



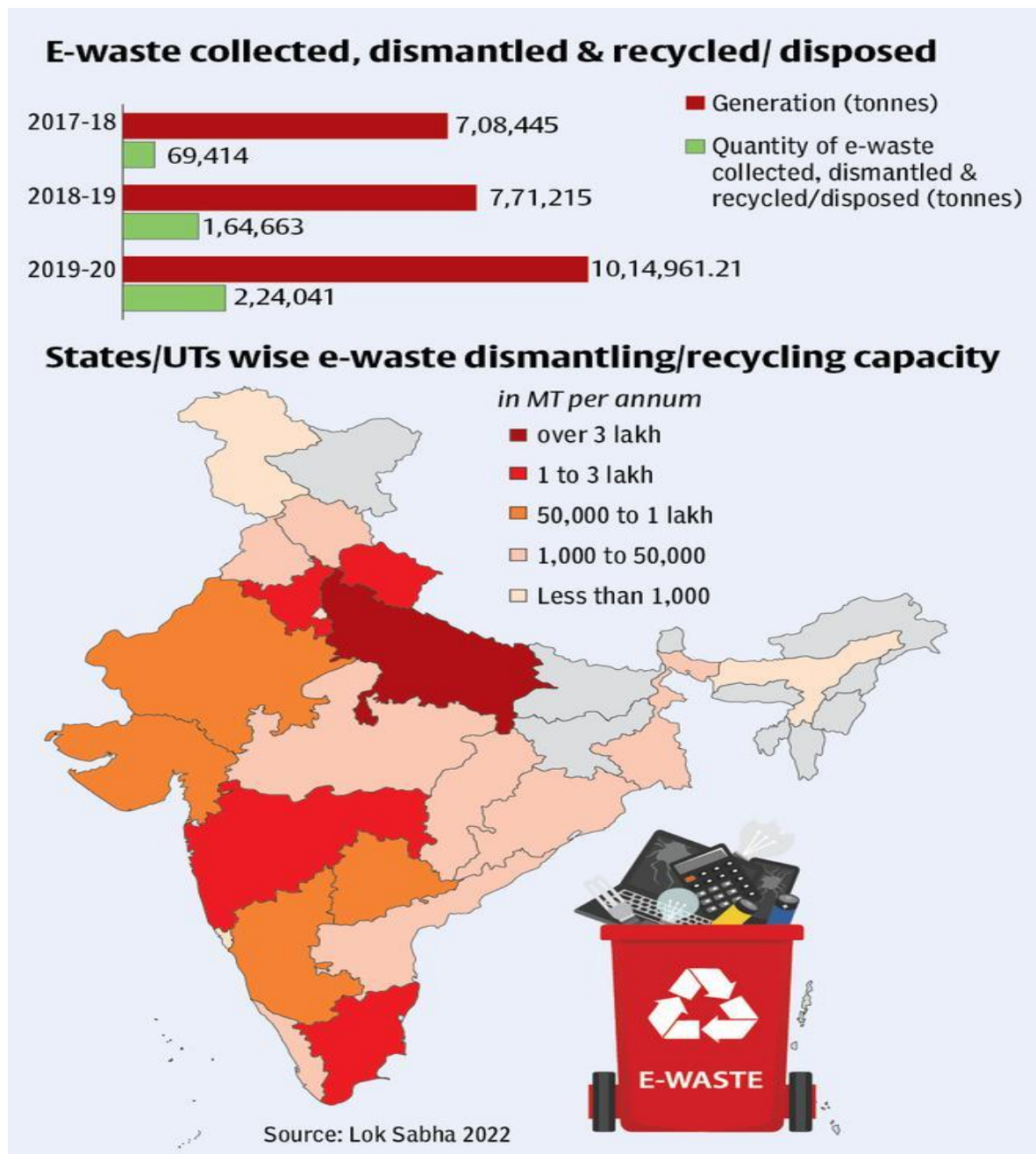
Study of E-Waste Management in Nagpur District

