IMAGE: A MAP OF THE STARS OF THE ORION CONSTELLATION

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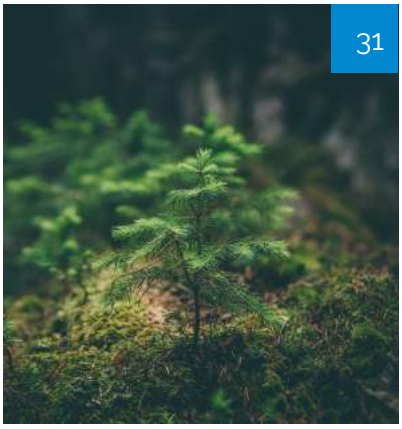

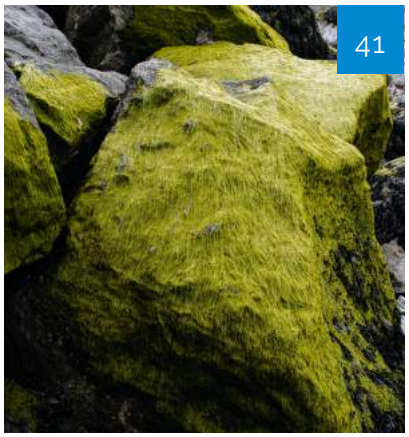

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Fatemah K. Al-Asfour

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Keywords: buzan - characteristics – education for sustainable development - e-waste - environmental awareness - hazard waste - knowledge mapping - medical waste - mind maps – rubbish - survey - sustainable - sustainable development - waste management.

Author: Department of Environmental Health, College of Health Science, the Public Authority for Applied Education and Training, Kuwait.

Tools: iMindMap11 software - Microsoft Excel - Questionnaire population – Survey.

The Important of research and reasons for Application:

The main objective of this work is to contribute to the establishment of a continuous integrated environmental awareness project that serves all segments of society.

It depends on knowledgeable concepts that contribute to creating a new definition of waste to get it out of being expired materials, into raw materials and new elements, and the growth of an economic resource moving towards sustainable development.

I. INTRODUCTION

People's belonging to planet Earth and its correlation with the components of earth, air and water creates a shared responsibility, the engineering of coexistence, symbiosis and continuity for survival is to preserve and protect all the sources of life on our planet.

The concept of sustainability is increasingly being used in multiple fields, we environmentalists focus on highlighting that sustainability is a unified long-term project that combines under its

roof not to harm the environment and the depletion of its primary resources and is It is directly related to Intergenerational, irreversibility, human welfare, ecological health, and Circular economy. Before the concept of "sustainable development" was used in the late 1980s, the dominant concept was "development" in its traditional sense. The first to refer to it officially is the report "Our Common Future" issued by the World Commission on Development and the Environment in 1987, and this committee was formed by a decision of the United Nations General Assembly in December 1983. The unilateral definitions of sustainable development were approved, and in fact they are closer to slogans and not definitions in the scientific sense:-

- Sustainable development is renewable and sustainable development.
- Sustainable development is development that does not conflict with the environment.
- Sustainable development is that which puts an end to the mentality of the infinite natural resources.

The most comprehensive definition is that sustainable development is development that meets the needs of human beings at the present time without compromising the ability of future generations, and focuses on integrated sustainable economic and environmental growth and social responsibility. Sustainable development is related to the concepts of developing land, cities and societies, as well as businesses, provided that they meet the needs of the present without compromising the ability of future generations to meet their needs.

The report issued by the International Commission on Environment and Development in 1987 entitled "Our Common Future" defined sustainable development as follows: [Sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs]. It becomes clear to us that sustainable development is, "a comprehensive concept linked to the continuity of the economic, social, institutional and environmental aspects of society."

All over the world, the human migration to urban areas continues, which results in the expansion of cities and a rapid working lifestyle. Which led to an increase in the percentage of waste, its accumulation and its danger.

The cornerstone of this research is to highlight the importance of environmental awareness for the success of a waste management project. The project between humans on Earth and the protection of their planet.

Education and awareness are based on creativity, excitement, encouragement and continuity in application, in addition to highlighting results and achievements. It is appropriate here to refer to a more general concept of circular economy. The circular economy is an economic solution that tackles global challenges like climate change, biodiversity loss, waste, pollution, environmental disaster, Pandemic, Biotechnology risk, various operations, industries and treatment. Focus on the importance of products for recycling and reuse markets, rather than scrapping them and then Production of new materials from waste. At circular economy, all waste will be returned, nothing will perish. The circular economy is designed to keep waste in use and preserve natural systems.

We can say "waste is the result when humans lack creativity, innovation and imagination".

The framework for the success of the waste management project is based on "rationalization and regulation", rationalization of consumption and regulation of reuse, recycling and treatment processes. On September 25, 2015, the United Nations General Assembly adopted the 2030 Agenda for Sustainable Development by developing a sustainable vision and reorienting humanity towards a sustainable path. The plan includes 17 Sustainable Development Goals (SDGs). Education for sustainable development - a key tool for achieving the sustainable development goals "A fundamental change in education patterns is needed to reach the global goal and the success of the sustainable development project. This is an urgent need to preserve biodiversity and the safety of life on our planet.

Back to “Learning objectives for achieving the SDGs -Education for Sustainable Development Goals-“, study and analyze the objectives, and then link them with the research topic "the success of the waste management project". We will observe a direct relationship between the success of sustainable development and the success of waste management, as well as the responsibility of education in building a culture of environmental generations. The researcher here refers to the objectives related to the topic of the research, which confirm and indicate the importance of taking care and following up the waste management project through education and building a future generation that deals with waste as an economic wealth and not expired materials that end up in the landfill.

Learning objectives for achieving the SDGs:-

1) Goal: 1.2.3. SDG 3 | Good Health and Well-being | Ensure healthy lives and promote well-being for all at all ages
2) Goal: 1.2.6. SDG 6 | Clean Water and Sanitation | Ensure availability and sustainable management of water and sanitation for all
3) Goal: 1.2.7. SDG 7 | Affordable and Clean Energy | Ensure access to affordable, reliable, sustainable and clean energy for all
4) Goal: 1.2.8. SDG 8 | Decent Work and Economic Growth | Promote sustained, inclusive and sustainable economic growth, full and productive employment and decent work for all
5) Goal: 1.2.9. SDG 9 | Industry, Innovation and Infrastructure | Build infrastructure, promote inclusive and sustainable industrialization and foster innovation
6) Goal: 1.2.11. SDG 11 | Sustainable Cities and Communities | Make cities and human settlements inclusive, safe, resilient and sustainable
7) Goal: 1.2.12. SDG 12 | Responsible Consumption and Production | Ensure sustainable consumption and production patterns
8) Goal: 1.2.13. SDG 13 | Climate Action | Take urgent action to combat climate change and its impacts
9) Goal: 1.2.14. SDG 14 | Life below Water | Conserve and sustainably use the oceans, seas and marine resources for sustainable development
10) Goal: 1.2.15. SDG 15 | Life on Land | Protect, restore and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, and halt and reverse land degradation and halt biodiversity loss

We must also point out here:-

UNESCO together with UNICEF, the World Bank, UNFPA, UNDP, UN Women and UNHCR organized the World Education Forum 2015 in Incheon, Republic of Korea, from 19 – 22 May 2015, adopted the Incheon Declaration for Education 2030, which sets out a new vision for education for the next fifteen years.

