
136. Zero Waste Italy. The open case study of the Zero Waste Research Center of Capannori (Lucca) on the Lavazza coffee pods starts delivering results. Available online: http://www.zerowasteitaly.org/the-open-case-study-of-the-zero-waste-research-center-of-capannori-lucca-on-the-lavazza-coffee-pods-starts-delivering-results/ (accessed on 14 September 2018).
137. Vliet, A.V. The Story of Capannori—A Zero Waste Champion. Available online: https://zerowasteeurope.eu/2013/09/the-story-of-capannori-a-zero-waste-champion/ (accessed on 14 September 2018).

138. UCLG Commeetee. Capannori, Italy: The First Case of the Application of the: "Zero Waste Strategy" in Italy. Available online: https://www.uclg-cisdp.org/sites/default/files/Capannori_2010_en_FINAL.pdf (accessed on 14 September 2018).
139. Chesbrough, H. *Open Innovation. The New Imperative for Creating and Profiting from Technology*; Harvard Business School Press: Boston, MA, USA, 2003.
140. Curran, T.; Williams, I.D. A zerowaste vison for industrial networks in Europe. *J. Hazard. Mater.* **2012**, *207*, 3–7. [CrossRef] [PubMed]
141. Campbell-White, T. Why Zero Waste Needs To Be So Much More Than Just Zero Landfill. 2°. 2016. Available online: https://www.dssmith.com/recycling/insights/blogs/2015/12/why-zero-waste-needs-to-be-so-much-more-than-just-zero-landfill (accessed on 14 September 2018).
142. Gharfalkar, M.; Richard Court, R.; Campbell, C.; Ali, Z.; Hillier, G. Analysis of waste hierarchy in the European waste directive 2008/98/EC. *Waste Manag.* **2015**, *39*, 305–313. [CrossRef] [PubMed]
143. Themelis, N.J. Search Result: Comments by Prof. Themelis on "Zero Waste" Discussion in D-Waste Blog. Available online: http://www.seas.columbia.edu/earth/wtert/ (accessed on 8 December 2014).
144. Krausz, R.; Hughey, K.F.D.; Montgomery, R. Zero Waste to Landfill: An Unacknowledged Supermegaproject. *Linc. Plan. Rev.* **2013**, *5*, 10–26.
145. Campanelli, J. Swell idea turns sour. In *Waste & Recycling News*; KC Crain: Detroit, Michigan, 2011; Volume 17, p. 1.
146. Ragossnig, A. Zero waste—A desirable goal in residue utilization? (Editorial). *Waste Manag. Res.* **2006**, *24*, 403. [PubMed]
147. Bartl, A. Moving from recycling to waste prevention: A review of barriers and enablers. *Waste Manag. Res.* **2014**, *32*, 3–18. [CrossRef] [PubMed]
148. Themelis, N.J. Don't trash waste-to-energy plants. In *Cape Cod Times*; Cape Cod Media Group: Hyannis, MA, USA, 2009.
149. ISWA. ISWA's Mission. Available online: http://www.iswa.org/iswa/organisation/about-iswa/ (accessed on 14 September 2018).
150. SWANA. Zero Waste Principles and Practices. Available online: https://swana.org/Training/CourseCatalog/PlanningManagement/ZeroWastePrinciplesandPractices.aspx (accessed on 14 September 2018).
151. Trotti, J. (Ed.) *MSW Management: Swana Golden Anniversary Issue*; Forrester Media Inc.: Sanata Barbara, CA, USA, 2012; Volume 22, pp. 1–104.
152. Humes, E. *Garbology: Our Dirty Love Affair with Trash*; Avery: New York, NY, USA, 2012.
153. Palmer, P. The Faux Zero Movement Is Spreading. Zero Waste Institute. 2013. Available online: http://zerowasteinstitute.org/wp-content/uploads/2013/03/Faux-Zero-Waste.pdf (accessed on 8 December 2014).
