

# **Material Flow Analysis in WEEE Management for Circular Economy: A Content Review on Applications, Limitations and Future Outlook**

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## **Content**

**Table S1** Summary of existing studies

**Table S2** Waste from Electrical and Electronic Equipment (WEEE directive)

**Table S1**

Selected of existing study

No	Preferen ces	Continent	Economic status of the country	Year	Publisher	E-waste category		Aspect evaluated	Sustainability dimension	MFA application in e-waste management		
										M 1	M 2	M 3
1.	[45]	Asia	OECD	2010	Journal of Material Cycles and Waste Management	Waste Electrical Electronic Equipment (WEEE Directive)	from and	<ul style="list-style-type: none"> <li>Product level assessment</li> <li>E-waste management</li> </ul>	Economic and environmental	•	•	•
2.	[41]	Asia	Non- OECD	2010	Environmental Science and Technology	Specific appliances Computer)	electrical (e.g.,	<ul style="list-style-type: none"> <li>Geographical level assessment</li> <li>Environmental impact assessment</li> <li>Uncertainty analysis</li> </ul>	Economic, social and environmental	•		
3.	[46]	America	OECD	2010	Waste Management	Specific appliances Computer)	electrical (e.g.,	<ul style="list-style-type: none"> <li>Consumer behaviour</li> </ul>	Social and environmental	•		•
4.	[47]	Asia	Non- OECD	2010	Waste Management	Waste Electrical Electronic Equipment (WEEE Directive)	from and	<ul style="list-style-type: none"> <li>Product level assessment</li> <li>Material level assessment</li> <li>Geographical level assessment</li> </ul>	Economic, social and environmental	•		•
5.	[48]	Europe	OECD	2011	Waste Management and Research	Waste Electrical Electronic	from and	<ul style="list-style-type: none"> <li>E-waste management</li> </ul>	Economic, social and environmental		•	•

						Equipment (WEEE Directive)		<ul style="list-style-type: none"> <li>• Product level assessment</li> <li>• Consumer behaviour</li> </ul>				
6.	[43]	Asia	Non-OECD	2011	Resource, Conservation and Recycling	Various appliances	electrical	<ul style="list-style-type: none"> <li>• Product level assessment</li> <li>• Uncertainty analysis</li> </ul>	Economic and environmental		•	•
7.	[49]	America	OECD	2012	Resource, Conservation and Recycling	Waste Electrical Electronic Equipment (WEEE Directive)	from and	<ul style="list-style-type: none"> <li>• Consumer behaviour</li> <li>• Product level assessment</li> <li>• Uncertainty analysis</li> </ul>	Economic, social and environmental		•	•
8.	[50]	Asia	Non-OECD	2012	Ecological engineering	Various appliances	electrical	<ul style="list-style-type: none"> <li>• Product level assessment</li> <li>• E-waste management <sup>c</sup></li> </ul>	Economic and environmental		•	•
9.	[51]	Asia	Non-OECD	2012	Journal of Cleaner Production	Waste Electrical Electronic Equipment (WEEE Directive)	from and	<ul style="list-style-type: none"> <li>• Product level assessment</li> <li>• E-waste management <sup>a</sup></li> <li>• Consumer behaviour</li> </ul>	Economic, social and environmental		•	•
10.	[52]	Asia	Non-OECD	2012	Waste Management & Research	Various appliances	electrical	<ul style="list-style-type: none"> <li>• Product level assessment</li> <li>• E-waste management <sup>c</sup></li> <li>• Consumer behaviour</li> </ul>	Economic, social and environmental		•	•
11.	[53]	Africa	Non-OECD	2013	Journal of Environmental Protection	Waste Electrical Electronic	from and	<ul style="list-style-type: none"> <li>• Consumer behaviour</li> </ul>	Social and environmental		•	•

						Equipment (WEEE Directive)		<ul style="list-style-type: none"> <li>• Product level assessment</li> </ul>				
12.	[54]	Asia	Non-OECD	2013	Waste Management	Various appliances	electrical	<ul style="list-style-type: none"> <li>• Product level assessment</li> <li>• Consumer behaviour</li> </ul>	Social and environmental	•	•	
13.	[55]	America	OECD	2013	Journal of Industrial Ecology	Technology appliances (CRT LCD)	based (e.g.,	<ul style="list-style-type: none"> <li>• Product level assessment</li> <li>• Material level assessment</li> <li>• Uncertainty analysis</li> </ul>	Economic and environmental	•	•	
14.	[56]	America Europe Asia	OECD	2013	Waste Management	Waste Electrical Electronic Equipment (WEEE Directive)	from and	<ul style="list-style-type: none"> <li>• Product level assessment</li> <li>• Material level assessment</li> <li>• Environmental impact assessment</li> <li>• Life cycle analysis</li> </ul>	Economic, social and environmental	•		•
15.	[57]	Asia	Non-OECD	2014	Journal of Material Cycles and Waste Management	Various appliances	electrical	<ul style="list-style-type: none"> <li>• Consumer behaviour</li> <li>• Circular economy</li> <li>• E-waste management<sup>a</sup></li> <li>• Uncertainty analysis</li> </ul>	Economic, social and environmental	•	•	
16.	[58]	Asia	Non-OECD	2014	Waste management	Various appliances	electrical	<ul style="list-style-type: none"> <li>• Product level assessment</li> <li>• Geographical level assessment</li> </ul>	Economic, social and environmental	•	•	