By reading the researcher in Incheon Declaration - Education 2030 Framework, The researcher linked the achievement of sustainable development through a framework that is divided into three sections:

1) Section I, outlines the vision, rationale and principles of SDG4-Education 2030.
2) Section II, describes the global education goal and its associated seven targets and three means of implementation, as well as indicative.
3) Section III, proposes a structure for coordinating global education efforts, as well as governance, monitoring, follow-up and review mechanisms. It also examines ways of ensuring that SDG4-Education 2030.

The 2030 Education Agenda highlights that sustainable development is one of the goals of self-contained education - Goal No. 4 - under which the health-related sustainable development goals fall; employment growth; sustainable consumption and production; with climate change. Because, in fact, education is a key factor in accelerating progress towards achieving and succeeding all sustainable development goals, and therefore it was among the strategies to achieve them all. What is new here is that the strategy did not leave anyone behind in education. One of the

most important development and humanitarian goals of education and development, based on the principles of human rights, dignity, social justice, peace, inclusion and protection, as well as cultural, linguistic and ethnic diversity, ensuring well-being, equality between generations, and sharing responsibility and accountability. For better life. Through the fourth goal:-

1) Goal: 4.4 by 2030, substantially increase the number of youth and adults who have relevant skills, including technical and vocational skills, for employment, decent jobs and entrepreneurship.
2) Goal: 4.7 by 2030, ensure that all learners acquire the knowledge and skills needed to promote sustainable development, including, among others, through education for sustainable development and sustainable lifestyles, human rights, gender equality, promotion of a culture of peace and non-violence, global citizenship and appreciation of cultural diversity and of culture's contribution to sustainable development.

All of the above confirms that education is the cornerstone in facing challenges and aspirations that will lead to sustainable and inclusive growth, and coexistence in peace.

Through my work in teaching and academic training of Environmental Health Department courses, and community awareness in public seminars. I was facing some difficulties in explaining and giving preference to: "Waste Management" and the reason for this is due to the branching of the topic and its multiplicity of chapters. The difficulties lie in explaining, detailing, summarizing and applying theories, solutions and interpretations. As for the recipient, understanding, remembering and applying the scientific and practical material needs study and attention. The researcher transferred the experience of education using mind maps to another field, which is community awareness. A contribution from us as researchers in closing the cycle (consumption - expiration - disposal - landfills).

After being invited to a symposium on "healthy cities" for one of the women's public benefit associations, I participated in the topic: "Awareness of the types and components of waste" under the slogan "Better Policy for a Better Life".

Using iMindMap 11- software- to create and display mental maps of the components and types of waste after its excellent results in education.

And by applying a questionnaire -a survey- to measure the extent of the subject's comprehension, influence, and response.

II. METHODOLOGY

The researcher seeks to apply a new methodology that opened to him after its success in academic education, the mental mapping methodology, which is a graphic technique, promoted by Tony Buzan, which aims to reach the maximum potential of our brain, because this method of analysis allows us to organize our thoughts using our mental abilities to the fullest. Mind maps are a simple way to manage and map all the information in our brain: words, ideas, numbers, readings, and drawings, and then link them together.

In a symposium entitled "Municipality waste between reality and hope" affiliated to one of the women's public benefit associations, the target group was women because they are housewives and it is the most influential in household waste.

The researcher will present and explain the mind maps. The survey tool was also designed to assess responses and the effect of applying mind maps on understanding and applying everything related to waste characteristics. Using Excel to analyze the data. And this study presents the survey with a questionnaire to measure the reactions and then analyze them.

We refer here to Tony Buzan, a psychologist, one of the most famous people interested in the field of memory, known as the Professor of Memory. His fame is due to his prominent invention known as Mind Maps, and these maps constituted the largest leading scientific revolution in this field. The mind map is a modern graphic means and an

innovative style through which we express our ideas through a scheme in which writing, images, symbols and colors combine, to interconnect ideas and concepts. Which aims to reach the maximum potential of our brain, because this method of analysis allows us to organize our thoughts using our mental abilities to the maximum. It is the technique that allows to organize thoughts. Using iMindMap11 software gives you a lot of flexibility in your work and great space to think and be creative with the information you present in its five workspaces.

Through the researcher's experience in this field, I have found iMindMap11 software the most advanced in this field.

Under the slogan "Better Policy for a Better Life", in the "Healthy Cities" symposium, with the participation of 58 women of different ages and scientific levels, on the topic "Awareness of the types and components of waste", two main methods were applied to provide information: the traditional method of explaining and discussing acquaintance and the "iMindMap11" program As shown in the following mind maps:

