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Electronic waste management and sustainable development goals
Is there a business case for linking the two?

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Abstract

Purpose – The purpose of this study is, first, to understand if the firms are displaying integrated approach toward electronic waste management and sustainability and, second, is there a business case for linking e-waste management with sustainable development goals (SDGs) pronounced by the United Nations.

Design/methodology/approach – This study conducts an extensive literature review to gather perspective from multiple disciplines and also carries out content analysis of annual reports/sustainability reports of the firms.

Findings – Bulk consumers have sustainability policies and/or strategies but many of these firms have not linked their e-waste management with their sustainability strategies practices. Also, based on the elaboration of different perspectives, this study provides an integrative framework that suggests focus of a particular perspective on a given SDG and commensurate business approach by the firms to find a synergy between the two.

Research limitations/implications – This study provides a wider perspective on the subject of electronic waste management and its linkage with SDGs to create business case, thus opening up many theoretical avenues.

Practical implications – The policy like extended producers' responsibility has a clear practical implication in terms of creating reputational capital for the firms by linking electronic waste management and SDGs.

Social implications – The SDG, detailing clean water and sanitation by asking firms not to pollute water bodies by dumping the waste, has clear social implications.

Originality/value – This study is first of its kind to explore the linkage between electronic waste and SDGs to understand the business case. It also throws good insights on whether the firms use integrated approach toward electronic waste management and sustainability.

Keywords Electronic waste, Business sustainability, Sustainable development goals, Extended producer responsibility

Paper type Research paper

1. Introduction

Electronics and telecommunication industry has witnessed major technological and market developments in the last two decades. A number of factors such as advent and growth of internet, advancements in communication technologies, continued growth of services sector, rising disposable incomes, changing consumer preferences and decreasing lifespan of consumer electronic goods have led to a revolution world over in shape of emergence of new electrical and electronic equipment (EEE) like mobile phones, computers and various hand held devices (Khetriwal *et al.*, 2009; Kumar and Bhaskar, 2016). Existing EEE like computers and printers have witnessed radical changes in their production, design, utility and use. A

direct consequence of this growth in availability and sales of EEE has been the rise in volume of waste electrical and electronics equipment (WEEE) that is more commonly known as electronic waste (e-waste). Annual global levels of e-waste are fast approaching 50 million tons mark (Balde *et al.*, 2015). E-waste contains many valuable metals (gold, silver etc.), rare earth metals (lanthanum, cerium etc.) and toxic metals (lead, lithium etc.) (Mayers *et al.*, 2005; Ministry of Environment and Forest, 2008). The combination of valuable and toxic metals makes management of e-waste complex and different from other streams of waste. If not done properly, management of e-waste could have many negative externalities for the environment, society and economy.

India has not remained untouched with the rise in quantities of e-waste generated. Though there are no official estimates, it is estimated that India generated 1.5 million tons of e-waste in 2015 (Bhaskar and Turaga, 2017). Most e-waste in India has traditionally been managed by the informal sector with scant attention paid to human health and environmentally safe recycling and disposal practices (Bandyopadhyay, 2008; Manomaivibool, 2009; Bandyopadhyay, 2010; Wath *et al.*, 2010; Pradhan and Kumar, 2014). Alarmed by the rise in volumes of e-waste generation and the negative consequences for the environment and society, the government of India introduced the first e-waste specific rules in 2012. Till 2012 the onus of environmentally safe management of e-waste rested upon the urban local bodies. The 2012 rules shifted the responsibility of management of e-waste from urban local bodies to the producers. The underlying framework of the rules is that of extended producer responsibility (EPR). First coined in early 2000s in Northern Europe, EPR has been a widely used policy approach by government world over for management of different streams of waste.

The Indian e-waste rules were subsequently modified in October 2016. The modified rules also continue with the framework of EPR and in addition mention possible strategies for producers including setting up a deposit refund system (DRS) either jointly with other producers or individually. The modified rules differed from the previous rules in three main ways as discussed in Table I.

However, the mere inclusion of EPR in waste management rules is not a guarantee that it will work or will result in satisfactory response from the producers. Past research on implementation of EPR for waste management in developing countries has shown that there are difficulties in implementation. These difficulties are mainly on account of the large informal sector in waste processing found in these countries, illegal import of e-waste often from developed countries, and weak regulatory capacity of the state (Akenji *et al.*, 2011; Manomaivibool and Vassanadumrongdee, 2011). Literature on implementation of EPR in Indian e-waste rules is scarce. This scarce literature also suggests that the impact of e-waste

Parameter	2011 E-waste rules	2016 E-waste rules
Applicability of the rules	Applied to every producer, consumer, or bulk consumer involved in manufacture, sale, purchase and processing of e-waste, collection center, dismantler and recycler of e-waste	Apply to every *manufacturer*, producer, consumer, bulk consumer, *collection centers, dealers, e-tailers, refurbishers*, dismantler and recycler involved in manufacture, sale, *transfer*, purchase, *collection, storage* and processing of e-waste
Collection targets for producers	Not specified	Mandatory targets with year-wise escalation
Penalty for producers for non-compliance	Not specified	Provisions for revocation of license to sell products

Table I.
Key differences between 2011 and 2016 E-waste rules

rules on practices of producers and their subsequent efforts have been far from satisfactory (Bhaskar and Turaga, 2017). It is estimated that even after the introduction of the rules, almost 85 to 95 per cent e-waste is still channelized to the informal sector in India (Bhaskar and Turaga, 2017). Apart from the producers, the 2012 and 2016 versions of the rules mandated responsibilities for one important business stakeholder that is bulk consumer. Bulk consumers are mainly business entities involved in huge volume of e-waste. However just as is the case with producers, very little is known about the e-waste management practices of bulk consumers.