154. Zero Waste Canada. Programme for the ZWIA14 dialogue. Available online: http://www.zerowastecanada.ca/ (accessed on 8 December 2014).
155. Lenton, T.M.; Ciscar, J. Integrating tipping points into climate impact assessments. *Clim. Chang.* **2013**, *117*, 585. [CrossRef]
156. Schneider, S. The worst-case scenario. *Nature* **2009**, *458*, 1104–1105. [CrossRef] [PubMed]
157. Hansen, J. *Storms of My Grandchildren: The Truth about the Coming Climate Catastrophe and Our Last Chanch to Save Humanity*; Bloomsbury: London, UK, 2009.
158. SRMG Inc. *Environmental Life Cycle Assessment of Waste Management Strategies with a Zero Waste Objective: Study of the Solid Waste Management System in Metro Vancouver, British Columbia*; Sound Resource Management Group Inc., Belkorp Environmental Services Inc & Metro Vancouver: Olympia, WA, USA, 2009.
159. Hood, I.; Ministry of Environment British Columbia. *Zero Waste Business Case: Draft for Expert Review*; Ministry of Environment: Vancouver, BC, Canada, 2013.
160. Porritt, J. *Capitalism as if the World Matters*; Revised ed.; Earthscan: London, UK, 2007.
161. Snow, W.; Dickinson, J. *The End of Waste: Zero Waste by 2020*; Zero Waste New Zealand Trust: Auckland, New Zealand, 2001.
162. Bourg, D.; Erkman, S. (Eds.) *Perspectives on Industrial Ecology*; Greenleaf Publishing Ltd.: Sheffield, UK, 2003.
163. WMAA; AIEN. Resource Recovery–It's just good business. In Proceedings of the 4th Australasian Industrial Ecology Conference, Ulsan, Korea, 25–28 June 2013.
164. Loiseau, E.; Saikku, L.; Antikainen, R.; Droste, N.; Hansjürgens, B.; Pitk€anen, K.; Leskinen, P.; Kuikman, P.; Thomsen, M. Green economy and related concepts: An overview. *J. Clean. Prod.* **2016**, *139*, 361–371. [CrossRef]

165. Maciejczak, M. How to analyse the bioeconomy. *Ann. Pol. Assoc. Agric. Econ. Agribus.* **2015**, *XVI*, 165–171.
166. El-Chichakli, B. Five cornerstones of a global bioeconomy. *Nature* **2016**, *535*, 203–221. [CrossRef] [PubMed]
167. Pfau, S.F.; Hagens, J.E.; Dankbaar, B.; Smits, A.J.M. Visions of Sustainability in Bioeconomy Research. *Sustainability* **2014**, *6*, 1222–1249. [CrossRef]
168. Navia, R.; Chamy, R. The link between waste management, climate change and bioeconomy. *Waste Manag. Res.* **2017**, *35*, 561–562. [CrossRef] [PubMed]
169. O'Callaghan, K. Technologies for the utilisation of biogenic waste in the bioeconomy. *Food Chem.* **2016**, *198*, 2–11. [CrossRef] [PubMed]
170. Swinnen, J.; Riera, O. The global bio-economy. *Agric. Econ.* **2013**, *44*, 1–5. [CrossRef]
171. Morganti, P. Bionanotechnology & Bioeconomy for a Greener Development. *J. Appl. Cosmetol.* **2015**, *33*, 51–65.
172. Seghetta, M.; Hou, X.; Bastianoni, S.; Bjerre, A.-B.; Thomsen, M. Life cycle assessment of macroalgal biorefinery for the production of ethanol, proteins and fertilizers e A step towards a regenerative bioeconomy. *J. Clean. Prod.* **2016**, *137*, 1158–1169. [CrossRef]
173. Zuin, V.G. Circularity in green chemical products, processes and services: Innovative routes based on integrated eco-design and solution systems. *Curr. Opin. Green Sustain. Chem.* **2016**, *2*, 40–44. [CrossRef]
174. Philp, J.C.; Ritchie, R.J.; Guy, K. Biobased plastics in a bioeconomy. *Trends Biotechnol.* **2013**, *31*, 65–67. [CrossRef] [PubMed]
175. Asveld, L.; van Est, R.; Stemerding, D.E. *Getting to the Core of the Bio-Economy: A Perspective on the Sustainable Promise of Biomass*; Rathenau Instituut: The Hague, The Netherlands, 2011.