								<ul style="list-style-type: none"><li>• Material level assessment</li><li>• Uncertainty analysis</li></ul>				
17.	[59]	Europe	OECD	2014	Environmental Science and Technology	Waste Electrical Electronic Equipment (WEEE Directive)	from and	<ul style="list-style-type: none"><li>• Material level assessment</li><li>• Uncertainty analysis</li><li>• Environmental impact assessment</li></ul>	Economic and environmental	•	•	
18.	[60]	Asia	Non-OECD	2014	Environmental Earth Science	Various appliances	electrical	<ul style="list-style-type: none"><li>• E-waste management <sup>c</sup></li><li>• Geographical level assessment</li><li>• Product level assessment</li></ul>	Economic, social and environmental	•	•	
19.	[61]	America	OECD	2014	ACS Sustainable Chemistry and Engineering	Specific appliances (Batteries)	electrical (e.g.,	<ul style="list-style-type: none"><li>• Product level assessment</li><li>• Uncertainty analysis</li></ul>	Economic and environmental	•	•	
20.	[62]	Europe Asia	OECD and Non-OECD	2014	Environmental Science and Technology	Waste Electrical Electronic Equipment (WEEE Directive)	from and	<ul style="list-style-type: none"><li>• Geographical level assessment</li></ul>	Social and environmental	•	•	
21.	[33]	Europe	Non-OECD	2014	International Journal of Life Cycle Assessment	Specific appliances (Mobile Phone)	electrical (e.g.,	<ul style="list-style-type: none"><li>• E-waste management <sup>c</sup></li><li>• Product level assessment</li><li>• Material level assessment</li></ul>	Economic, social and environmental	•	•	

22.	[63]	Asia	OECD	2015	Journal of Material Cycles and Waste Management	Various appliances	electrical	<ul style="list-style-type: none"> <li>• E-waste management</li> <li>• Product level assessment</li> </ul>	Economic and environmental	•			
23.	[11]	Europe	OECD	2015	Environmental Science and Technology	Specific appliances (e.g., Computer)	electrical	<ul style="list-style-type: none"> <li>• Product level assessment</li> <li>• material level assessment</li> </ul>	Economic and environmental		•	•	
24.	[35]	Asia	Non-OECD	2015	Resource, Conservation and Recycling	Various appliances	electrical	<ul style="list-style-type: none"> <li>• Consumer behaviour</li> </ul>	Social and environmental				•
25.	[10]	Asia	Non-OECD	2015	Rare Metals	Specific appliances (e.g., Laptops)	electrical	<ul style="list-style-type: none"> <li>• Product level assessment</li> <li>• Material level assessment</li> </ul>	Economic and environmental	•	•		
26.	[64]	Asia	Non-OECD	2015	Waste Management	Specific appliances (e.g., Mobile phone)	electrical	<ul style="list-style-type: none"> <li>• Product level assessment</li> <li>• Material level assessment</li> <li>• Uncertainty analysis</li> <li>• Consumer behaviour</li> </ul>	Economic, social and environmental	•	•		
27.	[42]	Europe	OECD	2015	Resource, Conservation and Recycling	Waste Electrical Electronic Equipment (WEEE Directive)	from and	<ul style="list-style-type: none"> <li>• Product level assessment</li> <li>• Material level assessment</li> <li>• Consumer behaviour</li> </ul>	Economic, social and environmental		•	•	
28.	[65]	Europe	OECD	2015	Waste Management and Research	Waste Electrical Electronic	from and	<ul style="list-style-type: none"> <li>• E-waste management</li> <li>• Product level assessment</li> </ul>	Economic, social and environmental	•	•	•	