Sustainability has emerged as a major global agenda in last two decades. Key events like the Brundtland Commission's report of 1987, Earth Summit of 1992, Kyoto Protocol, launch of the Millennium Development Goals in 2000, and the more recent Paris Climate Treaty of 2015 are some examples outlining the importance of sustainable practices. In the same period, businesses have taken several steps to address sustainability issues inside and outside of their ambit and hence there is an increased interest in understanding business responses to sustainability. Sustainability initiatives by firms have been on rise which is evident from the spur in sustainability reporting by firms and their adherence to national and international regulations. Firms have also been trying to look at numerous drivers to move toward sustainability like cost reduction benefits because of waste reduction and better management of natural resources with a view on long-term value generation.

The United Nations announced sustainable development goals (SDGs) in October 2015. While businesses had been involved in previous sustainability discourses too, under the new SDG agenda, onus has been put on businesses, governments, and civil society equally to pursue a more sustainable path (Hajer *et al.*, 2015; Scheyvens *et al.*, 2016). After the introduction of SDGs, firms across the world are in the process of devising strategies to align their businesses to focus on one or more SDGs. This is needed particularly when all stakeholders like manufacturers, marketers and retailers are required to align their business activities in line with the basic philosophy of sustainability (Kumar *et al.*, 2017). However, these sustainability initiatives of businesses often seem to work in silos. Sustainability definition is rather broad and difficult for organizations to understand and apply (Dao *et al.*, 2011). Often, firms are confused as to what emphasis need to put so that various initiatives garner larger synergies for the firms. For example, there are multiple standards for sustainability reporting (GRI, UN Global Compact, National Voluntary Guidelines of India, etc.) and many firms wonder which standard to comply with.

Emergence of sustainability as a global agenda has also led to rise in interest in sustainable consumption as a topic among researchers and practitioners in the same period. In the Indian context too, there have been few attempts to study closely sustainable consumption. For e.g. Clark (2007) has argued that although Indian consumers consumer significantly lower than consumers in the USA on an average, over time a "global consumer class" will evolve that may have similar consumption pattern as a consumer in the USA. Another study by Hubacek *et al.* (2007) also put forward similar apprehensions mentioning rising income may lead to unsustainable consumption pattern in countries like India. These then suggest that the firms willing to adopt sustainability strategies may need to deploy sustainability initiatives for Indian markets as they do for other Western markets. However, Indian consumer research for sustainable consumption is scarce in nature, and to the best of our knowledge existing studies have not linked business initiatives with SDGs.

In the context of e-waste management, businesses have a key role since two of the most important stakeholders, producers and bulk consumers, are from business. Companies, whether producers or bulk consumers, have started making policies and strategies for complying with Indian e-waste rules. However, as noted earlier the business response to

e-waste management rules in India has been less than satisfactory. We, the authors of this paper, have attended several conferences, workshops and meetings on e-waste management in India and the role of businesses in meeting the requirements posed by EPR in the last three years. We have also interacted with various stakeholders (e.g. regulators, producers, environmental organizations, and bulk consumers) during this period. One of the arguments that has been heard in these discussions is that bulk consumers account for bulk of e-waste generation in India and the rules should focus not just on producers but also on bulk consumers who account for huge volume of e-waste generation in India. These discussions provided the initial backdrop for our study. Bulk consumers have been defined in rules as:

> Bulk users of EEE such as central government or state government departments, public sector undertakings, banks, educational institutions, multinational organizations, international agencies, partnership and public or private companies and health care facilities which have turnover of more than one crore or have more than twenty employees.

This definition of bulk consumers is fairly broad and all private and public businesses operating in India that have a turnover of more than one crore or have more than 20 employees come under the purview of the rules.

It is estimated that bulk consumers account for 70 per cent of e-waste generation and yet the volume of e-waste that gets channelized to formal sector is only between 5-15 per cent (Bhaskar and Turaga, 2017; Rajya Sabha, 2011). This fact highlights that a large proportion of e-waste originating from bulk consumers are not channelized to the formal sector, which is contrary to the requirements of e-waste rules in India. Many of these bulk consumers either have a policy on sustainability and SDGs or are in the process of identifying relevant SDGs for their businesses.

In view of this discussion, we frame our current work and focus on the practices and strategies of bulk consumers in the context of e-waste legislation in India, EPR, SDGs, and business response to sustainability. This study also takes cues from a recent study by Kumar and Bhaskar (2016) in which e-waste was viewed through the sustainability lens. In this paper, we seek answer to two basic questions: First – Are the firms displaying integrated approach toward electronic waste management and sustainability? and Second – Is there a business case for linking e-waste management with SDGs?