176. de Besi, M.; McCormick, K. Towards a Bioeconomy in Europe: National, Regional and Industrial Strategies. *Sustainability* **2015**, *7*, 10461–10478. [CrossRef]
177. Matharu, A.S.; de Melo, E.M.; Houghton, J.A. Opportunity for high value-added chemicals from food supply chain wastes. *Bioresour. Technol.* **2016**, *215*, 123–130. [CrossRef] [PubMed]
178. Mohan, S.V.; Butti, S.K.; Amulya, K.; Dahiya, S.; Modestra, A. Waste Biorefinery: A New Paradigm for a Sustainable Bioelectro Economy. *Trends Biotechnol.* **2016**, *34*, 852–855. [CrossRef] [PubMed]
179. Mohan, S.V.; Modestra, A.; Amulya, K.; Butti, S.K.; Velvizhi, G. A Circular Bioeconomy with Biobased Products from CO2 Sequestration. *Trends Biotechnol.* **2016**, *34*, 506–519. [CrossRef] [PubMed]
180. Mohan, S.V.; Nikhil, G.N.; Chiranjeevi, P.; Reddy, C.N.; Rohit, M.V.; Kumar, A.N.; Sarkar, O. Waste biorefinery models towards sustainable circular bioeconomy: Critical review and future perspectives. *Bioresour. Technol.* **2016**, *215*, 2–12. [CrossRef] [PubMed]
181. McCormick, K.; Kautto, N. The Bioeconomy in Europe: An Overview. *Sustainability* **2013**, *5*, 2589–2608. [CrossRef]
182. European Commission. *Innovating for Sustainable Growth: A Bioeconomy for Europe*; COM (2012); European Commission (EC): Brussels, Belgium, 2012.
183. OECD. *The Bioeconomy to 2030: Designing a Policy Agenda, Main Findings*; Organisation for Economic Cooperation and Development (OECD): Paris, France, 2009.
184. EuropaBio. *Building a Bio-Based Economy for Europe in 2020*; European Association for Bioindustries (EuropaBio): Brussels, Belgium, 2011.
185. White House. *National Bioeconomy Blueprint*; White House: Washington, DC, USA, 2012.
186. Kircher, M. The transition to a bio-economy: National perspectives. *Biofuels, Bioprod. Bioref.* **2012**, *6*, 240–245. [CrossRef]
187. Henry, G.; Trigo, E.; Hodson de Jaramillo, E. Editorial: LAC bioeconomies: Different pathways, preliminary results and first best practices. In *Towards a Latin American and Caribbean Knowledge Based Bioeconomy in Partnership with Europe*; Hodson de Jaramillo, E., Ed.; Pontificia Universidad Javeriana: Bogotá, Colombia, 2014; p. 149.
188. Johnson, T.G.; Altman, I. Rural development opportunities in the bioeconomy. *Biomas Bioenergy* **2014**, *63*, 340–344. [CrossRef]
189. Schmid, O.; Padel, S.; Levidow, L. The Bio-Economy Concept and Knowledge Base in a Public Goods and Farmer Perspective. *Bio-Based Appl. Econ.* **2012**, *1*, 47–63.
190. Philp, J.; Bartsev, A. Bioplastics science from a policy vantage point. *New Biotechnol.* **2013**, *30*, 635–647. [CrossRef] [PubMed]
191. CIWM. *The Circular Economy: What Does It Mean for the Waste and Resource Management Sector?* The Chartered Institution of Wastes Management: Northampton, UK, 2014.