Submitted by
Swapnil S. Kumare

Introduction

'E-Waste' means electrical and electronic equipment, whole or in part discarded as waste by the consumer or bulk consumer as well as rejects from manufacturing, refurbishment and repair processes; Electronic waste (e-waste) is one of the fastest-growing pollution problems worldwide given the presence of a variety of toxic substances which can contaminate the environment and threaten human health include brain, heart, liver, kidney and skeletal system damage, if disposal protocols are not meticulously managed. Moreover, exposure to toxic e-waste can affect the health and development of her unborn child for the rest of its life. Potential adverse health effects include negative birth outcomes, such as stillbirth and premature births, as well as low birth weight and length. Exposure to lead from e-waste recycling activities has been associated with significantly reduced neonatal behavioural neurological assessment scores, increased rates of attention deficit/hyperactivity disorder (ADHD), behavioural problems, changes in child temperament, sensory integration difficulties, and reduced cognitive and language scores as well as burning of PVC & brominated flame-retardants used in electronic components, releases extremely toxic & deadly pollutants such as carcinogenic POPs (Persistent Organic Pollutants) & PAHs (Polycyclic Aromatic Hydrocarbons). Other adverse child health impacts linked to e-waste include changes in lung function, respiratory and respiratory effects, DNA damage, impaired thyroid function and increased risk of some chronic diseases later in life, such as cancer and cardiovascular disease. "A child who eats just one chicken egg from Agbogbloshie, a waste site in Ghana, will absorb 220 times the European Food Safety Authority daily limit for intake of chlorinated dioxins," said Marie-Noel Brune Drisse, the lead WHO author on the report. "Improper e-waste management is the cause. This is a rising issue that many countries do not recognize yet as a health problem. If they do not act now, its impacts will have a devastating health effect on children and lay a heavy burden on the health sector in the years to come."

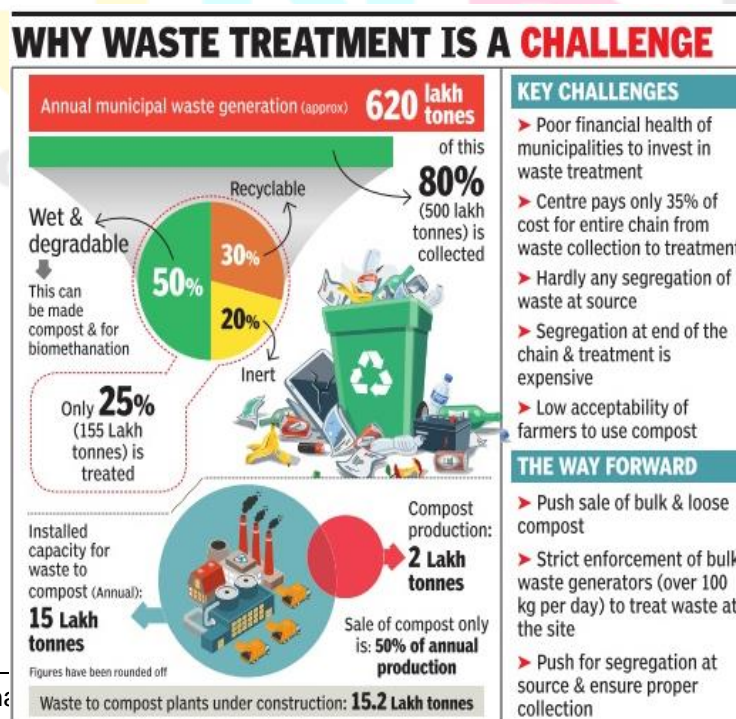
E-waste volumes are surging globally. According to the Global E-waste Statistics Partnership (GESp), they grew by 21% in the five years up to 2019, when 53.6 million metric tonnes of e-waste were generated. For perspective, last year's e-waste weighed as much as 350 cruise ships placed end to end to form a line 125km long. This growth is projected to continue as the use of computers, mobile phones and other electronics continues to expand, alongside their rapid obsolescence.