The mother mind map: “Waste Material Kinds” Alphabetical, figure.1

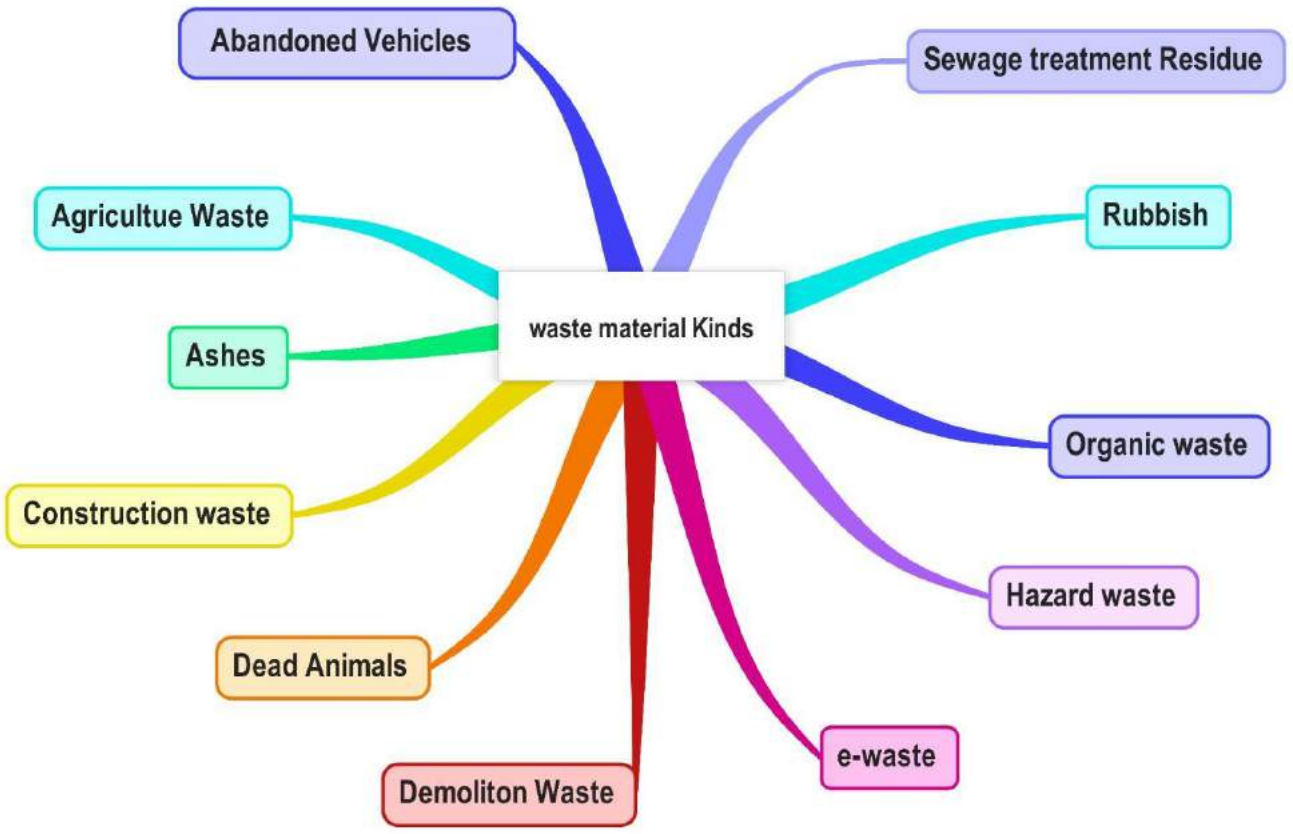


Figure-1: Waste Material Kinds

The common material of municipal waste can be classified in several different ways, one of most useful classifications is based on kinds.

The researcher used mental maps in detailing and explaining the mother map. In detailing and explaining the mother map, the researcher used mental maps and traditional methods in detailing and explaining the mother map, which includes the eleven types of waste. It is presented in this research as follows:

1) Abandoned Vehicles, Figure-2

Abandoned vehicles are dilapidated cars that have become useless in other ways, and that have been abandoned and dumped illegally in the environment. Abandoned vehicles take up space in the environment and, like other waste, pose significant risks to public health. Abandoned vehicles left in the environment are ugly and affect the visual comfort of the area. In addition, components that deteriorate and leak, such as oil and battery acid, pollute the surrounding environment and can cause a threat to the health and safety of people and animals. Abandoned vehicles harboring pests such as mice also provide that disease spread.

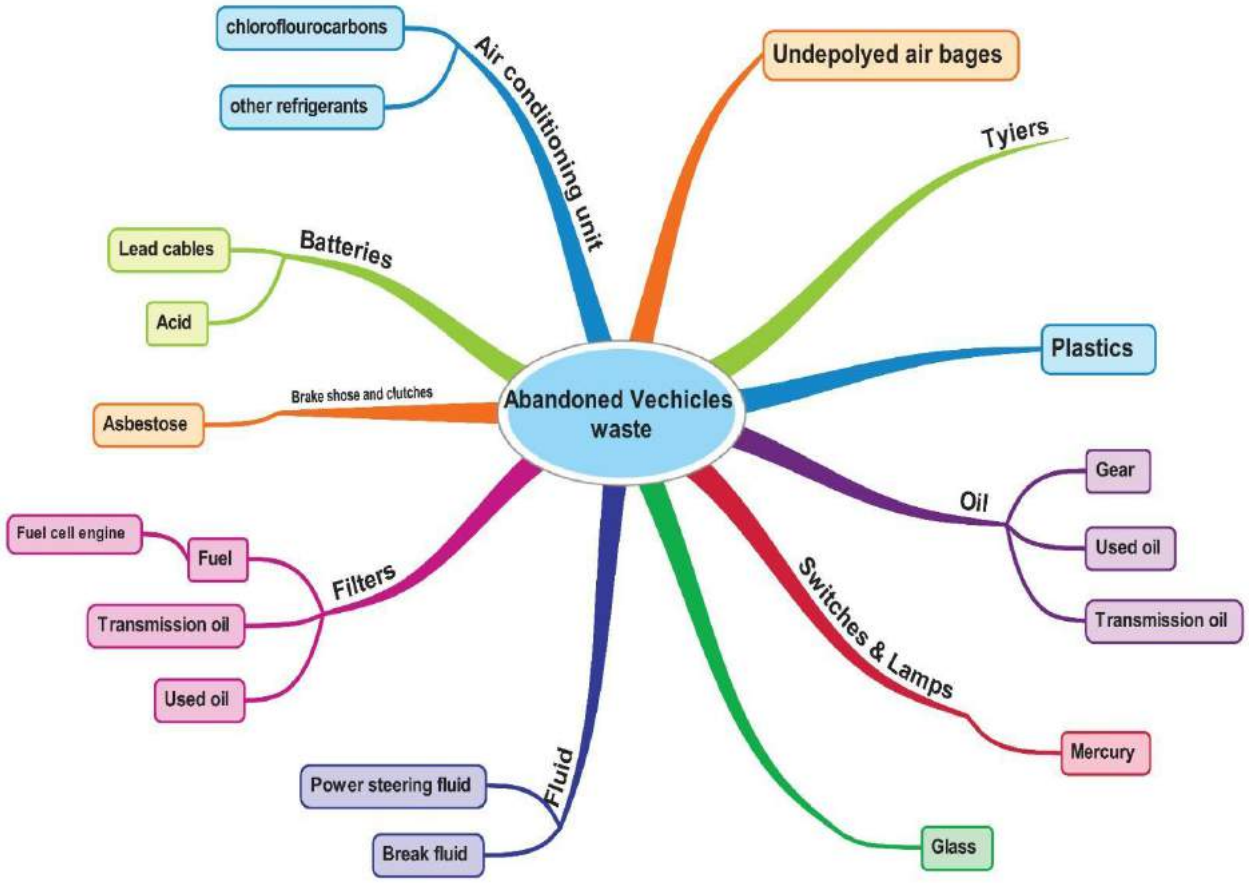


Figure-2: Abandoned Vehicles

2. *Agriculture Waste, Figure. 3*

Agricultural waste is generally defined as everything that is produced accidentally or secondary during the production of crops in the field, whether during harvesting or during the preparation for marketing or manufacturing of these crops and animal and poultry waste before slaughter or during slaughter operations and during the manufacturing processes and preservation of the products of these animals and poultry. As for the plant residues in the agricultural sector, they are the remainder of the agricultural crops. Agricultural work includes inorganic waste, including plastic sheets, plastic containers, pesticides and their packaging, and tools used by the farmer.

