A Review on E-waste Management For its Effective Implementation in India

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Abstract— **Studies on sustainable control of waste from electric and digital equipment (or e-waste) have received growing interest from researchers round the sector in latest years, with investigations into diverse factors of e-waste control had been investigated. Using content material evaluation, 3 primary factors of the present research had been evaluated: the distribution and traits of the publications, the scope and barriers of the research, and the modern studies practices and studies application. Another obstacle became observed associated with the variations withinside the choice of studies topics and the extent of evaluation led to versions withinside the scopes and barriers of the present research. Various different studies regions had been investigated in addition primarily based totally on their studies findings; however, the evaluation of diverse methodological factors became complex because of the growing variety of newly advanced methodologies and the dearth of complete and updated evaluations in this studies area. We observed that complete and updated evaluations of the methodological factors of e-waste era are nevertheless lacking. Based at the studies gaps and boundaries discussed, hints for destiny studies had been made.**

Keywords - waste; co-operation and development (OECD)

I. INTRODUCTION

A. Sustainable e-waste management

Research on sustainable e-waste control has end up crucial in current years, as diverse research were carried out to analyze diverse components of e-waste control at some stage in the sector. One of the principle studies subjects in e-waste control is associated with control structures and practices especially nations [1-5]. In general, the principle goal of those diverse courses from round the sector changed into to analyze modern-day control scenarios – both in country wide or global contexts – to pick out the control demanding situations and to study control practices from different nations and, consequently, to suggest development techniques for diverse components of e-waste control. The rules and guidelines on e-waste control are any other major studies subject matter in e-waste control [6]. Several extraordinary opinions were posted that cowl the e-waste control rules and guidelines from round the sector [7, 8]

B. Quantification of e-waste

One of the subtopics on this studies place is the characterization of e-waste to quantify the substances contained in e-waste as treasured (or recyclable) substances [9] or risky substances [10]. Generally, the principal intention of that research turned into to decide the monetary cost of the treasured substances contained in e-waste and/or compare the quantity of risky substances contained withinside the e-waste because of environmental issues that had been justified via toxicity assessments. The research of the composition of e-waste turned into every other subtopic on this studies place, in

which the researchers tried to quantify the composition of e-waste amongst different kinds of waste streams [11-13]. This form of take a look at is critical for decision-makers withinside the stable waste control sector.

II. RESEARCH MOTIVATION

Currently, a have a look at via way of means of the United Nations University (UNU) presents the biggest worldwide e-waste inventory, with a latest record posted in 2017 [14]. By rating the pinnacle thirty international locations round the sector via way of means of e-waste era, the information confirmed that China, the United States, and Japan had been the pinnacle international locations that generated huge portions of e-waste. While the UNU inventoried of waste era international via way of of means of using the technique advanced via way of means of Wang et al. (2013) [15] (i.e., income-stock-lifespan model), there are some of unique methodologies for the assessment of located e-waste era. This consists of numerous newly advanced methodologies (e.g., the income obsolescence model (SOM model) [16-19], and modeling primarily based totally on neural networks [20]. As it become located that the prevailing critiques in this studies vicinity had been restricted to unique methodologies, the existing have a look at become accomplished to shut the distance withinside the cutting-edge scenario via way of means of accumulating the prevailing research without proscribing the unique methodologies that had been utilized.
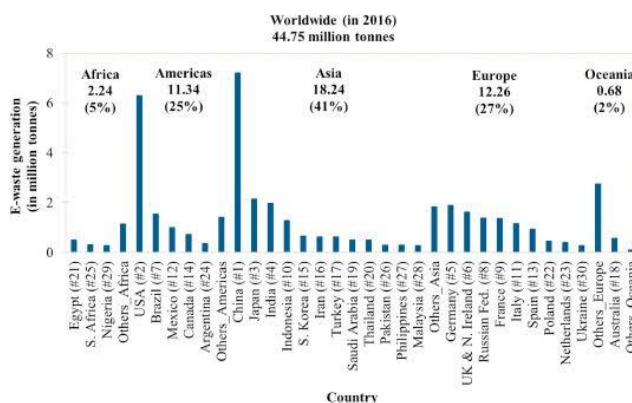