The questions are conceptualized as exploratory questions. We use content analysis of annual reports and sustainability reports of the firms to answer first question and a cross-disciplinary approach to answer second question. Using a cross-disciplinary approach, we try to integrate literature from four streams, namely, macromarketing, environmental policy, strategic management and business sustainability, and develop theoretical arguments for businesses to integrate their sustainability and SDG strategies with mandated e-waste responsibilities. In using the cross-disciplinary approach, we used the approach suggested by Dao *et al*. (2011), who developed theoretical arguments to help firms develop sustainability capabilities and proposed an integrated sustainability framework.

The paper is structured as follows: Section 2 discusses e-waste and SDGs, research methodology and sampling is presented in Section 3, followed findings and discussion in Section 4, and Section 5 presents research and managerial implications.

2. E-waste and sustainable development goals

Sustainability was defined by Elkington (1994) as a triple bottom line approach encompassing environment, society and economy. The triple bottom line concept emphasizes on a more rigorous understanding of environmental and social aspects with a view to create an interrelated mechanism with their repercussion on economic aspect. We

first describe 17 SDGs and their key targets. Next, using Kumar and Bhaskar (2016) and definition of sustainability suggested by Elkington (1994), we look at e-waste management and identify its positioning with respect to environmental, social and economic dimensions as shown in Figure 1.

Table II mentions the details of SDGs and key targets.

3. Research methodology and sampling

3.1 Sampling

Sampling in qualitative content analysis is purposive sampling that allows to answer the research questions and display a meaningful picture. As the purpose of qualitative research is normally transferability not generalizability, sampling should be purposive in nature. Transferability can be understood as judgment about applicability of finding from one context to another (White and Marsh, 2006). There is scarce inventory of e-waste in India. There is also no data on the largest generators of e-waste in India. One can safely assume that the largest generators of e-waste will also be the largest consumers of electronic appliances. Though it is difficult to understand largest consumers of electronic appliances, but we assume that the largest Indian companies would be among the largest consumers of such appliances. These companies would come under the definition of bulk consumers as defined in the 2011 and 2016 versions of e-waste rules.

Companies appearing on Sensex of the Bombay Stock Exchange, one of the two largest stock exchanges in India, are the 30 largest companies by market capitalizations in India. We have considered the Sensex firms as proxy to large consumers of electronic appliances (bulk consumers) and large generators of e-waste. We are aware of the possibility that these 30 firms may not be the 30 largest bulk consumers in India but these would be among the largest bulk consumers nonetheless. Our aim of taking these large bulk consumers is to study the role accorded to e-waste management and compliance to e-waste management rules as part of their sustainability strategies.

We first downloaded the annual reports of each of these 30 firms for past five years. For firms where sustainability reports were available, we downloaded those as well. We restricted our search to five years, as it has been a little over five years since the first e-waste rules were implemented.
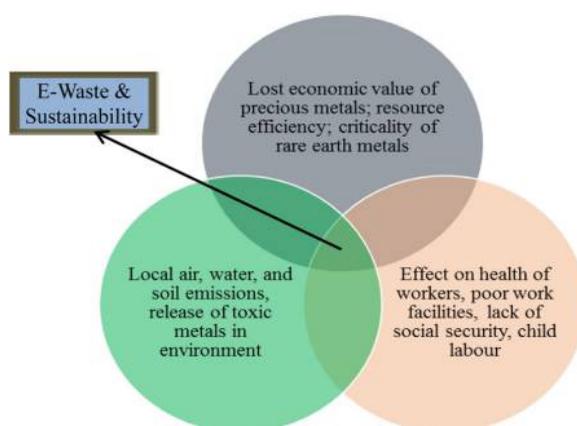

Figure 1.
E-waste and
Sustainability

Goal	Focus	Key targets
Goal 1	No poverty	Eradicate extreme poverty; Implement nationally appropriate social protection systems; Equal rights for all to economic resources. Build resilience of poor and those in vulnerable situations and reduce exposure and vulnerability to climate-related extreme events and other social, economic and environmental shocks and disasters. Policy framework to support accelerated investment in poverty eradication actions
Goal 2	Zero hunger	End hunger and ensure access to safe, nutritious and sufficient food. End all forms of malnutrition. Double the agricultural productivity and incomes of small scale food producers. Ensure sustainable food production systems
Goal 3	Good health and well being	Reduce global maternal mortality; End preventable deaths of newborns and reduce neonatal mortality; Reduce premature mortality from non-communicable diseases; End the epidemic of AIDS, TB, malaria and neglected tropical diseases and combat hepatitis, water-borne diseases and other communicable diseases; Strengthen the prevention and treatment of substance abuse; Halve the number of global deaths through injuries from road traffic accidents; Achieve universal health coverage; Ensure universal access to sexual and reproductive health-care services; Substantially reduce deaths and illnesses from hazardous chemicals and air, water and soil pollution and contamination
Goal 4	Quality education	Ensure access to quality pre-primary education and development and free, equitable and quality primary and secondary education for all boys and girls; Ensure equal access for men and women to affordable and quality technical, vocational and tertiary education; Substantially increase number of youth who have relevant skills for employment, decent jobs and entrepreneurship; Eliminate gender disparities in education; Ensure all learners acquire the knowledge and skills needed to promote sustainable development; Substantially increase the supply of qualified teachers
Goal 5	Gender equality	End all forms of discrimination and all forms of violence against women and girls; Eliminate all harmful practices like child, early and forced marriage and genital mutilation; Enhance use of technology to promote women empowerment
Goal 6	Clean water and sanitation	Achieve universal and equitable access to safe and affordable drinking water for all; End open defecation and achieve access to adequate and equitable sanitation and hygiene for all; Improve water quality by reducing pollution, eliminating dumping and minimizing release of hazardous chemicals and materials, halving proportion of untreated waste water and substantially increasing recycling and safe reuse globally; Substantially increase water use efficiency; Implement integrated water resource management; Protect and restore water related ecosystems
Goal 7	Affordable and clean energy	ensure universal access to affordable, reliable and modern energy services; increase substantially the share of renewable energy in the global energy mix; double the global rate of improvement in energy efficiency; expand infrastructure and upgrade technology for supplying modern and sustainable energy services for all in developing countries
Goal 8	Decent work and economic growth	Achieve higher levels of economic productivity through diversification, technological upgrading and innovation, including through a focus on high-value added and Labor-intensive sectors; Promote development-oriented policies that support productive activities, decent job creation, entrepreneurship, creativity and innovation and encourage the formalization and growth of micro-, small- and medium-sized enterprises, including through access to financial services; improve progressively, through 2030, global resource efficiency in consumption and production and endeavor to decouple economic growth from environmental degradation; substantially reduce the proportion of youth not in employment, education or training; Take immediate and effective measures to eradicate forced Labor, end modern slavery and human trafficking and secure the prohibition and