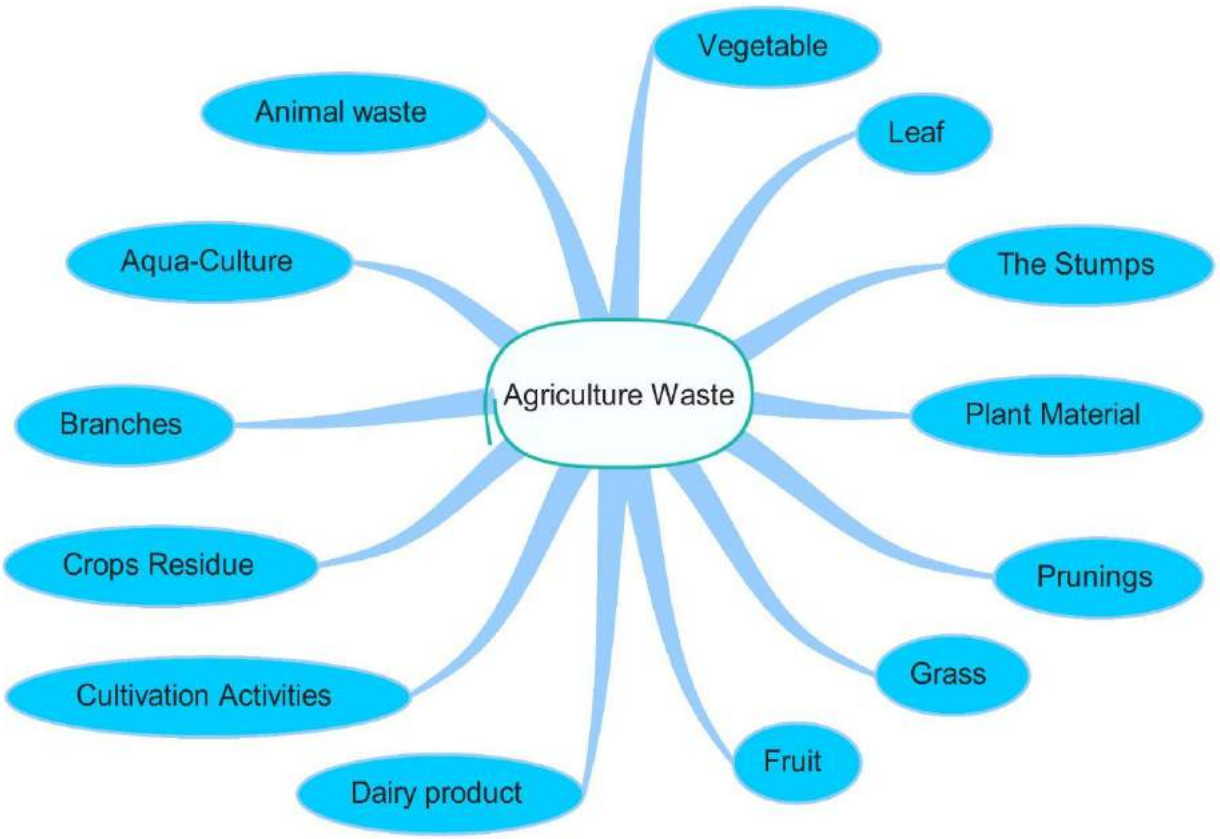


Figure-3: Agriculture Waste

Agricultural waste is by-products within the agricultural production system - (whatever its source is home, school, public gardens, forests, street afforestation, agricultural industry residues, constitute a significant proportion....), that must be maximized by converting it into organic fertilizers, fodder, human food, clean energy, or manufacturing to achieve agriculture. Clean horizontality, environmental protection from pollution, improvement of agricultural products and employment opportunities in the agricultural sector, thus improving the economic and environmental situation and raising the health and social level in the countryside.

3) Ashes

Ash is all that remains after the materials are completely burned inside the ash furnace at a temperature ranging from (525-650) °C, or it is the incombustible material that remains after the organic matter has completely burned.

The term ash is used to refer to the inorganic materials remaining after burning the organic matter in food at a high temperature ranging between 500° and 600°. As for the minerals that make up this inorganic residue, they are present in the form of oxides, sulfates, phosphates, silicates and chlorides (called ionic ash) and they depend on the composition of the food and the conditions of burning. Sources, ash is one of the largest types of industrial waste generated.

4) Construction & Demolition Waste, figure.4

This type of waste includes all the waste produced by the construction and demolition for all buildings and infrastructure, as well as road planning and maintenance operation. Demolition wastes are heterogeneous mixtures of building materials.