192. EEB. *Walking the Circle–the 4 Guiding Pillars for a Circular Economy: Efficient Material Management, Reduction of Toxic Substances, Energy Efficiency and Economic Incentives*; European Environment Bureau: Brussels, Belgium, 2015.
193. EC. *Towards a Circular Economy: A Zero Waste Programme for Europe + Annex*; Communication from the European Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions: Brussels, Belgium, 2014.
194. Krausz, R. Zero Effect. In *Waste 360*; Penton Media: New York, NY, USA, 2013; Volume 3.
195. Krausz, R. Show me the plan: Why zero waste initiatives ultimately fail. In Proceedings of the Post-Graduate Conference Lincoln University, Lincoln, New Zealand, 21 September 2011.
196. Mauck, R.J. Current Chances or Zero Waste? Zero. MSW Management: Santa Barbara, CA, USA, 2003; p. 1.
197. Mauck, R.J. Beyond Zero Waste can We do It? MSW Management: Santa Barbara, CA, USA, 2011; p. 2.
198. Diamond, J. *Collapse: How Societies Choose to Fail or Survive*; Penquin Books: London, UK, 2005.
199. Wright, R. *A Short History of Progress*; Text Publishing Company: Melbourne, Australia, 2004.
200. Pauling, C.; Ataria, J. *Tiaki Para: A Study of Ngai Tahu Values and Issues Regarding Waste*; Landcare Research Science Series No. 39; Manaaki Whenua Press: Lincoln, New Zealand, 2010.
201. Hawkins, G. *The Ethics of Waste: How We Relate to Rubbish*; Rowman & Littlefield: Lanham, MD, USA, 2006.
202. Jones, A.; Pimbert, M.; Jiggins, J. *Virtuous Circles: Values, Systems and Sustainability*; The International Institute for Environment and Development (IIED): London, UK, 2010.
203. Harmsworth, G. *The Role of Maori Values in Low-Impact Urban Design and Development (LIUDD): Discussion Paper*; Landcare Research NZ Ltd.: Palmerston North, New Zealand, 2003.
204. Zero Waste Europe; FPRCR. *Redesigning Producer Responsibility: A New EPR Is Needed for a Circular Economy–Executive Summary*; Zero Waste Europe & Fundacio per a la Prevencio de Residus i el Consum Responsable: Brussels, Belgium, 2015.
205. Nicol, S.; Thompson, S. Policy options to reduce consumer waste to zero: Comparing product stewardship and extended producer responsibility for refrigerator waste. *Waste Manag. Res.* **2007**, *25*, 227–233. [CrossRef] [PubMed]
206. Homer-Dixon, T. *The Upside of Down: Catastrophe, Creativity and the Renewable of Civilistion*; Text Publishing: Melborne, Australia, 2006.
207. Hoornweg, D.; Thomas, L. *What a Waste: Solid Waste Management in Asia. East Asia and Pacific Region*; World Bank: Washington, DC, USA, 1999.
208. Asian Development Bank. *Integrated Solid Waste Management for Local Government: A Practical Guide*; Asian Development Bank: Manila, Philippines, 2017.
209. Bartl, A. Evolution not Revolution. Waste Management World. 2014. Available online: http://www.waste-management-world.com/articles/print/volume-14/issue-5/wmw-special-recycling-focue/trash-talking-recycling-2035.html (accessed on 8 December 2014).
210. Amengual, L. 25 years of waste management in Mallorca, Balearic Islands, Spain: Time to brush up on history. In Proceedings of the Alternatives to incineration and landfills: Zero Waste International Alliance Conference, Nanaimo, BC, Canada, 30 July 2014.