Table II.
Sustainable development goals and key targets

(*continued*)

Goal	Focus	Key targets
		elimination of the worst forms of child Labor, including recruitment and use of child soldiers; protect labour rights and promote safe and secure working environments for all workers, including migrant workers, in particular women migrants and those in precarious employment
Goal 9	Industry, innovation and infrastructure	Develop quality, reliable, sustainable and resilient infrastructure, including regional and trans-border infrastructure, to support economic development and human well-being, with a focus on affordable and equitable access for all; Promote inclusive and sustainable industrialization and, by 2030, significantly raise industry's share of employment and gross domestic product, in line with national circumstances and double its share in least developed countries; Increase the access of small scale industrial and other enterprises in particular in developing countries, to financial services, including affordable credit and their integration into value chains and markets; Upgrade infrastructure and retrofit industries to make them sustainable, with increased resource-use efficiency and greater adoption of clean and environmentally sound technologies and industrial processes
Goal 10	Reduced inequalities	Progressively achieve and sustain income growth of the bottom 40 per cent of the population at a rate higher than the national average; empower and promote the social, economic and political inclusion of all, irrespective of age, sex, disability, race, ethnicity, origin, religion or economic or other status
Goal 11	Sustainable cities and communities	Ensure access for all to adequate, safe and affordable housing and basic services and upgrade slums; enhance inclusive and sustainable urbanization and capacity for participatory, integrated and sustainable human settlement planning and management in all countries; reduce the adverse per capita environmental impact of cities, including by paying special attention to air quality and municipal and other waste management
Goal 12	Responsible consumption and production	Implement the 10-year framework of programs on sustainable consumption and production; achieve the sustainable management and efficient use of natural resources; achieve the environmentally sound management of chemicals and all wastes throughout their life cycle, in accordance with agreed international frameworks and significantly reduce their release to air, water and soil in order to minimize their adverse impacts on human health and the environment; substantially reduce waste generation through prevention, reduction, recycling and reuse; Encourage companies, especially large and transnational companies, to adopt sustainable practices and to integrate sustainability information into their reporting cycle; Promote public procurement practices that are sustainable, in accordance with national policies and priorities; ensure that people everywhere have the relevant information and awareness for sustainable development and lifestyles in harmony with nature
Goal 13	Climate action	Strengthen resilience and adaptive capacity to climate-related hazards and natural disasters in all countries; Improve education, awareness-raising and human and institutional capacity on climate change mitigation, adaptation, impact reduction and early warning; Integrate climate change measures into national policies, strategies and planning
Goal 14	Life below water	Prevent and significantly reduce marine pollution of all kinds, in particular from land-based activities, including marine debris and nutrient pollution; sustainably manage and protect marine and coastal ecosystems to avoid significant adverse impacts, including by strengthening their resilience and take action for their restoration in order to achieve healthy and productive oceans
Goal 15	Life on land	Ensure the conservation, restoration and sustainable use of terrestrial and inland freshwater ecosystems and their services, in particular forests, wetlands, mountains and drylands, in line with obligations under international agreements

(continued)

Table II.

