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An overview of the substance of *Resource, Conservation and Recycling*

Ming Lang Tseng[a,*], Wai Peng Wong[b], Keng Lin Soh[c]

[a] Institute of Innovation and Circular Economy, Asia University, Taiwan
[b] School of Management, Universiti Sains Malaysia, 11800 USM, Penang, Malaysia
[c] Veritas University College, Aras 6, Menara NB1, No. 5050, Jalan Bagan Luar, 12000, Butterworth, Penang, Malaysia

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ABSTRACT

The objective of this review is to provide an overview of the substance of the *Resource, Conservation and Recycling* journal. The four domains of Hierarchy of Waste, Recycling, Human Behaviour and Legal Influence populate the journal. The journal articles predominantly dwell on mid-level of the hierarchy reflecting *Recycling*. The recycling articles are varied and are associated with biotechnology, industrial technology, and human attitudes and behaviour. The European Union's (EU) Waste and Landfill Directives cast a considerable influence on national and municipal recycling policies and laws. This legal-geostrategic impactful research focus should be sustained because they have a deep and wide bearing at regional, national, municipal and community levels. This overview also reveals human behaviour is a strategic domain because of the enduring effects of both poor and good recycling habits. However, the success of moving waste management strategies up the hierarchy seems elusive. This journal exhibits strategic research attributes in addition to the journal's objectives of operational recycling transformation processes. This overview suggests developing waste management habits and the DFX research mindset. It concludes with recycling dilemma.

1. Introduction

Building the theory of waste management is an effort towards scientification of waste management (Pongrácz and Pohjola, 2004). A theory is used to explain phenomena, or give a concise view of a subject, and the system of these theories proposes a scheme of relations between the parts (Pongrácz and Pohjola, 2004). On this basis, the Hierarchy of Waste with different waste management levels or parts of the strategies are arranged in an ascending order with reducing wastes. This suggests a theory of waste minimisation (Gregson et al., 2013) when moving up the hierarchy.

The synchronization of the theoretical construct of waste management and the Hierarchy of Waste aptly matches the objectives of this journal which "emphasizes the transformation processes involved in a transition toward more sustainable production and consumption systems". Sustainable production and consumption would imply the continual supply and demand for both non-renewable and renewable resources. Moving up the Hierarchy of Waste should minimise waste because of more efficient resource use to mitigate resource depletion. An initial preview of the journal shows it is replete with articles containing technology processes (biotechnologies, industrial transformation processes), management processes (material flow analysis, life cycle inventory, behaviours), legal enactments (1997 Kyoto Protocol, European Union Waste and Landfill Directives, UK legislations) and economic incentives or disincentives (pay-as-you-throw, direct charging) among others. The journal is stocked with topics of recycling (phosphorus, copper, water, electronic and electrical parts), treatment (thermal and biological, land and wastewater), and disposal (collections and landfills) of the lower Hierarchy of Waste. These are attempts to salvage recyclables before final disposal in landfills and are not necessarily the best destination for untreated wastes.

Noting the above, the objective of this review is to identify the substance of the journal based on its articles. The journal's title, objectives and the publications (article titles, abstracts and keywords) form the basis of this review. The journal's objectives on its website are clearly associated with its title which is *Resources, Conservation and Recycling*. For *Resources*, the resource use efficiency in materials and energy are associated with *Conservation* to minimise waste. This minimisation is aimed at the processes of industrial metabolism which includes extraction, production and consumption of virgin materials with recycling at the heels of conservation. Recycling is a very broad term referring to "the conversion of waste (as discarded material with no worth) into a useful material (resource with an economic value)" (Waite et al., 1995). Therefore, recycling is the treatment to recover recyclables for reuse. With this as the guide, two databases consisting of the titles, abstracts and keywords of the journal's articles were compiled

* Corresponding author.
E-mail addresses: tsengminglang@gmail.com, tsengminglang@asia.edu.tw (M.L. Tseng), wongwp@usm.my (W.P. Wong), klsohklsohklsoh@gmail.com (K.L. Soh).

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and categorised.

This overview contributes to uncovering articles and issues which have geo and human strategic impacts. The geostrategic impact cascades from regional legal formulation to influence national, municipal and community laws and household enforcements. The journal articles also reveal the enduring attribute of people behaviour – both poor and good behaviour. This important revelation suggests a successful behavioural change could be beneficial to waste and environmental management. Therefore, this overview suggests the strengthening and continuation of strategic research focus on legal and people behaviour.

The remaining parts of this paper are organized as follows. The next section contains methodology followed by four domains of waste management. They are Hierarchy of Waste, Recycling, Human Behaviour and Legal Influence. Conclusion is the last section of this review.