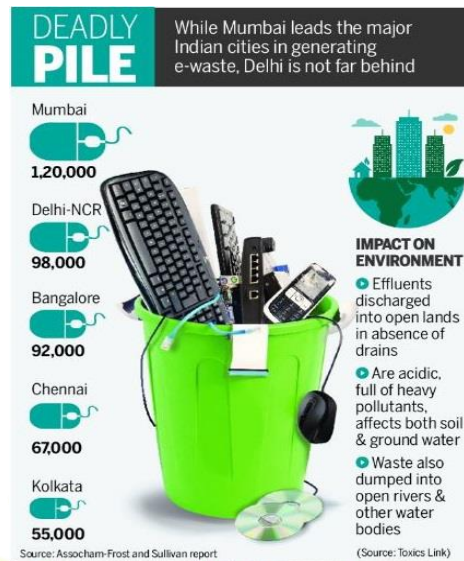


Only 17.4% of e-waste produced in 2019 reached formal management or recycling facilities, according to the most recent GESP estimates, the rest was illegally dumped, overwhelmingly in low- or middle-income countries, where it is recycled by informal workers. Appropriate collection and recycling of e-waste is key to protect the environment and reduce climate emissions. In 2019, the GESP found that the 17.4% of e-waste that was collected and appropriately recycled prevented as much as 15 million tonnes of carbon dioxide equivalents from being released into the environment. Apart from that Among Indian states, Maharashtra generates the most e-waste (19% or 3.96 lakh tonnes), but recycles only 47, 81tonnes, finds report.

This is the highest among all the states, stated the report. E-waste management rules that were introduced in 2016 introduced goals for manufacturers; the government has set a target of collecting and recycling 70% of the e-waste by 2023. The report expressed scepticism about achieving the target, based on its findings.

E-waste contains significant quantities of hazardous waste, including lead, mercury and cadmium. Improper recycling and disposal operations found in different cities of India often involve the open burning of plastic waste, exposure to toxic solders, river dumping of acids, and widespread general dumping. As a result, pollutants are dumped into the land, air and water. As per country level Waste Electrical and Electronic Equipment (WEEE) assessment study, Mumbai and Pune falls under the top ten cities that are generating maximum quantities and Mumbai alone generates maximum among all the cities of India. Total WEEE waste generation in Maharashtra is 20270.6 tons, out of this Navi Mumbai contributes 646.48 tons, Greater Mumbai 11017.06 tons, Pune 2584.21 tons and Pimpri-Chinchwad 1032.37 tons. As far as Nagpur District concerned It is the winter capital and second capital of the state of Maharashtra, a fast growing metropolis and third largest city in Maharashtra after Mumbai and Pune. With a population of 46,53,570 (2011) Nagpur Metropolitan Area is the 13th largest urban conglomeration in India. It has also recently been ranked as the cleanest city and the second greenest city of India . In addition to being the seat of annual winter session of Maharashtra state assembly “Vidhan Sabha”, Nagpur is also a major commercial and political center of the Vidarbha region of Maharashtra, and is also famous throughout the country as “Orange City” for being a major trade center of oranges that are cultivated in the region. In addition, the city also derives political importance from being the headquarters for the RSS and an important location for the Buddhist movement. Nagpur is said to among top 10 cities generating e waste in India, with some 3000 tons of e waste generated every year . The e-waste rules 2011 will come into effect from May 11, making it mandatory for Maharashtra pollution control board (MPCB) and Nagpur municipal corporation (NMC) to collect and dispose of e-waste in safe manner. However still e-waste is a very serious issues need to be address with proper policy formulation and implementation. From above reason I choose this topic for research purpose. Some laws and rules on e-waste management in India:-





E-Waste (Management & Handling) Rules, 2011.:

These rules shall apply to every producer, consumer or bulk consumer involved in the manufacture, sale, purchase and processing of electrical and electronic equipment or components as specified in Schedule-I, collection centre, dismantler and recycler of e-waste and shall not apply to-

- (a) batteries as covered under the Batteries (Management and Handling) Rules, 2001 made under the Act;
- (b) Micro and small enterprises as defined in the Micro, Small and Medium Enterprises Development Act, 2006 (27 of 2006); and
- (c) radio-active wastes as covered under the provisions of the Atomic Energy Act, 1962 (33 of 1962) and rules made thereunder.