						Equipment (WEEE Directive)		<ul style="list-style-type: none"> <li>• Material level assessment</li> </ul>				
29.	[66]	Oceania	OECD	2016	Journal of Cleaner Production	Specific appliances (e.g., Mobile Phone)	electrical (e.g.,)	<ul style="list-style-type: none"> <li>• Product level assessment</li> <li>• Geographical level assessment</li> <li>• Consumer behaviour</li> <li>• Uncertainty analysis</li> </ul>	Economic, social and environmental	•	•	•
30.	[67]	Asia	Non-OECD	2016	Waste Management and Research	Waste Electrical Electronic Equipment (WEEE Directive)	from and	<ul style="list-style-type: none"> <li>• Product level assessment</li> </ul>	Economic and environmental		•	
31.	[9]	Asia	Non-OECD	2016	Environmental Science and Technology	Waste Electrical Electronic Equipment (WEEE Directive)	from and	<ul style="list-style-type: none"> <li>• Product level assessment</li> <li>• Material level assessment</li> <li>• Uncertainty analysis</li> </ul>	Economic and environmental	•	•	
32.	[68]	Europe	OECD	2016	Journal of Cleaner Production	Specific appliances (e.g., Computer)	electrical (e.g.,)	<ul style="list-style-type: none"> <li>• Geographical level assessment</li> <li>• Product level assessment</li> </ul>	Social and environmental	•	•	
33.	[69]	Asia	OECD	2016	Procedia CIRP	Specific appliances (e.g., Mobile phone)	electrical (e.g.,)	<ul style="list-style-type: none"> <li>• Material level assessment</li> <li>• Product level assessment</li> <li>• Uncertainty analysis</li> </ul>	Economic and environmental	•		•

34.	[70]	America	OECD	2016	Environmental Science and Technology	Various appliances	electrical	<ul style="list-style-type: none"> <li>• Product level assessment</li> <li>• E-waste management</li> <li>• Uncertainty analysis</li> </ul>	Economic and environmental	•	•	•
35.	[71]	Asia	OECD	2016	Recycling	Specific appliances (e.g., Mobile Phone)	electrical (e.g.,	<ul style="list-style-type: none"> <li>• Product level assessment</li> <li>• End-of-life</li> <li>• Environmental impact assessment</li> </ul>	Economic, social and environmental	•		•
36.	[72]	Asia	Non-OECD	2017	Resources policy	Specific appliances (e.g., Lithium-ion battery)	electrical (e.g.,	<ul style="list-style-type: none"> <li>• Product level assessment</li> <li>• Material level assessment</li> </ul>	Economic and environmental	•	•	•
37.	[73]	Africa	Non-OECD	2017	Journal of Material Cycles and Waste Management	Specific appliances (e.g., Mobile phone)	electrical (e.g.,	<ul style="list-style-type: none"> <li>• Material level assessment</li> <li>• Product level assessment</li> <li>• Circular economy</li> </ul>	Economic, social and environmental		•	•
38.	[74]	Asia	Non-OECD	2017	Science of the Total Environment	Specific appliances (e.g., Mobile phone)	electrical (e.g.,	<ul style="list-style-type: none"> <li>• Material level assessment</li> </ul>	Economic and environmental	•		
39.	[34]	Europe	OECD	2017	Resource, Conservation and Recycling	Waste Electrical Electronic Equipment (WEEE Directive)	from and (WEEE	<ul style="list-style-type: none"> <li>• Product level assessment</li> <li>• Material level assessment</li> </ul>	Economic and environmental	•		



40.	[75]	Asia	Non-OECD	2017	Resource, Conservation and Recycling	Specific appliances (e.g., Lithium electric car)	electrical (e.g., form	• Product level assessment	Economic and environmental	•	•
41.	[76]	Asia	Non-OECD	2017	Journal of Industrial Ecology	Specific appliances (Batteries)	electrical (e.g.,	• Product level assessment • Material level assessment • Circular economy	Economic, social and environmental	•	•
42.	[77]	Asia	Non-OECD	2017	Resource, Conservation and Recycling	Waste Electrical Electronic Equipment (WEEE Directive)	from and (WEEE	• Consumer behaviour • Geographical level assessment	Social and environmental		•
43.	[78]	Asia	Non-OECD	2018	Journal of Cleaner Production	Various appliances	electrical	• Product level assessment • Material level assessment • Uncertainty analysis	Economic, social and environmental	•	•
44.	[14]	Asia	Non-OECD	2018	Resource, Conservation and Recycling	Specific appliances (Television)	electrical (e.g.,	• Product level assessment • E-waste management <sup>c</sup> • Uncertainty analysis	Economic, social and environmental	•	•
45.	[79]	Asia	Non-OECD	2018	Proceedings of the Eleventh International Conference on Management Science and	Waste Electrical Electronic Equipment (WEEE Directive)	from and (WEEE	• Product level assessment	Economic and environmental	•	•