2. Methodology

To identify the substance of the journal, we created two databases – using Word and Excel. The Word document contains Title, Abstract, Keywords and notes made from the text and internet explanations of technologies deployed in the articles. The latter helped our understanding especially with technology. Parallel to this is the Excel database wherein each article is categorised into 16 fields consisting of (1) Titles, (2) Hierarchy of Wastes of 6 levels, (3) Notes made from the abstracts, (4) Keywords, (5) Industrial, consumer or post-consumer wastes, (6) Conservation and recycling, (7) Types of papers - Original research articles, reviews or perspectives, (8) Primary objectives of the article - efficiency, environmental impact, resource recovery, technologies, policies, behaviour, mathematical modelling, (9) Project-type, company, national or international scale, (10) Methodology - literature-based, open literature, new process, field trials, pilot-scale, laboratory pilot scale, bench scale, farm scale or site monitoring, (11) Theme, (12) Operational, Tactical or Strategic, (13) Industry, (14) Sector, (15) Air, land mass, water, solids, liquid, gas, and (16) Discipline - technological, economic, institutional, mathematical or policy. However, not all fields yield discriminatingly useful information.

Hierarchy of Waste was used to classify the theme of each article based on its title, abstract and keywords. While there are other versions of hierarchy of waste, Petek and Glavic (1996) was adopted because it offers detailed definitions for each level of the hierarchy (see Table 1). In addition, the substance of the journal was also identified from the topics or words associated with resource use efficiency, conservation and recycling for processes and materials. To that end, five experts in the study of conservation, recycling and the environment were approached separately to brainstorm for the relevant topics or words. Five lists were obtained and collated and was given to a municipal solid waste collection and recycling entrepreneur to ensure words related to his enterprise were not left out.

A frequency word count for each topic or words was obtained separately within titles, abstracts and keywords and tabulated in Table 2. These results are incorporated in the review. While there were numerous relevant topics or words, the numbers were whittled down and merged into four main domains. They are the Hierarchy of Waste, Recycling, Human Behaviour and Legal Influence. The Hierarchy of Waste and Recycling were chosen as domains for their default relevance in waste management. For this overview, the Hierarchy of Waste presents the discussion of each level of the hierarchy. Recycling delivers a broad range of recycling methods and issues including treatment and disposal.

Human Behaviour and Legal Influence were also chosen as domains because of their strategic impact on waste and environment

Table 2
Word Search.

Nos.	Topics	Word search	Title	Abstract	Keywords
1	Waste	waste	754	1304	723
2	Recycling, recyclates	Recycl	486	950	527
3	Environment	environment	362	1013	204
4	Life cycle assessment	Life cycle Assessment and LCA	73	375	168
5	Material flow and substance flow	Material flow/ substance flow/ MFA/SFA	79	233	144
6	Municipal	Municipal	103	282	114
7	Construction	Construction	80	186	81
8	Green	Green	45	158	79
9	Efficiency and Efficient	efficien	202	558	72
10	Plastics	Plastic	63	158	65
11	Composting, Compost	Compost	59	117	61
12	Paper	Paper	67	73	60
13	Landfills	Landfill	39	270	59
14	Algae	Alga	13	270	59
15	Behaviour	Behaviour	32	76	44
16	Incineration, incinerator	Incinerat	30	142	42
17	Demolition	Demolition	19	51	36
18	Anaerobic	Anaerobic	36	76	33
19	Phosphorus	Phosphorus	15	39	24
20	Aluminium and Aluminum	Aluminium/ Aluminum	28	80	24
21	Climate	Climate	15	82	22
22	Rainwater harvest	Rainwater harvest	20	22	21
23	Life cycle Inventory and LCI	Life cycle Inventory/LCI	21	86	19
24	Circular	Circular	6	10	11
25	Carbon footprint	Carbon footprint	7	12	9
26	Scavenging	scaveng	10	14	7
27	Deconstruction	Deconstruction	5	7	5
28	Marine	marine	5	14	4
29	Hierarchy	hierarchy	2	35	3
30	Dematerialisation	Dematerial	1	4	2
31	Joint forest management	Joint forest management	3	3	2
32	EU Directive	EU Directive	1	3	1
33	Sustainable production and consumption	Sustainable production and consumption	1	2	1

Table 1
Hierarchy of Waste (Petek and Glavic, 1996).

Highest Priority	
1. Elimination	Complete elimination of waste
2. Prevention	Prevention of waste production shall be considered as the initial feasibility at design stage and may determine if the project proceeds
3. Waste minimization by source reduction	Avoidance, reduction or elimination of waste generally within the confines of the production unit, through changes in industrial processes, procedures, products or input materials
4. Recycling	The use, re-use and recycling of waste in existing or another processes
5. Treatment	Destruction, detoxification, neutralization, etc. of waste to obtain less harmful substances
6. Disposal	Discharge of waste to air, water or land in properly controlled or safe ways such that compliance is achieved; secure land disposal may involve volume reduction, encapsulation, leaching of containment and monitoring techniques
Lowest priority	