CPCB Guidelines for implementation of the E-Waste (M&H) Rules, 2011:- Every producer of electrical and electronic equipment listed in Schedule I, collection centre, dismantler and recycler of e-waste shall obtain an authorization from the State Pollution Control Board or Pollution Control Committee of Union territories concerned as the case may be.

International conventions

The Rotterdam Convention is an international treaty designed to facilitate informed decision-making by countries with regard to trade in hazardous chemicals.

Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and Their Disposal controls the international trade in hazardous wastes and certain other wastes.

Stockholm Convention is a global treaty that aims to protect human health and the environment from the effects of persistent organic pollutants (POPs)

Minamata Convention on Mercury is a global treaty to protect human health and the environment from the adverse effects of mercury.

Kigali Amendment calls for a gradual reduction in the consumption and production of hydrofluorocarbons (“HFCs”), which are potent greenhouse gases. Its global implementation should avoid as much as half a degree Celsius of warming by the end of the century.

Kyoto Protocol is a treaty created by the United Nations in 1997 that aimed to reduce carbon emissions worldwide, thereby combating global warming or climate change.

Review of Literature:-

Ekta Raut (2019, et.al):- Solid Waste Management is today's emerging issue for the safe environment and healthy life. This article mainly discusses about the primary goal of solid waste management is reducing and eliminating adverse impact of waste on human health and environment to support economic development and superior quality of life. Waste generation has increased day by day due to increasing population, industrialization and urbanization. With rapid population growth and urbanization municipal waste generation is expected to rise to 2.2 billion tons by 2025. Increasing use of technologies and recent gadgets will generate large amount of electronic waste which contributes to about 27% of total waste generated. Hence, it is necessary to minimize waste generation and recycling of recyclable waste. This case study has discussed the scenario of e-waste in Nagpur city.

Jayaprakash P.& Pillai, R. R. (2016): -This article proposes a model for managing e-waste in India using systems thinking approach. The plot of the article begins by the idea of reducing the environmental pollution caused by e-waste in the hands of the informal sector. This can be done by formalizing the disposal stage of the electronic products. The idea can reap results when the registered e-waste agencies be a part of the supply chain activities and thereby ensures reverse logistics model of handling e-waste. Currently, the amount of e-waste generated in the country is higher than the total capacity of the registered recyclers in the country. Even then, most of the recyclers are not functioning at full capacity, which is counter intuitive. The government norms are not commanding which leads this waste becoming hazardous to human health. The article uses system dynamics approach proposing one solution to reduce this menace. The causal loop diagram gives a holistic picture of the problem in hand and the stock and flow diagram validates the integrated model of e-waste management system.

Ali AS, Akalu ZK(2022) :- The objective of this study was to assess the awareness, management strategies, and associated influencing factors among the central role players of the e-waste-related business. A cross-sectional study was used to assess the awareness and management of 345 purposely selected e-waste workers including all those who are actively engaged in e-waste buying, selling, dismantling, storing, and transferring. A questionnaire was used to obtain the required information. The findings show that about 92% of the dismantlers, 70% of the sellers, and 55% of the repair and maintenance workers have poor awareness. The awareness level of the respondents is strongly associated with the newness of the issue and lack of

concern, and moderately associated with educational status, their lack of access to information, job type and income level. The e-waste management among the study groups was limited to unsafe disposal, unsafe storage and transfer to other users. The awareness level of the respondents is very poor and influenced by several complex factors. During the study period, no study groups were practicing any of the proper e-waste management at all.

Mascarenhas, O., D'Souza, D., & George, S. (2016):- This article discussed about E-waste. It is looming as a gigantic global problem that is an increasing threat to ecology, biology and sustainability. Most of e-waste management solutions, legislations and enforcements thus far are post-factum (after the e-waste stream or damage has occurred) band aids or quick-fixes that become mutated problems of tomorrow. In exploring ethics of e-waste management, we offer an integrated before– during–after approach of inputs, processes and outputs. We first characterize the e-waste enterprise in its antecedent inputs of design and production, in its process of distribution and marketing, and in its consequent outputs of e-consumption, e-disposal and e-waste. Several ethical theories are invoked and applied and their potential for resolving the e-waste problem explored.