211. Dobbs, R.; Oppenheim, J.; Thompson, F.; Mareels, S.; Nyquist, S.; Sanghvi, S. *Resource Revolution: Tracking Global Commodity Markets: Trends Survey 2013*; McKinsey Global Institute: New York, NY, USA, 2013.
212. Anthony, R.; Liss, G. Zero Waste Hierarchy: NEWS. Available online: http://zwia.org/standards/zero-waste-hierarchy/ (accessed on 8 December 2014).
213. Snow, W.; Dickinson, J. *Getting There: The Road to Zero Waste: Strategies for Sustainable Communities*; The Zero Waste New Zealand Trust and Envison New Zealand Ltd.: Auckland, New Zealand, 2003.
214. Chandavarkar, N.; UNDESA/UNEP. *Introduction of the Report of the Secretary-General on Waste Management*; UNDESA: New York, NY, USA, 2010.
215. Murray, R. *Creating Wealth from Waste*; Demos: London, UK, 1999.
216. Williams, I. ZEROWIN. Southampton University. Southampton, UK. Available online: http://www.southampton.ac.uk/mediacentre/news/2013/feb/13_30.shtml (accessed on 8 December 2014).
217. Hestin, M.; Mudgal, S.; Portugal, V.; Obersteiner, G.; Scherhaufer, S.; Beigl, P.; Pertl, A.; Barruetabeña, L.; Salas, O.; Delgado, C.; et al. *Zerowin: Literature Review "Approaches to Zero Waste"*; University of Southampton Southampton: Southampton, UK, 2010.
218. Van Vliet, A. *Zero Waste Europe Case Study 1: The Story of Capannori*; Zero Waste Europe: Leiden, The Netherlands, 2014.

219. Van Vliet, A. *Zero Waste Europe Case Study 2: The Story of Argentona*; Zero Waste Europe: Leiden, The Netherlands, 2014.
220. Van Vliet, A. *Zero Waste Europe Case Study 3: The Story of Vrhinika "Slovenian traiblazers"*; Zero Waste Europe: Leiden, The Netherlands, 2014.
221. EEC. Sustainable waste management ladder. In *Earth Engineering Center for Sustainable Waste Management*; Columbia University: New York, NY, USA, 2008.
222. Hill, J.; Hislop, H.; Steel, C.; Shaw, B. *An International Survey of Zero Waste Initiatives*; Green Alliance/DEFRA: London, UK, 2006.
223. Levitzke, V. Foreword: Designing for zero waste. In *Designing for Zero Waste: Consumption, Technologies and the Built Environment*; Crocker, R., Lehmann, S., Eds.; Earthscan: London, UK, 2012.
224. Zaman, A.U.; Lehmann, S. Urban growth and waste management optimization towards "zero waste city". *City, Cult. Soc.* **2011**, *2*, 177–187. [CrossRef]
225. Leroux, K. Is zero waste possible? *Waste Age* **2001**, *32*, 102.
226. Lombardi, E. Beyond Recycling! Zero Waster Darn Near. *Biocycle* **2001**, *42*, 75.
227. Dimino, R.; Warren, B. *Reaching for Zero: The Citizen Plan for Zero Waste in New York City*; Zero Waste Campaign, Consumer Policy Institute & Consumers Union: New York, NY, USA, 2004; pp. 1–195.
228. Clift, R. Waste a waste! *Materials Today* **2004**, *7*, 64. Available online: https://www.materialstoday.com/energy/articles/s1369702104001038/ (accessed on 14 September 2018). [CrossRef]
229. Townend, W.K. Zero waste: An aspiration or an oxymoron? *Waste Manag. Res.* **2010**, *28*, 1–3. [CrossRef] [PubMed]
230. Living Earth Foundation. Waste to Wealth. Available online: http://wastetowealth.livingearth.org.uk/ (accessed on 8 December 2014).
231. Hogg, D.; Ballinger, A. *The Potential Contribution of Waste Management to a Low Carbon Economy*; Zero Waste Europe, Zero Waste France, ACR+, Eunomia Research & Consulting: Brussels, Belgium, 2015.