					Engineering Management							
46.	[36]	Oceania	OECD	2018	Resource, Conservation and Recycling	Waste Electrical Electronic Equipment (WEEE Directive)	from and	<ul style="list-style-type: none"><li>• Geographical level assessment</li><li>• Circular economy</li><li>• Product level assessment</li><li>• Uncertainty analysis</li></ul>	Economic, social and environmental		•	•
47.	[81]	Asia	Non-OECD	2018	Journal of Cleaner Production	Specific appliances (e.g., Mobile phone)	electrical (e.g.,	<ul style="list-style-type: none"><li>• Geographical level assessment</li><li>• Consume behaviour</li><li>• Uncertainty analysis</li></ul>	Economic, social and environmental	•		•
48.	[82]	Europe	OECD	2018	Resource, Conservation and Recycling	Waste Electrical Electronic Equipment (WEEE Directive)	from and	<ul style="list-style-type: none"><li>• Product level assessment</li><li>• Consumer behaviour</li><li>• E-waste management <sup>a</sup></li></ul>	Economic, social and environmental		•	•
49.	[83]	Oceania	OECD	2018	Journal of Cleaner Production	Waste Electrical Electronic Equipment (WEEE Directive)	from and	<ul style="list-style-type: none"><li>• E-waste management <sup>c</sup></li><li>• Consumer behaviour</li></ul>	Economic, social and environmental		•	•
50.	[31]	Asia	OECD	2018	Frontiers of Environmental Science and Engineering	Specific appliances (Batteries)	electrical (e.g.,	<ul style="list-style-type: none"><li>• Consumer behaviour</li><li>• Product level assessment</li><li>• Geographical level assessment</li></ul>	Economic, social and environmental		•	•

51.	[2]	America	Non-OECD	2018	Resource, Conservation and Recycling	Specific appliances (e.g., Television)	electrical (e.g.,)	<ul style="list-style-type: none"> <li>• Product level assessment</li> <li>• Uncertainty analysis</li> </ul>	Economic and environmental	•		
52.	[84]	Asia	Non-OECD	2018	Sustainability	Various appliances	electrical	<ul style="list-style-type: none"> <li>• Consumer behaviour</li> <li>• Product level assessment</li> </ul>	Social and environmental	•		•
53.	[85]	Asia	Non-OECD	2018	Journal of Material Cycles and Waste Management	Various appliances	electrical	<ul style="list-style-type: none"> <li>• Consumer behaviour</li> <li>• Product level assessment</li> </ul>	Social and environmental	•		•
54.	[86]	Asia	OECD	2018	Journal of Cleaner Production	Various appliances	electrical	<ul style="list-style-type: none"> <li>• Consumer behaviour</li> <li>• Life cycle analysis</li> <li>• E-waste management<sup>a</sup></li> </ul>	Economic, social and environmental			•
55.	[22]	Europe	OECD	2019	Resource, Conservation and Recycling	Waste Electrical Electronic Equipment (WEEE Directive)	from and (WEEE)	<ul style="list-style-type: none"> <li>• Product level assessment</li> <li>• E-waste management</li> <li>• Material level assessment</li> <li>• Life cycle analysis</li> </ul>	Economic, social and environmental	•		•
56.	[87]	Asia	Non-OECD	2019	Journal of Cleaner Production	Waste Electrical Electronic Equipment (WEEE Directive)	from and (WEEE)	<ul style="list-style-type: none"> <li>• Product level assessment</li> <li>• Consumer behaviour</li> <li>• Geographical level assessment</li> </ul>	Economic, social and environmental	•	•	•

57.	[88]	Oceania	OECD	2019	Minerals Engineering	Specific appliances (Computer)	electrical (e.g.,	<ul style="list-style-type: none"><li>• E-waste management</li><li>• Product level assessment</li><li>• Uncertainty analysis</li></ul>	Economic, social and environmental		•	•
58.	[89]	America	OECD	2019	Resource, Conservation and Recycling	Waste Electrical Electronic Equipment (WEEE Directive)	from and (WEEE	<ul style="list-style-type: none"><li>• Circular economy</li><li>• Product level assessment</li></ul>	Economic and environmental	•	•	
59.	[12]	Oceania	OECD	2019	Journal of Environmental Management	Waste Electrical Electronic Equipment (WEEE Directive)	from and (WEEE	<ul style="list-style-type: none"><li>• Geographical level assessment</li><li>• Product level assessment</li><li>• Material level assessment</li></ul>	Economic, social and environmental	•	•	•
60.	[90]	Asia	Non-OECD	2019	Journal of Cleaner production	Specific appliances (Batteries)	electrical (e.g.,	<ul style="list-style-type: none"><li>• Material level assessment</li></ul>	Economic and environmental		•	
61.	[91]	Asia	Non-OECD	2019	Waste Management	Waste Electrical Electronic Equipment (WEEE Directive)	from and (WEEE	<ul style="list-style-type: none"><li>• Consumer behaviour</li></ul>	Social and environmental		•	•
62.	[92]	Asia	Non-OECD	2019	Waste Management and Research	Technology appliances (CRT LCD)	based (e.g.,	<ul style="list-style-type: none"><li>• Product level assessment</li></ul>	Economic and environmental	•		•
63.	[93]	Asia	Non-OECD	2019	Journal of Cleaner Production	Waste Electrical Electronic Equipment (WEEE Directive)	from and (WEEE	<ul style="list-style-type: none"><li>• Geographical level assessment</li><li>• Product level assessment</li></ul>	Economic, social and environmental			•