Prueksasit T (2020):- The PM₁₀ contributed in the e-waste dismantling community at Banmaichaiyaphot District, Buriram Province, was investigated due to the e-waste dismantling houses randomly located neighboring non-e-waste dismantling houses. The sampling was performed at non- and e-wastes dismantling houses and compared with the reference house in Daengyai subdistrict. The 24-hour average outdoor PM₁₀ concentrations ($81.957 \pm 18.724 \mu\text{g}/\text{m}^3$) at e-waste dismantling sites were higher than those of the non-e-waste dismantling houses ($80.943 \pm 32.740 \mu\text{g}/\text{m}^3$) and control house ($36.717 \pm 19.516 \mu\text{g}/\text{m}^3$). The 24-hour average indoors PM₁₀ concentrations of the e-waste dismantling houses ($116.171 \pm 64.635 \mu\text{g}/\text{m}^3$) showed higher concentrations than those of the non-e-waste dismantling ($113.637 \pm 64.641 \mu\text{g}/\text{m}^3$) and reference house ($70.907 \pm 22.464 \mu\text{g}/\text{m}^3$), but there were no statistically significant differences ($P > .05$). Both indoor and outdoor PM₁₀ concentrations between non- and e-waste dismantling houses did not have significant differences, whereas those of non- and e-waste dismantling houses were significantly higher than that of the reference house locating approximately 5 km away. The positive correlation between indoor and outdoor concentrations of non- and e-waste dismantling houses was satisfactory significant with the r of .613 and .825, respectively. The results indicate that the existing indoor PM₁₀ of either non- or e-waste dismantling houses could result from neighborhood e-waste dismantling.

Venugopal, P., Halog, A., & Dubey, B. Kr. (2016):- This research paper covering different themes of e-waste was presented in the papers from the perspectives of industry and consultants, the ethical dimensions of e-waste were also presented. Overall the paper focused on building a circular economy to ensure that e-waste is recycled and does not end up in landfills and cause environmental and health hazards. Towards this end, some of the obstacles and solutions were discussed. Since one of the major obstacles to manage e-waste safely and effectively is the lack of reliable data that poses a challenge to (a) policy makers

wishing to design an e-waste management strategy and (b) to industry wishing to make rational investment decisions; the paper discussed models on estimating the extent of e-waste being generated.

Turaga, R (2019,et.al):- Turaga discusses policy experiences of other countries in managing e-waste and draws valuable lessons from the last eight years of Indian policy landscape. Satish Sinha draws upon his close to two decades of experience in working with the waste management sector, and in particular, the informal sector, to bring out the nuances of how the evolving e-waste landscape is affecting or getting affected by the informal sector in India. In their article, Hinchliffe, Hemkhaus and Arora delves into the relationships between the informal sector and formal sector in managing e-waste in India and suggest possible mechanisms for partnerships between the two sectors. These authors bring a wealth of experience from their organization, GIZ, which has been actively working on waste management and other environmental issues, not only in India but also in other developing countries.

Problem Formulation:-

- Toxicity: E-waste consists of toxic elements such as Lead, Mercury, Cadmium, Chromium, Polybrominated biphenyls and Polybrominated diphenyl.
- Effects on Humans: Some of the major health effects include serious illnesses such as lung cancer, respiratory problems, bronchitis, brain damages, etc due to inhalation of toxic fumes, exposure to heavy metals and alike.
- Effects on Environment: E-waste is an environmental hazard causing groundwater pollution, acidification of soil and contamination of groundwater and air pollution due to the burning of plastic and other remnants.
- Effect on Psychology: Affects Development of Unborn Children Adverse health effects to the child include stillbirth, premature birth and low birth weight. Further, any exposure the woman has to lead could reduce neonatal behavioural scores, an increased risk of mental health disorders, behavioural problems and reduced cognitive abilities.
- Dumping issue: Electronics imported to developing countries can litter towns and villages and introduce serious health and environmental risks. For example, Guiyu, China receives a significant amount of e-waste and also contains some of the highest amounts of cancer-causing dioxins.
- Economic Impact: If we look at the material value of our spent devices, globally this amounts to \$62.5 billion, three times more than the annual output of the world's silver mines, according to data in the new Global E-Waste Report. More than 120 countries have an annual GDP lower than the value of our growing pile of global e-waste.
- Effect on climate change: It is also worth considering the effects electronic goods have on climate change. Every device ever produced has a carbon footprint and is contributing to human-made global warming. Manufacture a tonne of laptops and potentially 10 tonnes of CO₂ are emitted.
- E-waste collection, transportation, processing, and recycling is dominated by the informal sector. The sector is well networked and unregulated. Often, all the materials and value that could be