Figure 1. Worldwide distribution of e-waste generation (in millions of tons) in 2016. Source

III. MATERIALS AND METHOD

A. Collection of the existing studies

In the prevailing study, the choice of courses turned into restrained to magazine articles and convention complaints written in English. We are conscious that there were numerous researches at the assessment of e-waste era posted in non-English A general of 10 seek strings had been hooked up thru the aggregate of "e-waste" and "WEEE" key phrases with "era", "estimate", "quantification", "forecast", and "projection" key phrases to accumulate the present research at the assessment of e-waste era. In the prevailing study, however, numerous databases, along with Web of Science and Science Direct had been used to acquire the present research from numerous peer-reviewed journals. In the prevailing study, however, Google Scholar turned into used as a complementary seek engine to encompass the present gray literature, along with convention complaints [21] stays a arguable issue, it turned into observed that Google Scholar has come to be an effective scholarly database, as its insurance of scholarly literature has multiplied drastically in latest years [22].

B. Selection of the existing

Languages, along with in Chinese, Portuguese and Spanish, as referred to through numerous research [23]. Italy [24], the Netherlands [25], France [26], South Africa [27], Morocco [28], Tanzania [29], Malaysia [30], Thailand [31] and Vietnam [32]. This additionally blanketed numerous reviews on technique improvement for the observe of e-waste era, in conjunction with a case observe [1, 33]. The seek of current research beneath the scope of the prevailing observe ended on the cease of October 2019. As a result, a complete of one hundred thirty current research comparing e-waste era have been decided on for in addition evaluation withinside the gift observe.

C. *Analysis of the existing studies*

Content evaluation is a broadly used evaluation technique for categorizing and synthesizing data quantitatively or qualitatively for any kind of communication [2]. In the existing study, 3 fundamental elements of the prevailing studies at the assessment of e-waste technology had been analyzed the usage of content material evaluation (Fig. S1). The first thing became the evaluation of the distribution and traits of publications. Consequently, hints for destiny studies wishes had been made primarily based totally on diverse studies gaps and boundaries that had been recognized at some point of this work.

IV. ANALYSIS AND RESULTS

A. *Distributions and trend of publications*

1. Analysis of Publications based on types

An overall of a hundred thirty present research comparing e-waste era have been decided on for similarly evaluation withinside the gift study. As proven in Fig. 2, that research consisted of 118 magazine articles and 12 convention proceedings. More than 50% of the chosen present research have been posted through 5 journals, with the best variety of courses posted through Waste Management (21).

2. Analysis of the distribution and trends of the publications

The monetary popularity of a rustic refers to whether or not it's far a member of the Organization for Economic Co-operation and Development (OECD) (a advanced country) or non-member of the OECD (a growing country). Currently, there are 36 member nations of the OECD throughout 5 fundamental continents (OECD, 2019). The information discovered that about 70% of the courses had been posted via way of means of growing nations, and the relaxation had been posted via way of means of advanced nations.
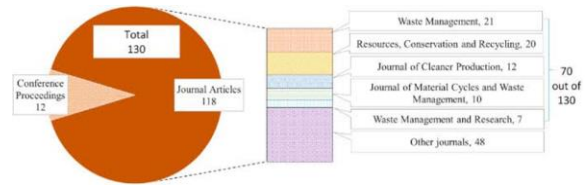

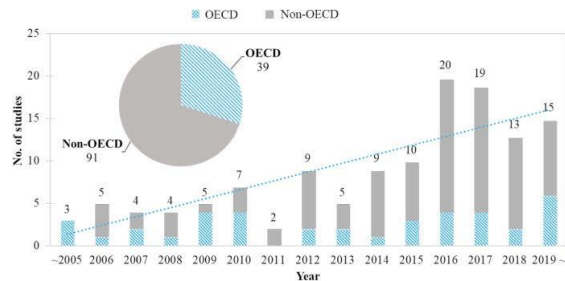Figure 2. Distribution of the publications based on types