								<ul style="list-style-type: none"> <li>Life cycle analysis</li> </ul>				
64.	[94]	Asia	Non-OECD	2019	Resource, Conservation and Recycling	Specific appliances (Batteries)	electrical (e.g.,	<ul style="list-style-type: none"> <li>Geographical level assessment</li> <li>Product level assessment</li> <li>Material level assessment</li> <li>Uncertainty analysis</li> </ul>	Economic, social and environmental	•	•	
65.	[95]	Asia	Non-OECD	2019	Environmental Science and Technology	Various appliances	electrical	<ul style="list-style-type: none"> <li>Product level assessment</li> <li>Material level assessment</li> <li>Circular economy</li> </ul>	Economic, social and environmental	•	•	
66.	[25]	America	OECD	2019	Sustainability	Specific appliances (Mobile phone)	electrical (e.g.,	<ul style="list-style-type: none"> <li>Consumer behaviour</li> <li>Circular economy</li> <li>Product level assessment</li> </ul>	Economic, social and environmental		•	
67.	[96]	Asia	OECD	2019	Environmental Engineering Research	Various appliances	electrical	<ul style="list-style-type: none"> <li>Consumer behaviour</li> <li>E-waste management <sup>b</sup></li> <li>Product level assessment</li> </ul>	Economic, social and environmental		•	•
68.	[40]	Europe	OECD	2019	Science of the Total Environment	Waste Electrical Electronic Equipment (WEEE Directive)	from and (WEEE	<ul style="list-style-type: none"> <li>Material level assessment</li> <li>E-waste management <sup>c</sup></li> </ul>	Economic, social and environmental			•

								<ul style="list-style-type: none"><li>• Geographical level assessment</li><li>• Life cycle analysis</li></ul>			
69.	[20]	Asia	Non-OECD	2020	Journal of Environmental Management	Waste Electrical Electronic Equipment (WEEE Directive)	from and (WEEE)	<ul style="list-style-type: none"><li>• E-waste management <sup>c</sup></li><li>• Geographical level assessment</li><li>• Uncertainty analysis</li></ul>	Economic, social and environmental	<ul style="list-style-type: none"><li>•</li></ul>	<ul style="list-style-type: none"><li>•</li></ul>
70.	[97]	Oceania	OECD	2020	Journal of Cleaner Production	Waste Electrical Electronic Equipment (WEEE Directive)	from and (WEEE)	<ul style="list-style-type: none"><li>• Product level assessment</li><li>• E-waste management <sup>c</sup></li><li>• Geographical level assessment</li><li>• Uncertainty analysis</li></ul>	Economic, social and environmental	<ul style="list-style-type: none"><li>•</li></ul>	<ul style="list-style-type: none"><li>•</li></ul>
71.	[98]	Oceania	OECD	2020	Resource, Conservation and Recycling	Waste Electrical Electronic Equipment (WEEE Directive)	from and (WEEE)	<ul style="list-style-type: none"><li>• Product level assessment</li><li>• Material level assessment</li><li>• Uncertainty analysis</li></ul>	Economic, social and environmental	<ul style="list-style-type: none"><li>•</li></ul>	
72.	[26]	Oceania	OECD	2020	Journal of Environmental Management	Specific appliances (e.g., Mobile phone)	electrical (e.g.,)	<ul style="list-style-type: none"><li>• Consumer behaviour</li><li>• Geographical level assessment</li><li>• Life cycle analysis</li><li>• Circular economy</li></ul>	Economic, social and environmental	<ul style="list-style-type: none"><li>•</li></ul>	<ul style="list-style-type: none"><li>•</li></ul>

73.	[29]	America	Non-OECD	2020	Journal of Environmental Management	Specific appliances (e.g., Metal Electrical equipment)	electrical (e.g., form	<ul style="list-style-type: none"> <li>• Material level assessment</li> <li>• Life cycle analysis</li> <li>• Waste management</li> </ul>	Economic, social and environmental	•		•
74.	[99]	Europe	OECD and Non-OECD	2020	Resources, Conservation and Recycling: X	Waste Electrical Electronic Equipment (WEEE Directive)	from and (WEEE	<ul style="list-style-type: none"> <li>• Consumer behaviour</li> <li>• Product level assessment</li> <li>• Circular economy</li> <li>• E-waste management <sup>c</sup></li> </ul>	Economic, social and environmental	•	•	•
75.	[100]	America	Non-OECD	2020	Waste Management	Various appliances	electrical	<ul style="list-style-type: none"> <li>• Product level assessment</li> <li>• Consumer behaviour</li> </ul>	Economic, social and environmental	•	•	•
76.	[28]	Europe	OECD	2021	Environmental Technology and Innovation	Waste Electrical Electronic Equipment (WEEE Directive)	from and (WEEE	<ul style="list-style-type: none"> <li>• E-waste management <sup>c</sup></li> <li>• Consumer behaviour</li> <li>• Risk assessment</li> </ul>	Economic, social and environmental			•
77.	[101]	America	Non-OECD	2021	Technological Forecasting and Social Change	Waste Electrical Electronic Equipment (WEEE Directive)	from and (WEEE	<ul style="list-style-type: none"> <li>• E-waste management <sup>c</sup></li> <li>• Circular economy</li> </ul>	Economic, social and environmental			•
78.	[15]	Asia	Non-OECD	2021	Journal of Cleaner Production	Waste Electrical Electronic Equipment (WEEE Directive)	from and (WEEE	<ul style="list-style-type: none"> <li>• Consumer behaviour</li> <li>• Life cycle analysis</li> </ul>	Economic, social and environmental	•		•