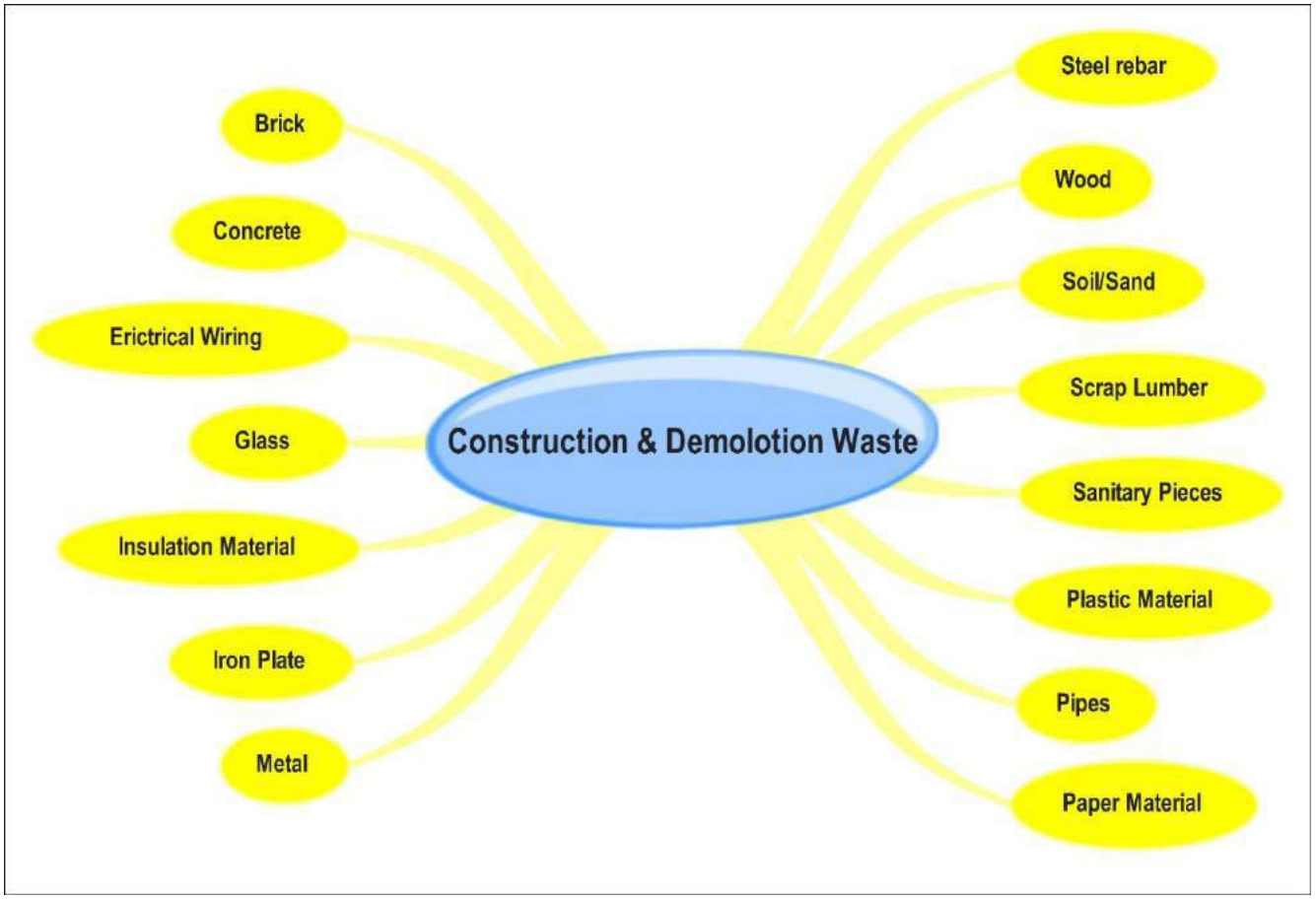


Figure - 4: Construction & Demolition Waste

Construction & demolition waste is the non-hazardous solid waste that is generated from the activities of demolition, construction, construction of projects, development and restoration. The construction and urban expansion processes generate millions of tons of construction waste, including (asphalt - ordinary concrete - reinforced concrete - bricks - wood - glass - iron - Aluminum - Electrical cables and wires - Plastic tubes)

These wastes are often disposed of in landfills without treatment, with what this leads to an increase in the level of environmental pollution and a waste of usefully exploitable resources.

5) Dead Animals

The meaning of carcass refers to: the body of a dead animal, including its blood, skin, visceral organs, head and feet, etc., as well as fish that are not fit for human consumption. Animal carcasses and body parts are in most cases disposed of as infectious waste and hazardous waste. The most important health and environmental damage caused by throwing slaughtered remains in the streets:

I. Dumping this type of waste attracts insects and rodents, which usually carry with them various types of diseases, and thus transmit them to humans.
II. Carrion emits methane, in addition to the unpleasant odors resulting from its putrefaction, it leads to pollution in the air we inhale, and causes many chest and respiratory diseases.
III. The decomposition of the remains of slaughtered animals and their mixing with the soil, which may lead to an environmental imbalance and pollution of groundwater.
IV. Throwing slaughtering residues into water bodies, polluting sea water and harming the water balance and marine ecology.

6) E-Waste, figure.5 & 6

We can define electronic garbage as garbage that consists of electronic scrap and all kinds of electrical and electronic equipment or its components and parts that are disposed of due to the end of their useful life.

The danger of electronic waste lies in its parts and components that have a significant negative impact on the environment and then human health, and is mainly related to the heavy metals that it releases into the environment. Likewise, the plastics that make up the covers and other parts are also a source of pollution.

Heavy metals from e-waste such as lead, cadmium, arsenic and mercury cause serious human health problems. Also, the dioxins released by plastic materials have a negative impact on environmental and human health.

As shown below in the e-waste component parts mind map figure.5 and e-waste composition parts mind map figure.6.