232. Auckland Council. *Auckland Waste Management and Minimisation Plan: Getting Auckland's Waste Sorted*; Auckland Council: Auckland, New Zealand, 2012.
233. Ministry of Health. Smokefree Aotearoa 2025. Available online: http://www.health.govt.nz/our-work/preventative-health-wellness/tobacco-control/smokefree-2025 (accessed on 14 September 2018).
234. Department of Conservation. Available online: http://www.doc.govt.nz/our-work/predator-free-new-zealand-2050/ (also see: and http://predatorfreenz.org); (accessed on 14 September 2018).
235. Grow. Zero Sucide Approach. Available online: https://www.grow.co.nz/ (accessed on 14 September 2018).
236. Zero Suicide New Zealand. Zero Sucide Resource Site. Available online: http://zerosuicide.nz/ (accessed on 14 September 2018).
237. MfE. *The New Zealand Waste Strategy (NZWS2002): Towards Zero Waste and a Sustainable New Zealand*; Ministry for the Environment: Wellington, New Zealand, 2002.
238. ZWNZ Trust. What Is Zero Waste? Available online: http://www.zerowaste.co.nz/zero-waste-1/about-us-2/ (accessed on 8 December 2014).
239. Clough, P. Waste or Rationality? Economic Perspectives on Waste Management and Policies in New Zealand. Retrieved from NWIER, Wellington. Available online: https://nzier.org.nz/publication/waste-and-rationality-economic-perspectives-on-waste-management-and-policies-in-new-zealand (accessed on 8 December 2014).
240. WasteMINZ. *Lifeafterwaste: Closing the Loop on Waste by Changing the Way We Act*; The Waste Management Institute of New Zealand: Auckland, New Zealand, 2001.
241. Farrelly, T.; Tucker, C. Action research and residential waste minimisation in PalmerstonNorth, New Zealand. *Resour. Conserv. Recycl.* **2014**, *91*, 11–26. [CrossRef]
242. MfE. *Review of the Effectiveness of the Waste Disposal Levy 2017*; New Zealand Ministry for the Environment: Wellington, New Zealand, 2017.
243. MfE. *Briefing to the Incoming Minister for the Environment: "Environment Portfolio"*; Ministry for the Environment: Wellington, New Zealand, 2017.
244. WasteMINZ. *The Waste Disposal Levy: What Wasteminz Members Think*; Waste Management Institute of New Zealand: Auckland, New Zealand, 2016.
245. WasteMINZ. *Local Government Waste Management Manifesto: Developed by the Territorial Authority Forum, a Sector Group of Wasteminz*; WasteMINZ: Auckland, New Zealand, 2018.

246. WasteMINZ TA Forum. *Cost Benefit Analysis of a Container Depostit Scheme: Summary Report and FAQS*; Waste Management Institute of New Zealand: Auckland, New Zealand, 2017.
247. WasteMINZ. Auckalnd Crowned Zero-waste World Champ. *Waste Management Institute of New Zeqaland e-news, Edition 413.* Available online: https://www.wasteminz.org.nz/ (accessed on 8 December 2017).
248. C40Cities. Auckland Waste to Resources. Available online: http://www.c40.org/awards/2017-awards/profiles/119 (accessed on 14 September 2018).
249. Forbes, J. Case Study: Para Kore: Zero Waste on Marae. Available online: http://www.wasteminz.org.nz/pubs/case-study-para-kore-zero-waste-on-marae/ (accessed on 14 September 2018).
250. Scoop Independent News. Para Kore wins Energy Globe Award. Available online: http://www.scoop.co.nz/stories/AK1608/S00078/para-kore-wins-energy-globe-award.htm (accessed on 14 September 2018).
251. Christensen, I. *Te Reo Pūtaiao, a Māori Language Dictionary of Science*; He Kupenga Hao i te Reo: Aotearoa, New Zealand, 2009.