79.	[1]	America	OECD	2021	Resource, Conservation and Recycling	Waste Electrical Electronic Equipment (WEEE Directive)	from and (WEEE)	<ul style="list-style-type: none"> <li>• Geographical level assessment</li> <li>• Consumer behaviour</li> <li>• Uncertainty analysis</li> </ul>	Economic, social and environmental	•	•
80.	[102]	America	OECD	2021	Journal of Industrial Ecology	Various appliances	electrical	<ul style="list-style-type: none"> <li>• Consumer behaviour</li> <li>• Uncertainty analysis</li> </ul>	Economic, social and environmental	•	•
81.	[135]	America	OECD	2021	Journal of Cleaner Production	Waste Electrical Electronic Equipment (WEEE Directive)	from and (WEEE)	<ul style="list-style-type: none"> <li>• Geographical level assessment</li> <li>• E-waste management <sup>c</sup></li> <li>• Circular economy</li> </ul>	Economic, social and environmental	•	
82.	[103]	America	Non-OECD	2021	Resource, Conservation and Recycling	Various appliances	electrical	<ul style="list-style-type: none"> <li>• Product level assessment</li> <li>• Geographical level assessment</li> <li>• Circular economy</li> </ul>	Economic, social and environmental	•	
83.	[3]	America Europe Asia	OECD and Non-OECD	2021	Journal of Hazardous material	Waste Electrical Electronic Equipment (WEEE Directive)	from and (WEEE)	<ul style="list-style-type: none"> <li>• Geographical level assessment</li> <li>• Consumer behaviour</li> <li>• E-waste management <sup>a</sup></li> </ul>	Economic, social and environmental		•
84.	[104]	Asia	Non-OECD	2021	Waste Management	Specific appliances (e.g., Mobile phone)	electrical (e.g.,)	<ul style="list-style-type: none"> <li>• Material level assessment</li> <li>• Uncertainty analysis</li> </ul>	Economic and environmental	•	•



85.	[8]	Europe	OECD	2021	Resource, Conservation and Recycling	Various appliances	electrical	<ul style="list-style-type: none"> <li>• Product level assessment</li> <li>• Geographical level assessment</li> <li>• Consumer behaviour</li> </ul>	Economic, social and environmental	•	•
86.	[23]	Europe	OECD	2021	Sustainability	Waste Electrical and Electronic Equipment (WEEE Directive)	from and (WEEE Directive)	<ul style="list-style-type: none"> <li>• Product level assessment</li> <li>• Material level assessment</li> </ul>	Economic and environmental	•	•
87.	[105]	Europe	Non-OECD	2021	Journal of Ecological Engineering	Waste Electrical and Electronic Equipment (WEEE Directive)	from and (WEEE Directive)	<ul style="list-style-type: none"> <li>• Product level assessment</li> <li>• Material level assessment</li> </ul>	Economic and environmental	•	•
88.	[106]	Asia	Non-OECD	2021	Journal of Cleaner Production	Specific appliances (e.g., Mobile phone)	electrical (e.g.,)	<ul style="list-style-type: none"> <li>• Product level assessment</li> <li>• Consumer behaviour</li> <li>• Micro level estimation</li> </ul>	Economic, social and environmental	•	•
89.	[107]	America	OECD	2021	Journal of Cleaner production	Specific appliances (e.g., Refrigerator)	electrical (e.g.,)	<ul style="list-style-type: none"> <li>• Environmental impact assessment</li> <li>• Product level assessment</li> <li>• End-Of-Life</li> </ul>	Economic, social and environmental	•	•
90.	[108]	Africa	Non-OECD	2021	International Journal of Engineering Applied	Various appliances	electrical	<ul style="list-style-type: none"> <li>• E-waste management <sup>a</sup></li> <li>• Product level assessment</li> </ul>	Economic, social and environmental	•	•