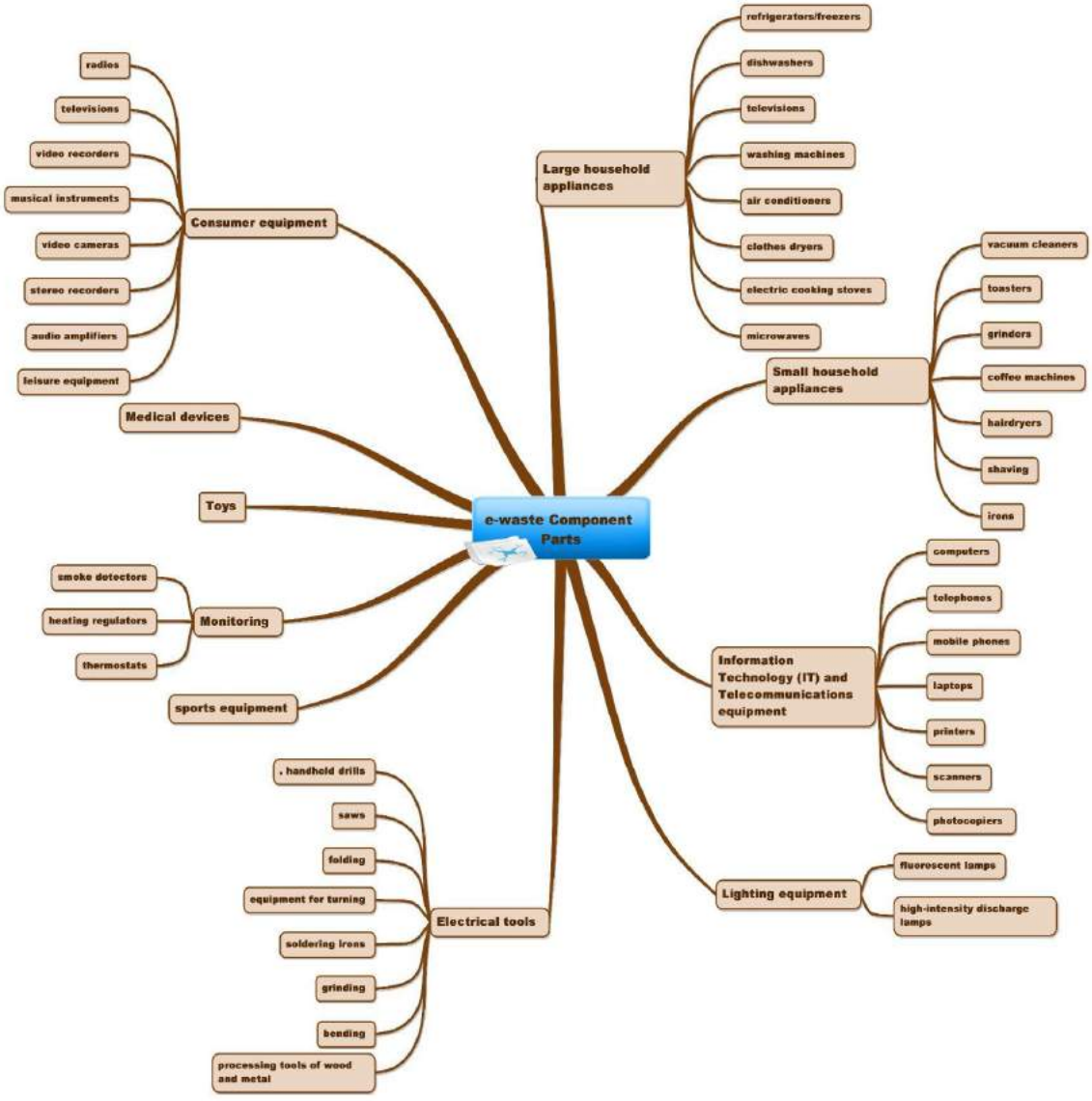


Figure-5: E-Waste component parts

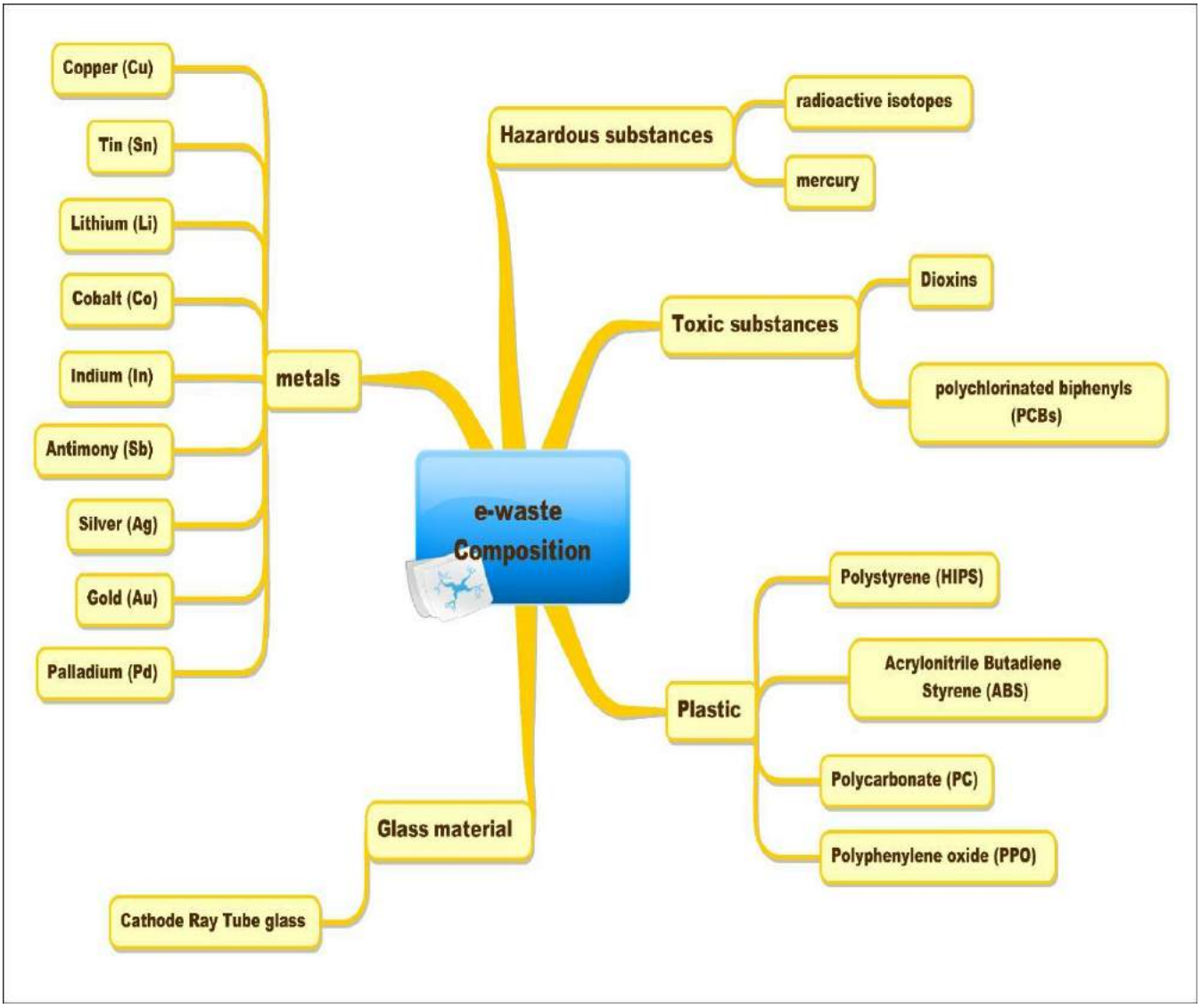


Figure 6: E-Waste composition parts

This type of waste is a growing problem in today's technology world. E-waste is one of the fastest growing categories of household waste in the world, according to the United Nations health agency.

The Global E-Waste Statistics Partnership (GESP) said that of the 53.6 million tons produced worldwide in 2019, only 17.4 percent were disposed of and managed in an environmentally safe manner. This confirms that the fate of the remaining e-waste is unknown, and it is unlikely that it was managed in an environmentally safe manner.

An alternative to reducing e-waste is reuse and recycling so that electronic devices can be reused or reusable parts removed. Moreover, this equipment can be recycled to obtain metals and plastics as raw materials.

We can say here that “electronic waste is a mine of natural minerals” as it contains minerals that are expensive to extract from their natural sources or cause undesirable and costly environmental effects, and these elements can be recovered in addition to rare elements such as the so-called “rare earth” -a group of 15 elements- used in the manufacture of mobile phones.

Recycling methods depend on the type of electronic device and what you want to recover. It can range from disassembling and cutting parts manually or with a specialized robot, to undergoing liquid nitrogen cooling and crushing equipment.