Goal	Focus	Key targets
		Promote the implementation of sustainable management of all types of forests, halt deforestation, restore degraded forests and substantially increase afforestation and reforestation globally. Combat desertification, restore degraded land and soil, including land affected by desertification, drought and floods and strive to achieve a land degradation-neutral world
		Ensure the conservation of mountain ecosystems, including their biodiversity, in order to enhance their capacity to provide benefits that are essential for sustainable development
		Take urgent and significant action to reduce the degradation of natural habitats, halt the loss of biodiversity and, by 2020, protect and prevent the extinction of threatened species
		Take urgent action to end poaching and trafficking of protected species of flora and fauna and address both demand and supply of illegal wildlife products
		Integrate ecosystem and biodiversity values into national and local planning, development processes, poverty reduction strategies and accounts.
Goal 16	Peace, justice and strong institutions	Significantly reduce all forms of violence and related deaths. End abuse, exploitation, trafficking and all forms of violence against and torture of children. Promote rule of law at national and international levels Significantly reduce illicit financial and arms flow. Substantially reduce corruption and bribery in all forms Ensure public access to information and protect fundamental freedoms
Goal 17	Partnership for goals	Strengthen domestic resource mobilization to improve domestic capacity for tax and other revenue collection. Mobilize additional resources for developing countries Promote the development, transfer, dissemination and diffusion of environmentally sound technologies to developing countries on favorable terms. Enhance policy coherence for sustainable development

Table II.   **Source:** Sustainable Development Goals, United Nations

3.2 Methodology

We used a combination of perspectives on sustainability from literature and content analysis to answer the research questions. An extensive review of literature on sustainability from different perspectives namely macromarketing, environmental policy, strategic management and business sustainability was carried out to understand the key perspectives on the subject. These perspectives were later used to identify the relevant SDGs for each of the four disciplines and to come up with suggested business approaches while integrating the different perspectives.

Content analysis, which is also known as a method of analysis, is used to describe and quantify a given phenomenon (Sandelowski, 1995). Content analysis allows us to collate words and phrases into smaller categories which are related in terms of the meaning they carry. As per Cavanagh (1997), classifying the words, phrases and similar contents into a single category is based on the assumption of similar underlying meaning. Content analysis is largely used to provide replicable and valid inference from the data at hand. The end purpose is to provide new knowledge, broader insights and overall representation of facts by condensing the description of phenomenon either in the form of categories or concepts (Elo and Kyngäs, 2008).

We used ATLAS.ti software to conduct the basic content analysis. We carried out qualitative content analysis of annual/sustainability reports of Sensex 30 firms using the following keywords: "sustainability", "sustainable development goals", "SDG", "society", "environment", "economy", "development", "e-waste", "electronic waste", "extended producer responsibility", "EPR" etc.

In view of the content analysis and exploration of sustainability literature from different perspectives, we attempted to understand if the firms are displaying integrated approach toward electronic waste management and sustainability, and if there is a business case for linking e-waste management with SDGs.

4. Findings and discussion
4.1 Findings based on content analysis
Out of Sensex 30 firms, 6 firms have framed internal policies for SDG and 23 firms have framed policies for sustainability.

Table III displays the result of content analysis in terms of word count of key words in their annual report/sustainability reports in last five years. Based on this finding we conclude that bulk consumers have sustainability policies and/or strategies. It also shows that majority of these firms do not focus much on the EPR. We also created a word cloud as shown in Figure 2 from the key words using ATLAS.ti software to understand the pattern appearance of the keywords in sustainability/annual reports of the firms. Word cloud provides the visualization of the text data. They are based on the word frequencies and more frequent the word is used, the larger and bolder it is shown in the word cloud. Word clouds may help in understanding the trends and patterns that may sometimes be difficult to interpret from the tabular data presentation. The word cloud shown in Figure 2 indicates that e-waste is not as strongly discussed a topic in the firms as sustainability or issues related to environment. The word cloud also does not show the words like EPR or EPR indicating less attention by the firms on this issue.

Based on the findings of the content analysis as indicated in Table III and Figure 2, and thorough analysis of the annual/sustainability reports of the firms, we arrived at the conclusion that many of these firms have not integrated their e-waste management with sustainability policies and strategies. This answers our first research question.

4.2 Findings based on different perspectives on sustainability
We have tried to understand answer to the second research question using different perspectives on sustainability in terms of gathering some meaningful insights on business case by linking e-waste and SDGs. The elaboration on this aspect is mentioned in subsequent sub-sections.

4.2.1 Environmental policy perspective. Rittel and Webber (1973) coined the term "wicked problem" while discussing about public policy issues. This "wickedness" arises from the characteristics of many public policy problems such as being interdisciplinary, boundary spanning, complex and difficult to solve (Head, 2008; Rittel and Webber, 1973). Every wicked problem is essentially unique and therefore any solution to such wicked problems needs to focus on that uniqueness aspect (Rittel and Webber, 1973). Management of e-waste in India can also be considered as one such wicked problem.

Unlike many other developed countries where management of e-waste is typically seen from an environmental perspective, there is a large social dimension also in countries like India with large informal waste management sector. Practices such as collecting, segregating and dismantling waste in the informal sector provide livelihood to millions of people in India in the informal waste management sector. Any attempt to solve the unsafe and improper management of e-waste by informal sector in India that considers only the negative externalities on environment and not the impact on livelihoods of people employed is unlikely to find acceptance by stakeholders. It is this strong social interface that strengthens the link of e-waste management in India with the three dimensions of sustainability, economic, environmental and social. Further, attempts to solve e-waste