potentially recovered is not recovered. In addition, there are serious issues regarding leakages of toxins into the environment and workers' safety and health.

- Effect on Wetlands and National heritage: By releasing toxic substance in air by industry, in water by dumping landfill will affect wetland and national heritage like Tajmahal,archelological site, etc

RESEARCH OBJECTIVES

- To study the various policies done by government on e-waste management in india and Maharashtra state.
- To find out various Measures taken by government, industry, institution for prevention from e-waste.
- Find out percentage awareness regarding E-waste in Nagpur district.
- Issues and challenges face by institution, Municipal Corporation, industries in Nagpur district.
- To study e-waste management process viz; collection, recycling and disposition.
- Find out which company mainly dealing with e-waste management in Nagpur district.
- Find out which area or region mainly affected by E-waste in Nagpur.
- Study of Nagpur municipal corporation in concerned regarding e-waste collection and disposition.
- Study how many people (safari karmachari) or collector affected by Toxic chemical during this e-waste management process.
- Study of which equipment, machine, tools use for recycling process.
- Study of health hazard happened in Nagpur district due to chemical released by e-waste.
- Find out how many institution, organisation still not uses proper e-waste management rules.

HYPOTHESES

- Maharashtra lacks in e-waste management process because Maharashtra recycles only about 1 percent of total e-waste generated in the state, shows data from the Maharashtra Pollution Control Board (MPCB). The state generates 10 lakh tonnes of e-waste annually.
- Poor performance in recycling, Only 22.7 per cent of the e-waste out of the total 10,14,961.21 tonnes generated in 2019-20 in India was collected, dismantled, and recycled or disposed off. This e-waste is comprised of 21 types of electrical and electronic equipment (EEE) notified Under the E-Waste (Management) Rules, 2016.¹² It will increase confidence of people if any online fraudulent happened, police will be dealing with efficiently.
- Lack of awareness& digital literacy regarding how to use of electronics items which led to damages of items that generates huge e-waste.
- Lack of separate dumping ground for e-waste in India.
- Industries are not properly following e-waste management rules in India.

- India does not have any stringent punishment for violating government norms regarding e-waste.

Methodology:-

The researcher would like to focus on the primary & secondary data as to how an E-waste management will work due to immense issues regarding management, laws, regulation and policies concern. The nature of the research was ex-post-facto and the research method used was an analytical case study of reports, Interview of head of the organisations, survey of district with questionnaire as well as how the Indian policy making process works regarding e-waste management..

Chapter Schemes:-

- **Chapter 1:- Introduction**
- **Chapter 2:-Review Literature**
- **Chapter 3:-E-Administration**
- **Chapter 4:-Structure**
- **Chapter 5:-Nagpur District E-waste Management**
- **Chapter 6:-Conclusion**

Conclusion:-

It is needed to come up with a strategy to engage with informal sector workers because doing so will not only go a long way in better e-waste management practices but also aid in environmental protection, improve the health and working conditions of labourers and provide better work opportunities to over a million people. This will make management environmentally sustainable and easy to monitor. The need of the hour is to generate employment, which can be done through identifying and promoting cooperatives and expanding the scope of the E-Waste (Management) Rules, 2016 to these cooperatives or the informal sector workers. Effective implementation of regulations is the way ahead to managing the e-waste in sustainable manner.

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