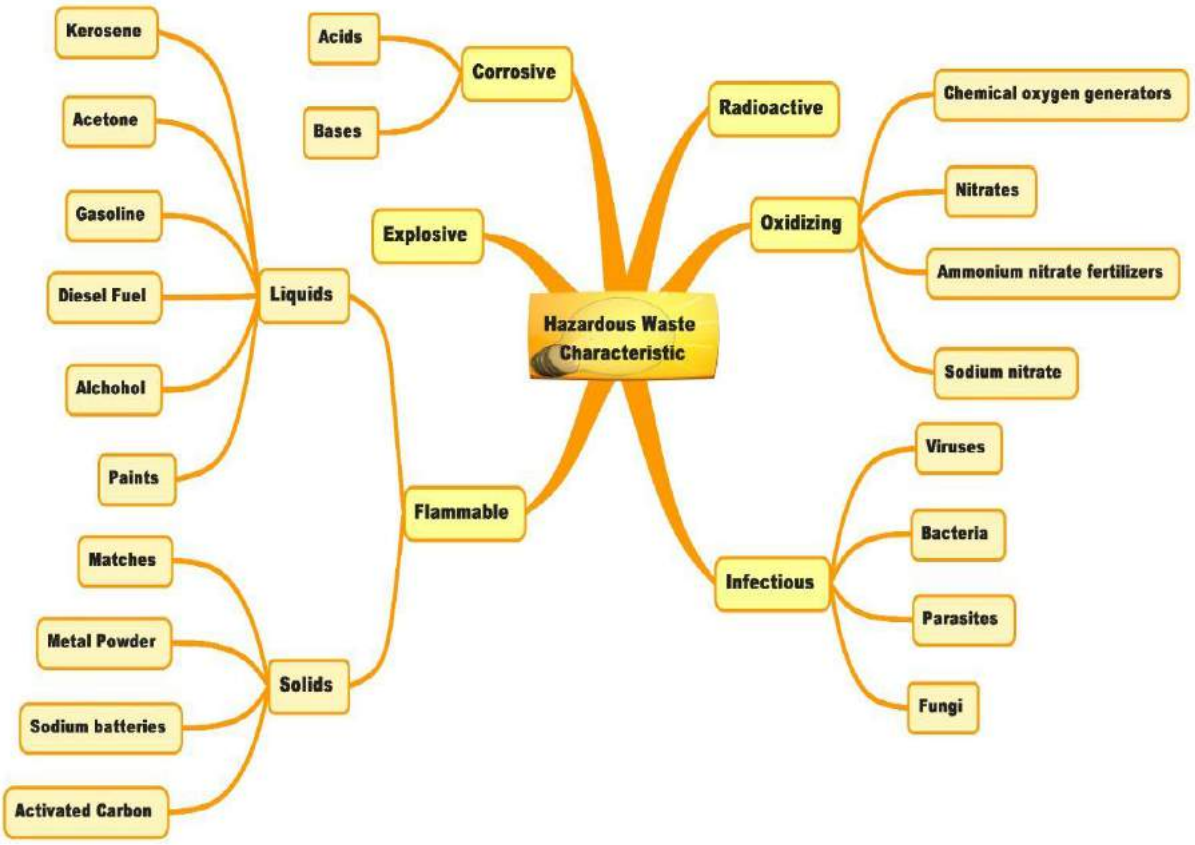


Figure-7: Hazard Waste

Hazardous waste is waste that has a negative impact on humans, living things or the planet - water, air and soil - as a result of its high toxicity or lack of decomposition after being thrown over time and then accumulating in the tissues of living organisms. We can also define it as waste resulting from industrial, medical and agricultural activities, and because of its quantity, concentration, physical, chemical or biological properties, it poses a threat to human health, environment, living organisms and public safety, waste that is difficult to handle, store, transport or treat again.

Hazardous waste is divided into types, as shown in the Hazard Waste mind map, Figure -7 such as radioactive or highly flammable waste, explosive materials, chemicals and biological waste, in other words, the hazardous waste bears one or more of the following characteristics, which are toxicity, oxidation potential, explosiveness and radiation.

It is flammable, contagious, pathogenic as well as corrosive. Hazardous waste comes from main sources, which are some power plants, health facilities, some industries and farms, and the most prominent components of this waste are heavy metals that are used in several industries, including the production of electronics, paints, metal formation, cars, etc., and volatile and flammable chemicals such as organic solvents and reactor waste. Nuclear waste from hospitals, clinics and health centers.

The optimal disposal of hazardous waste depends on several methods based on ensuring that these

wastes do not reach any of the components of the environment from soil, surface and ground water, or to the atmosphere. With an emphasis on minimizing use and using a safe alternative. Societies' familiarity with the developments and increase in hazardous waste has become a necessity, not for coexistence, but rather to prevent tampering with the environment and human health. For example environmental awareness of radioactive waste, use of radioisotopes in laboratory analysis of body tissues and fluids, in vivo organ imaging, treatments and many more clinical studies involving specific radionuclides need special management in a centralized radioactive waste treatment facility. Nuclear applications have developed rapidly in recent times, and many nuclear power plants have started operating all over the world. The potential impact of radioactive pollutants released into the environment has received increased attention due to nuclear accidents. Pollution of soil and water with radionuclides due to processes, global fallout from nuclear weapons tests, discharges from nuclear facilities, disposal of nuclear waste, and accidental nuclear accidents (e.g., Chernobyl in 1986 and Fukushima in 2011) lead to serious problems for biological systems. It is necessary for modern societies to realize that they deal with hazardous waste in parts and components of what they use daily, and herein lies the danger of the continuous use of small parts that will lead over time to large accumulations. We refer here to mercury, a persistent toxic substance that threatens human health and the environment. Mercury is one of the most important pollutants in many wastes that contain it, such as: [batteries-Detergents and detergents-Metering devices-fluorescent lamps-Specialized lamps-Switches, relays and sensors- thermometers-thermoelectric devices-thermostat sensors-electric switches,- manufacture of electrical equipment-manometers-barometers and vacuum gauges]. Mercury compounds used in metal finishing: (chloride - sulfate - nitrate - cyanide - oxide – dichromate) mercury. Raising the level of societal awareness requires building an integrated system of facts about what is contained in the waste of modern societies, by all available methods.

8) Organic Waste

The concept of the word organic has different interpretations from multiple angles: Organic in the field of chemistry is the formation of the compound from carbon, hydrogen and oxygen. Organic in biology and the environment is the living substance that consists of units that were living, as in humans, animals, plants and microorganisms. Therefore, the concept of organic waste is the excess and unwanted organic waste or waste “lignocellulose” resulting from all agricultural activities or from agricultural manufacturing processes or from animal husbandry or food waste from homes and restaurants “free of any extraneous materials such as metals, plastics or Glass or chemical compounds” and the percentage of these wastes constitute more than (60%) of the total general waste. We hope everyone has a good understanding of organic waste. Organic waste is a biodegradable material. It can also be referred to as wet waste. Organic waste can be divided into three categories, namely, "industrial organic waste", "agricultural organic waste" and "household organic waste", according to its source. The value and benefits of organic “agricultural” waste: These wastes are characterized by being rich in nutritional value (protein, carbohydrates, fat and many salts, acids, mineral elements and vitamins), so they are considered a good source in their raw form in their manufacturing processes to (feed or silage) used in feeding farm animals and birds or in the production of fertilizers And high quality organic soil.

The importance and benefits of using various mixed organic wastes: Agricultural waste is used with animal waste and food waste from homes and restaurants (which is subject to a deliberate and special treatment different from the rest of other organic waste) in the production of many products, which are fish feed and “organic soil & fertilizers of plant origin” Fertilizers” due to its high organic matter percentage. Through special treatment before manufacturing operations, many

factories have been established in several countries for the manufacture of fertilizers and organic soils from these wastes. They were excellent and profitable projects, and their products outperformed imported soil and organic fertilizers. This waste is also defined as biodegradable such as food and garden waste, paper, cardboard, textile wood, etc., which decompose over long periods of time by various aerobic and anaerobic bacteria to produce the liquid leachate. Biodegradable waste can be found in municipal solid waste (sometimes called biodegradable municipal waste, green waste, food waste, waste paper and biodegradable plastic). Other biodegradable waste includes human waste, manure, sewage, sewage sludge, and slaughterhouse waste.

9) Rubbish Waste, Figure-8 & 9

Communities need to learn about the type and characteristics of the waste inside their disposal bags, ideas on how to store it and reduce waste, and details about what to do with specific types of waste. These things should be put in another bag and another place that is more useful and safe for the environment and human being. And dealing with them is that they are not expired materials, but rather they are raw resources for new industries. Garbage is generally divided into different types, and it is necessary for society to know what accumulates in the yard or rooms of the house, warehouse, work or market, because this will affect how it is disposed of later. To simplify the issue of garbage, it has been divided in this research into two main types: combustible and non-combustible garbage. The mind map at figure-8 represents of the contents of the trash branches of each type.