Sr. no.	Name of the firm	Sustainability	Sustainable	SDG	Society	Environment	Economy	Development	Electronic waste	e-waste	EPR	Extended producer responsibility
1	Adani Ports and Special Economic Zone Limited	324	65	3	19	218	31	451	0	3	0	0
2	Asian Paints Annual Report SUS Report	57	35	3	12	130	50	226	0	2	0	0
3	Axis Bank Ltd Annual Report	107	74	0	31	234	20	144	0	0	0	0
4	Bajaj Auto Limited Annual Report	6	12	0	33	29	5	263	0	0	0	0
5	Bharti Airtel Ltd Annual Report	141	59	0	34	201	26	204	1	14	0	0
6	Cipla Ltd Annual Report	29	29	0	15	77	7	234	0	0	0	0
7	Coal India Ltd Annual Report	49	77	0	37	230	12	455	0	0	0	0
8	Dr Reddy Laboratories Annual Report	222	37	0	35	213	6	651	0	0	0	0
9	HDFC Bank Ltd Annual Report	235	172	0	100	207	27	224	0	10	0	0
10	Hero Motocorp Ltd Annual Report	97	35	0	36	251	52	385	0	0	0	0
11	Hindustan Unilever Ltd Annual Report	73	233	2	15	241	21	246	0	1	0	0
12	HDFC Annual report	16	4	0	19	48	27	378	0	0	0	0
13	Icici Bank Ltd Annual Report	3	55	2	10	98	59	327	0	0	0	0
14	Infosys Sustainability Report	1181	161	2	90	655	16	346	0	27	4	0
15	ITC Ltd Sustainabilty Report	659	676	11	148	824	75	797	0	3	0	5
16	Kotak Mahindra bank Annual Report	9	46	0	50	145	52	186	0	0	0	0
17	Larsen and Turbo Ltd AR	352	92	1	52	352	81	1294	1	0	0	0
18	Lupin Ltd AR	21	55	0	60	122	2	556	0	0	0	0
19	Mahindra and Mahindra Ltd	652	148	0	69	473	18	721	0	5	1	0
20	Maruti Suzuki India Ltd SUS R	178	14	0	38	230	13	271	0	0	0	0
21	NTPC	87	79	0	37	462	8	998	0	0	0	0
22	Oil and natural Gas Corp Ltd AR	87	79	0	37	462	8	998	0	6	0	0
23	Power Grid Corp of India LTd AR	371	168	0	46	574	24	746	1	0	2	0
24	Reliance Industry Ltd AR	121	180	4	77	343	32	862	1	0	1	0
25	SBI AR	115	45	0	80	504	47	761	1	0	1	0
26	Sun Pharma AR	18	26	0	48	93	58	255	0	0	0	0
27	Tata Motors AR	43	30	0	44	189	51	490	0	0	0	0
28	Tata Steel AR	159	58	0	63	279	33	424	0	0	0	0
29	TCS AR	87	27	0	52	288	128	778	0	5	0	0
30	Wipro AR	366	97	0	90	412	56	609	7	67	0	0
	TOTAL								12	140	9	5

Table III.
Findings of content analysis

Figure 2.
Word cloud of the
textual data

management problem in India would require involvement of multiple stakeholders (producers, bulk consumers, retail consumers, informal waste management sector, formal waste management sector, governments, regulators etc.) and use of different disciplines (environmental, social, business, public policy etc.).

Most of the past research on e-waste has positioned e-waste as an environmental issue and as such prescriptions from an environmental policy perspective are dominant. Extending responsibility of waste management is a way to force producers to internalize negative externalities (Sachs, 2006). The approach of EPR is based on this premise. It has been suggested earlier that EPR approach can motivate firms to integrate waste disposal costs at product design stage (OECD, 2013). However, EPR alone does not guarantee internalization of negative externalities by the producers and a lot could depend on the incentives on various stakeholders by policy instruments compatible with EPR. Instruments like the DRS have been considered to be an economically efficient policy instrument to manage waste and the 2016 version of rules allow for DRS and other instruments to be used by producers to incentivize consumers.

In addition to these issues, other challenges for effective implementation of EPR in developing countries continue to remain. These are the presence of large informal sector, weak regulatory capacity, illegal import of e-waste and difficulty identifying producers (Manomaivibool, 2009; Kojima *et al.*, 2009; Skinner *et al.*, 2010; Akenji *et al.*, 2011).

4.2.2 Macromarketing perspective. Several researchers have criticized marketers for their excessive emphasis on consumption driven approach often clubbed with negligence toward environment and ecology (Fisk, 1974; Van Dam and Apeldoorn, 1996). As marketing as a discipline is supposed to provide products and services to the consumers without creating negative externalities such as environmental degradation, macromarketing as the proponent of this approach aptly follows this concept. Macromarketing is the study encompassing marketing systems, their effects on society and also the effect of society on marketing system (Hunt, 1981). As a discipline of marketing, it is the agent facilitating marketing exchange with a view to positively affect societies, businesses and individuals (Fisk, 1974). The developmental school of macromarketing advocates a positive role for

marketing system in economic development by focusing on issues like quality of life, peace over conflict and overall well-being (Shultz, 2007).

We have positioned EPR as solution to the larger issues of environmental degradation arising out of consumption and un-scientific disposal of the technological products. In line with the Development School of Macromarketing, which perceives markets and marketing system as a tool providing solution to the human conditions (Mittelstaedt *et al.*, 2014), it makes sense to discuss EPR as part of the solution to the environmental degradation with a longer time horizon covering an important part of the overall value chain ultimately leading to the sustainable way of consumption.