Figure 3. Trend of publications based on the economic status of the country

V. LESSON LEARNED AND DISCUSSION

A. *Present research progress*

By reviewing over a hundred guides associated with the assessment of e-waste generation, it changed into found out that Waste Management; Resources, Conservation and Recycling; Journal of Cleaner Production; Journal of Material Cycles and Waste Management; and Waste Management and Research have been the pinnacle journals on this studies place amongst over forty different journals. In addition, the range of research posted through growing international locations changed into always extra than that posted through evolved international locations after 2011.

The differences withinside the definition of e-waste beneath Neath the country's regulations, the scope of the study, and different factors, inclusive of the provision of data, made the choice of studies topics withinside the current research both primarily based totally on e-waste categories, technology-primarily based totally electric appliances (inclusive of CRT and LCD appliances), or particular electric appliances. the improvement of e-waste inventories changed into the overall purpose of the prevailing research at the assessment of e-waste generation. These essential statistics changed into in addition hired as a primary argument to decorate the present-day nation of e-waste control through guidelines on diverse elements of e-waste control (inclusive of rules

and regulations) to diverse stakeholders (inclusive of policy-makers and government).
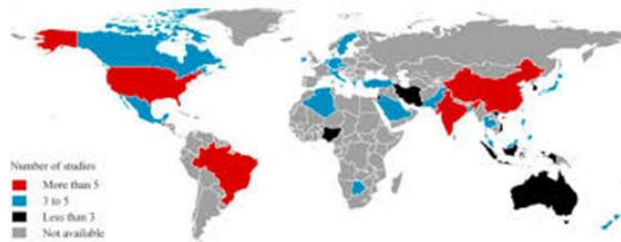

Figure 4. Overview of the current research progress worldwide

B. Future research needs

1. Small number of publications based on countries of origin

Although over a hundred courses had been reviewed, the variety of courses primarily based totally on international locations of foundation may be taken into consideration small the map evaluation of the present research on studies at the assessment of e-waste technology become performed. This illustrated the assessment of courses primarily based totally on international locations of foundation (Fig. four in Section four.1.2) with the pinnacle 30 international locations in e-waste technology worldwide, as suggested through the UNU in 2016 (Fig. 1 in Section 2). the evaluation found out that handiest 4 international locations from the pinnacle 30 international locations that generated huge quantities of e-waste may be taken into consideration the maximum effective on this studies area, consisting of China and India. Out of the pinnacle 30 international locations, 9 international locations fairly produced courses withinside the assessment of e-waste technology, consisting of Australia and Nigeria. However, greater than 1/2 of the pinnacle 30 international locations that generated huge portions of e-waste may be taken into consideration much less effective on this studies area, with courses nevertheless absent from a few international locations, consisting of Egypt and South Africa at the African continent, Argentina withinside the Americas, and the UK and Russian Federation at the European continent. Note that the scope of the existing take a look at becomes centered on magazine articles and convention lawsuits written in English. However, its miles

encouraged that researcher from round the sector be actively involved, particularly international locations with a loss of courses and people that had been much less effective on this studies area. e, earlier than these records may be used similarly for growing sustainable e-waste control via right regulations, policies, infrastructure and diverse different technical system.

VI. Conclusion

Various different studies regions had been investigated in addition primarily based totally on their studies findings; however, the evaluation of diverse methodological factors became complex because of the growing variety of newly advanced methodologies and the dearth of complete and updated evaluations in this studies area. We observed that complete and updated evaluations of the methodological factors of e-waste era are nevertheless lacking. Based at the studies gaps and boundaries discussed, hints for destiny studies had been made.

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