252. Green Party. New OECD Environment Report Damaging for NZ's Reputation. Available online: http://www.scoop.co.nz/stories/PA1510/S00479/new-oecd-environment-report-damaging-for-nzs-reputation.htm (accessed on 14 September 2018).
253. Parliamentary Commissioner for the Environment. Commissioner Releases Mixed Report Card on Environment. Available online: http://www.pce.parliament.nz/our-work/news-insights/commissioner-releases-mixed-report-card-on-environment (accessed on 14 September 2018).
254. Macfie, R. The Great Climate Change Rort. Available online: http://www.listener.co.nz/current-affairs/climate-change-current-affairs/great-climate-change-rort/ (accessed on 14 September 2018).
255. Mourao, P.R. The effectiveness of Green voices in parliaments: Do Green Parties matter in the control of pollution? *Environ. Dev. Sustain.* **2018**. [CrossRef]
256. Agudelo-Vera, C.M.; Leduc, W.R.W.; Mels, A.R.; Rijnaarts, H.H.M. Harvesting urban resources towards more resilient cities. *Resour. Conserv. Recycl.* **2012**, *64*, 3–12. [CrossRef]
257. Grimm, N.B.; Faeth, S.H.; Golubiewski, N.E.; Redman, C.L.; Wu, J.; Bai, X.; Briggs, J.M. Global change and the ecology of cities. *Science* **2008**, *319*, 756–760. [CrossRef] [PubMed]
258. Agudelo-Vera, C.M.; Mels, A.; Keesman, K.; Rijnaarts, H. Urban harvest approach as an aid for sustainable urban resource planning. *J. Ind. Ecol.* **2012**, *16*, 839–850. [CrossRef]
259. Graedel, T.E. *Metal Stocks in Society: Scientific Synthesis*; UNEP: New York, NY, USA, 2010.
260. Greenfield, A.; Graedel, T.E. The omnivorous diet of modern technology. *Resour. Recovery Conserv.* **2013**, *74*, 1–7. [CrossRef]
261. Lehmann, S. What is green urbanism? Holistic principles to transform cities for sustainability. In *Climate Change–Research and Technology for Adaptation and Mitigation*; Blanco, J., Ed.; InTech: Rijeka, Croatia, 2011.
262. Zero Waste Europe. *The Zero Waste Masterplan: Start-Up Toolkit for European City Planner Policy-Makers and Community Leaders*; Zero Waste Europe: Ixelles, Belgium, 2017.
263. Enkvist, P.-A.; Klevnas, P. *The Circular Economy–A Powerful Force for Climate Mitigation: Transformative Innovation for Prosperous and Low-Carbon Industry*; Material Economics Sverige AB: Stockholm, Sweden, 2018.
264. Crocker, R.; Lehmann, S. Conclusion: The culture and politics of zero waste–looking ahead. In *Designing for Zero Waste–Consumption, Technologies and the Built Environment*; Crocker, R., Lehmann, S., Eds.; Earthscan: London, UK, 2012; pp. 385–393.
265. Funtowicz, S.; Ravetz, J. Post-Normal Science. In *Internet Encyclopaedia of Ecological Economics*; International Society for Ecological Economics: London, UK, 2003; pp. 1–10.
266. Frame, B.; Brown, J. Developing post-normal technologies for sustainability. *Ecol. Econ.* **2008**, *65*, 225–241. [CrossRef]
267. Klein, J.T. Discourses of transdisciplinarity: Looking Back to the Future. *Futures* **2014**, *63*, 68–74. [CrossRef]
268. ZeroWIN. Zero Waste Industrial Networks Project. Available online: http://www.zerowin.eu/ (accessed on 8 December 2014).
269. ISWA. *Waste and Climate Change: ISWA White Paper Summary*; International Solid Waste Association: Vienna, Austria, 2009.