4.2.3 Strategic management perspective. Corporate environmental strategy has been considered to be a continuum between proactive and reactive strategy (Aragón-Correa, 1998; González-Benito and González-Benito, 2010; Menguc *et al.*, 2010). Corporate environmental strategy is motivated by firm's internal capabilities, stakeholder pressure, regulatory pressure, positions in value chain and competitive environment and firm's strategic attitude (Aragón-Correa, 1998; Menguc *et al.*, 2010; Stadtler and Lin, 2017). These then suggest that bulk consumers would frame their strategy on responding to e-waste regulations driven by their internal capabilities, pressure exerted by stakeholders and regulatory bodies in India, their strategic attitude and positions in value chain and competitive environment. One can then argue that a policy approach that emphasizes EPR and puts the onus on producers does not exert sufficient pressure on bulk consumers to align their e-waste management practices with the requirements of the legislations and their strategic attitude toward sustainability. Previous research has also called for socially responsible company to do more than simply make a profit (Matten and Crane, 2005).

In a more recent work, Stadtler and Lin (2017) highlighting the role of interaction effects argue that government regulation and customer sensitivity moderate the relationship between a firm's entrepreneurial orientation and environmental strategy. This could then mean that strategic response of a firm to e-waste management will be affected by the interaction between the e-waste rules and sensitivity of customers. There is limited research analyzing the drivers prompting firm engagement in future oriented sustainable development rather than an incremental pollution prevention projects (Stadtler and Lin, 2017). Of the limited research that looks into it has found that firms often find it difficult to frame strategies for sustainable development because pollution prevention requires changes in existing products and processes, but strategies for sustainable development require greater normative and operative shifts from firms and for them to challenge their existing essential assumptions underlying their business models (Hart, 1995; Dyllick and Muff, 2016).

4.2.4 Business sustainability perspective. Pressure companies feel to implement sustainability practices too often results in a jumble of uncoordinated sustainability activity that neither makes any meaningful social impact nor strengthens firm's long-term competitiveness (Porter and Kramer, 2006). Answers to the firms' quest to address "depletion of natural resources vital to their businesses" may lie in the principles of shared value which is primarily based on reconceiving products and markets, and redefining productivity in value chain. As societal problems can create economic costs in the firm's value chain, better resource utilization will permeate to all parts of the value chain and spread to suppliers and channels accruing larger value (Porter and Kramer, 2006).

In a suggestive approach to drive firms on the path of sustainability, Orsato (2006) mentioned four strategies for firms, namely eco-efficiency, beyond compliance leadership, eco-branding and environmental cost leadership. Echoing similar notes, Arevalo and Aravind (2011) discussed four models of corporate social responsibility (CSR) in India

(ethical, statist, liberal and stakeholder) and concluded that much improvement is needed in how CSR strategies are integrated and implemented in Indian firms (Arevalo and Aravind, 2011).

Despite challenges, firms are making some effort in this direction which is evident from the exclusion or inclusion of sustainability in a firm's mission statement that is indicative of the firm's commitment to the pursuit of a sustainability strategy (Galpin and Lee Whittington, 2012). Nevertheless, a gap still exists regarding development of a model that encompasses key elements of corporate sustainability efforts from inception to implementation. In the context of electronic waste management, business sustainability perspective may provide some important insights like handling of electronic waste management in sustainable manner that too with a business sense.

4.3 Integration of different perspectives with relevant sustainable development goals
Based on the elaboration of different perspectives discussed above, we have provided an integrative discussion as shown in Table IV, which suggests focus of a particular perspective on a given SDG and commensurate business approach by the firms to find a synergy between the two. This holistically answers the second research question.

Table IV indicates that e-waste management in India is liked with more than one SDGs. In particular, targets of some of the SDGs such as responsible consumption and production, and clean water and sanitation are closely related to the business case for e-waste management. Some of the prominent SDGs like clean water and sanitation aimed at improving water quality by reducing pollution, eliminating dumping and minimizing release of hazardous chemicals and materials to protect and restore water related ecosystems is very important for the firms looking at safe handling of e-waste. Another SDG meant for responsible consumption and production targeted at sustainable management and efficient use of natural resources, environmentally sound management of chemicals and control of all wastes through their life cycle has important positive repercussions for the firms. Other aspects of this SDG like reduction of waste generation through prevention, reduction, recycling and reuse is directly related with business sustainability which is also a clear business case.

5. Implications and conclusion
EPR as a concept originated in Europe in early 2000s and has since then been extensively used in predominantly European and Western countries for management of various waste streams. A key feature of EPR is the responsibility placed on various stakeholders, in particular businesses. Developing countries, however, differ in many ways when compared to Western countries and that makes implementation of EPR a challenge (Akenji *et al.*, 2011; Manomaivibool and Vassanadumrongdee, 2011). Little is known about the implementation of EPR in developing countries both in theory and in practice. India introduced EPR for the first time in 2011 for management of e-waste, whereby responsibilities were placed on various stakeholders including two major business stakeholders, producers and bulk consumers. We position our current work in this context of understanding business responses to EPR in developing countries. There are research, managerial and policy implications of our work.