					Sciences and Technology			<ul style="list-style-type: none"> <li>• Consumer behaviour</li> </ul>				
91.	[109]	Europe America China	OECD and Non- OECD	2021	Waste Management	Various appliances	electrical	<ul style="list-style-type: none"> <li>• Material level assessment</li> <li>• Cost benefit analysis</li> <li>• Life cycle analysis</li> </ul>	Economic, social and environmental	•		•
92.	[7]	Asia	Non- OECD	2021	Toxic	Specific appliances (e.g., Mobile Phone)	electrical (e.g., Mobile Phone)	<ul style="list-style-type: none"> <li>• Consumer behaviour</li> <li>• Material level assessment</li> <li>• E-waste management <sup>a</sup></li> </ul>	Economic, social and environmental	•		•
93.	[110]	Asia	Non- OECD	2021	Resources policy	Various appliances	electrical	<ul style="list-style-type: none"> <li>• Material level assessment</li> <li>• Circular economy</li> <li>• E-waste management <sup>a</sup></li> </ul>	Economic, social and environmental	•		•
94.	[111]	Asia	Non- OECD	2021	Journal of Cleaner Production	Waste Electrical Electronic Equipment (WEEE Directive)	from and (WEEE Directive)	<ul style="list-style-type: none"> <li>• Geographical level assessment</li> <li>• E-waste management <sup>c</sup></li> <li>• Input and output analysis</li> </ul>	Economic, social and environmental	•	•	•
95.	[112]	Europe	OECD and Non- OECD	2021	Waste Management and Research	Waste Electrical Electronic Equipment (WEEE Directive)	from and (WEEE Directive)	<ul style="list-style-type: none"> <li>• Product level assessment</li> <li>• E-waste management <sup>b</sup></li> <li>• Geographical level assessment</li> </ul>	Economic, social and environmental	•	•	•

								<ul style="list-style-type: none"> <li>• Circular economy</li> </ul>					
96.	[5]	Oceania	OECD	2021	Metals	Specific appliances (e.g., Printed board)	electrical (e.g., circuit board)	<ul style="list-style-type: none"> <li>• Material level assessment</li> <li>• Geographical level assessment</li> <li>• E-waste management <sup>a</sup></li> </ul>	Economic, social and environmental	•	•	•	
97.	[113]	Asia Europe America Oceania	OECD and Non-OECD	2022	Sustainability	Waste Electrical Electronic Equipment Directive)	from and (WEEE)	<ul style="list-style-type: none"> <li>• Product level assessment</li> <li>• E-waste management <sup>b</sup></li> <li>• Circular economy</li> </ul>	Economic, social and environmental	•		•	
98.	[27]	Europe	Non-OECD	2022	Energies	Waste Electrical Electronic Equipment Directive)	from and (WEEE)	<ul style="list-style-type: none"> <li>• Product level assessment</li> <li>• Circular economy</li> <li>• E-waste management <sup>c</sup></li> </ul>	Economic, social and environmental				•
99.	[114]	Asia	Non-OECD	2022	Heliyon	Various appliances	electrical	<ul style="list-style-type: none"> <li>• Environmental impact assessment</li> <li>• E-waste management <sup>c</sup></li> <li>• Circular economy</li> <li>• Product level assessment</li> </ul>	Economic, social and environmental		•	•	
100.	[115]	Europe	OECD	2022	The Journal of Research on Brussels	Waste Electrical Electronic	from and	<ul style="list-style-type: none"> <li>• E-waste management <sup>c</sup></li> </ul>	Economic, social and environmental	•		•	

						Equipment (WEEE Directive)						
101.	[116]		OECD and Non-OECD	2022	Journal of Engineering	Various appliances	electrical	<ul style="list-style-type: none"> <li>• Material level assessment</li> <li>• Life cycle analysis</li> <li>• E-waste management <sup>c</sup></li> </ul>	Economic, social and environmental	•		•
102.	[117]	Asia	Non-OECD	2022	Business Strategy and The Environment	Various appliances	electrical	<ul style="list-style-type: none"> <li>• E-waste management <sup>c</sup></li> <li>• Consumer behaviour</li> <li>• Product level assessment</li> </ul>	Economic, social and environmental	•		•
103.	[118]	America	OECD	2022	Resources, Conservation and Recycling Advances	Various appliances	electrical	<ul style="list-style-type: none"> <li>• E-waste management <sup>a</sup></li> <li>• Product level assessment</li> </ul>	Economic, social and environmental	•		•
104.	[13]	Asia	Non-OECD	2022	Resource, Conservation and Recycling	Various appliances	electrical	<ul style="list-style-type: none"> <li>• Product level assessment</li> <li>• Geographical level assessment</li> <li>• Life cycle analysis</li> <li>• Environmental impact assessment</li> </ul>	Economic, social and environmental	•	•	•
105.	[119]		OECD	2022	Resource, Conservation and Recycling	Various appliances	electrical	<ul style="list-style-type: none"> <li>• Geographical level assessment</li> <li>• E-waste management <sup>b</sup></li> <li>• Life cycle analysis</li> </ul>	Economic, social and environmental	•		•