In this paper, we have not sought to answer *how* can EPR be implemented in a developing country like India. Rather we have tried to study *whether* firms are displaying an integrated approach toward electronic waste management and sustainability and *if* there is a business case for firms to link e-waste management with SDGs. By attempting to study these two questions, we hope to gain a better understanding of firms' responses to their

Table IV.
Integrating different
perspectives with
commensurate
business case

Perspective	Focus of the perspective (Selected SDG goals shown in parenthesis)	Suggested approaches for the firms leading to business case	References
Macromarketing perspective	Overall well-being; Quality of life Good Health and Well Being (3)	Address occupational health issues of people in the informal e-waste management sector	Fisk (1981); Hunt (1981); Mittelstaedt et al (2015); Shultz, (2007), Van Dam and Appeldoorn (1996)
Environment policy perspective	Minimizing environmental impacts; Pro-environment production processes Clean Water and Sanitation (6), Affordable and Clean Energy (7)	Minimize use of toxic elements in products, Increase content of recycled materials in manufacturing processes, Minimize discharge of toxic materials in water, soil and air during production, use and end of life stages	Akenji et al (2011), Kojima et al (2009); Manomaivibool (2009); OECD (2013); Palmer and Walls (1997); Rittel and Webber (1973), Sachs (2006); Skinner et al. (2010);
Strategic Management perspective	Socially responsible firms, Do more than profit maximization, Industry, Innovation and Infrastructure (9), Responsible Consumption and Production (12), Climate Action (13)	Adopt Design for Environment strategy, Increase Resource Efficiency, Increase public awareness and make information publicly available	Dao, Langella, and Carbo (2011); Hart (1995), Matten and Crane (2005); Stadtler and Lin (2017); Aragón-Correa (1998); González-Benito and González-Benito (2010); Menguc et al., (2010), Dyllick and Muff (2016)
Business Sustainability perspective	Shared Value; Long term competitive strategic advantage Good Health and Well Being (3), Clean Water and Sanitation (6), Decent Work and Economic Growth (8), Industry, Innovation and Infrastructure (9), Sustainable Cities and Communities (11), Responsible Consumption and Production (12), Climate Action (13)	Adopt Design for Environment strategy, Increase Resource Efficiency, Increase public awareness and make information publicly available, Promote formalization of informal sector, Promote dissemination of technology and skills required to dismantle, refurbish and recycle materials and components locally, Innovative Business Models	Arevalo and Aravind (2011); Arora and Puranik (2004); Baskin (2006); Chapple and Moon (2005); Galpin and Lee Whittington (2012), Orsato (2006); Porter and Kramer (2006); Schaltegger and Hörisch (2017)

responsibilities under e-waste management rules in the broader context of their business sustainability strategies. By studying the link for bulk consumers of EEE as a stakeholder, we also hope to understand the drivers (or barriers) to corporate responses to responsibilities placed under EPR.

This study provides a much needed insight on e-waste and SDGs adding to the stock of knowledge on the subject. Improper management of e-waste is associated with many negative externalities for environment. Therefore, most of prior research on e-waste has approached the issue from an environmental perspective. However, as analyzed by us, e-waste management in India is not just an environmental problem but a social problem too. Therefore, there is a need for governments, businesses and other stakeholders to have a more integrated and holistic approach to e-waste management in India. Management of e-waste in India is a sustainability issue and as such any legislation or policy mechanism to address it must also focus on social and economic aspects and not merely on environmental aspects. For the governments, this may require a relook at the way future e-waste management policies are designed and drafted.

From a theoretical point of view, we have provided an integrative approach to understand how different perspectives such as macromarketing, environmental policy, strategic management and business sustainability perspective may provide some important insights on creating business case for the firms by linking electronic waste management and SDGs. This study is first of its kind to provide such wider perspective on the subject of electronic waste management in developing countries and opens up many theoretical avenues to pursue them further. These insights need to be developed further through rigorous empirical work to gain a better understanding of the business responses to responsibilities mandated by legislations on management of e-waste and other waste streams that mandate a role for businesses.

From a practitioner point of view, we have tried to identify SDGs relevant for e-waste management and for businesses in India. From the results, it appears that firms are not displaying an integrated approach toward business sustainability and responsibilities mandated as part of EPR under e-waste rules. Rather than integrating business sustainability with response to e-waste management and larger business objectives, firms appear to be looking at them as three separate objectives to be met. In a review of articles published over 50 years, Kolk (2016) has shown how the meaning of social responsibility of business has evolved from environment to ethics, rights and responsibilities to CSR and finally to sustainability and sustainable development in current form of discussion. Today when firms are striving hard to strike a balance between their business objectives and SDGs, policies like EPR in the domain of e-waste present a good business case with long term sustainable guidance. Such policies have clear managerial implications in terms of guiding firms on how to visualize a business case using electronic waste management and simultaneously creating a reputational capital for the firms by following SDGs.

We consider our current work to be first in a series of works looking from an integrated sustainability lens closely at business responses to EPR in developing countries context. Governments in India and elsewhere can be expected to use EPR for management of other waste streams, as evidenced by the recent ban on usage and sale of plastic products in the state of Maharashtra in India. The ban will have many different implications for the businesses in the short to long term, and businesses may require them to adopt a similar integrated approach. We hope to initiate conversations in India on the need for future waste management policies to adopt an integrated policy approach toward e-waste management that incorporates sustainability and not limit it merely within a boundary of environmental perspective.

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