								<ul style="list-style-type: none"> <li>• Product level assessment</li> </ul>				
106.	[120]	America	OECD	2022	Resource, Environment and Sustainability	Technology appliances (e.g., CRT LCD)	based (e.g.,	<ul style="list-style-type: none"> <li>• Product level assessment</li> <li>• Material level assessment</li> <li>• Circular economy</li> <li>• Life cycle analysis</li> </ul>	Economic, social and environmental	•	•	•
107.	[21]	America	Non-OECD	2022	Environmental Technology and Innovation	Various appliances	electrical	<ul style="list-style-type: none"> <li>• Product level assessment</li> <li>• Geographical level assessment</li> <li>• Consumer behaviour</li> <li>• E-waste management <sup>c</sup></li> </ul>	Economic, social and environmental	•	•	•
108.	[122]	Asia	Non-OECD	2022	Environmental Science and Pollution Research	Specific appliances (e.g., Mobile Phone)	electrical (e.g.,	<ul style="list-style-type: none"> <li>• Product level assessment</li> <li>• Material level assessment</li> <li>• E-waste policy</li> </ul>	Economic, social and environmental	•	•	•
109.	[123]	Asia	Non-OECD	2022	Total Environment Research Themes	Various appliances	electrical	<ul style="list-style-type: none"> <li>• Circular economy</li> <li>• Product level assessment</li> <li>• Environmental impact assessment</li> </ul>	Economic, social and environmental	•		•
110.	[124]	America	Non-OECD	2022	Environmental Technology and Innovation	Various appliances	electrical	<ul style="list-style-type: none"> <li>• Circular economy</li> </ul>	Economic, social and environmental	•		•

								<ul style="list-style-type: none"> <li>• Reverse logistics model</li> <li>• E-waste management <sup>c</sup></li> </ul>				
111.	[125]	Europe	OECD	2022	Resource, Conservation and Recycling	Specific electrical appliances (e.g., EV battery)		<ul style="list-style-type: none"> <li>• Circular economy</li> <li>• End-of-life</li> <li>• Product level assessment</li> </ul>	Economic, social and environmental	•		•
112.	[126]	Africa	Non-OECD	2022	Sustainable Environment	Waste Electrical and Electronic Equipment (WEEE Directive)	from and	<ul style="list-style-type: none"> <li>• Consumer behaviour</li> <li>• E-waste management <sup>c</sup></li> <li>• Product level assessment</li> </ul>	Economic, social and environmental	•		•
113.	[127]	Europe	Non-OECD	2022	Journal of Environmental Management	Specific electrical appliances (e.g., Mobile Phone)		<ul style="list-style-type: none"> <li>• Material level assessment</li> <li>• Circular economy</li> </ul>	Economic, social and environmental	•	•	•
114.	[6]	Europe	OECD	2022	Applied Sciences	Specific electrical appliances (e.g., EV Battery)		<ul style="list-style-type: none"> <li>• Material level assessment</li> <li>• Circular economy</li> </ul>	Economic, social and environmental	•		•
115.	[128]	America	Non-OECD	2022	Cleaner Waste System	Various electrical appliances		<ul style="list-style-type: none"> <li>• Geographical level assessment</li> <li>• Product level assessment</li> <li>• E-waste management</li> </ul>	Economic, social and environmental	•		•

Note ;

- E-waste management <sup>a</sup> (Disposal) , E-waste management <sup>b</sup> (Treatment) , E-waste management <sup>c</sup> (All aspects)

- MFA application in e-waste management: M1 (E-waste generation), M2 (E-waste stocks), M3 (E-waste flow)

**Table S2.**

Waste from Electrical and Electronic Equipment (WEEE directive)

No	Categories	Example
1.	Large Household Appliances	Washing Machines, Dishwashing Machines, Refrigerators
2.	Small Household Appliances	Radio, Toaster, Vacuum Equipment
3.	IT and Telecommunication Equipment	Telephones, Printers, Personal Computers
4.	Consumer Equipment and Photovoltaic Panels	Water Pumps, Solar Panels
5.	Light Equipment	LED Lamps, Fluorescent Lamps, High Discharge Lamps
6.	Electrical and Electronic Tools	Industrial Large Scale Electronic Equipment; Large Printers
7.	Toys, Leisure, and Sport Equipment	Coin Slot Machines, Video-Games Consoles,
8.	Medical Devices	Cardiac Defibrillators, High-Frequency Surgical Equipment.
9.	Monitoring and Control Instruments	Smoke Detectors, Thermostats,
10.	Automatic Dispensers	Hand Soap Dispenser, Sanitizer Dispenser