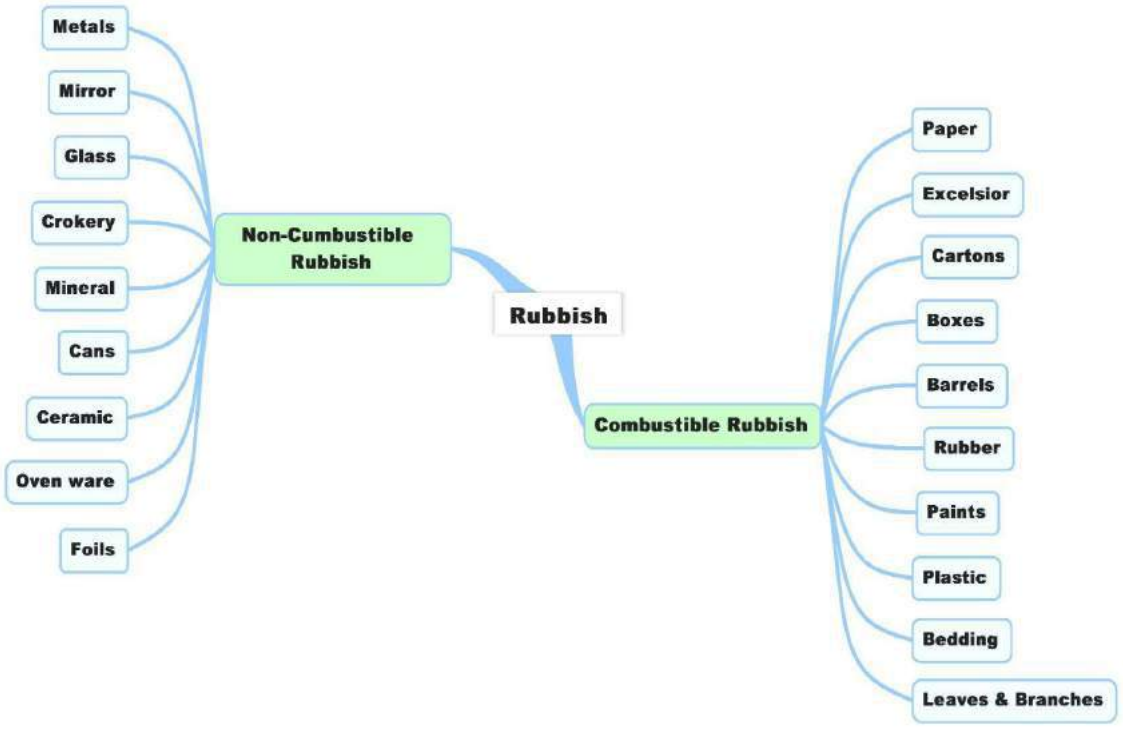


Figure-8: Rubbish Waste

Through the mind map above, we can detail rubbish waste includes garbage, mostly material such as glass, paper, cloth, wood, biodegradable food, or various metals, and a lot of daily consumables from different sources such as household waste, markets, schools, institutions, hospitals, universities. The researcher seeks to simplify information about the characteristics and components of rubbish for society. The division of

waste into combustible and non-combustible concept is more simple and accepted by society.

The importance of the topic lies in presenting scientific facts and statistics to the community during awareness raising. According to the statistics of the Ministry of Municipality in the State of Kuwait, which were published in "1st KISR / Italian – Joint Workshop on Waste Management – Operational Excellence in Waste Management Research – Book of proceeding "In cooperation with Kuwait Institution for Scientific Research. It indicates that by 2025 the urban population will reach 3.9million and municipal solid waste generated 2.0 (kg/capita/day). In addition, the statistics indicated that the waste composition by category by 2025, it will be as shown in the following table -1:-

Table 1: Waste Composition by Category

Waste	Concentration	Amount of Waste, (t/y)
	(%)	2025 Expected
Sanitary	6.3	182700
Paper	6.8	197200
Corrugated	8.3	252300
PET bottle	7.3	211700
Film	11.04	320160
Organic	44.2	1281800
Metals	4.5	130500
Glass	6.3	182700
Wood	4.2	121800

These studies emphasize the need to raise awareness of the components and characteristics of rubbish waste, It may be necessary to understand rubbish waste "paper, plastic, and metals" as one of their multiple and daily uses. Plastic is one of the most waste. Unfortunately, we are now paying for this artificial creation and will be for the foreseeable future. Because of the creepy nature of plastics, they're supposed to be in every food we eat, in our water, and in the air we breathe. We are exposed to plastic every day. However, even if all the plastic is prevented from entering the environment immediately, we will see an increase in micro plastics as the larger pieces begin to break down into fragments. We do not always know what products are made, whether they are made entirely or partially of plastic; For example, cigarette butts, diapers, shoes, and bags. Products like these consist of several interconnected materials, and therefore, there is difficulty in breaking them down for reuse or recycling.

Paper is a thin, flat material produced by compressing fibers that are usually natural and found in the walls of all plant cells so that it is composed primarily of cellulose. Paper waste occupies the first place over the rest of the waste in people's homes. The danger of this type of rubbish waste it produces methane when it decomposes. Because paper fibers contain carbon (originally absorbed by the tree from which they were produced), recycling keeps the carbon locked up for longer and out of the atmosphere. In most countries, waste paper is now recovered and recycled, and although not all of it may become new paper after repeated processing, the fibers become too short to produce new paper - which is why virgin fibers (from sustainably farmed trees) are added to the pulp recipe. However, the desire is still urgent to reduce the use of paper (bags - boxes - newspapers and magazines - cartons - and many daily uses) and recycling.

Awareness of the negative effects of high levels of consumption and paper waste is a very urgent necessity. That's because the life cycle of the paper industry from start to finish, begins with the cutting of the tree and ends its life, upsetting the carbon dioxide balance in the atmosphere. It ends with the manufacturing processes of paper that release nitrogen dioxide, sulfur dioxide and carbon dioxide into the air, which contributes to pollution such as acid rain and greenhouse gases. Hence the high pollution of water and air, and the consequent increase of water use by these industries, the clear cutting of trees, the consumption of fossil fuels, the emissions of greenhouse gases in the environment and the toxic bleaching products excreted.

Plastic is a human-made problem, not only that, there are some types of plastic contains additives to strengthen them and help them last longer, this means they can take much, much longer to break down. With this in mind, it is clear to see why we need to find a solution for plastic waste and why it

is so important for us to find reusable alternatives. So we need to take responsibility and start reducing its use in sourcing. Our response over the next two decades will determine the outcome of the plastic crisis. We know that the current approach is not enough. Taking advantage of our current options and significantly expanding our recycling range from the current average will help reduce the increasing waste tonnage.

Metals are essential and versatile and can be used in many ways, as metal can be used for industrial purposes such as aluminum in the manufacture of trucks, cars, planes, ships and railways, and can also be used to manufacture household items such as cutlery and even in packaging, aluminum foil and soda cans, as well as round paper clips, used staples, and metal columns from folders and files. It also contains office chairs, old file cabinets, and lights, copper in making wires to play its role in conducting electricity, brass, which is a mixture of copper with zinc, and it is a flexible, non-flammable metal, and is used in the manufacture of steel hammers, decorations as well as antique furniture , including doors, that most electrical devices, such as mobile phones, where mobile batteries are made of cobalt metal, and the mobile depends on 6 components of rare metals, and rare metals are used in the manufacture of coils and electrical wires that are inside electrical tools, thanks to their great conductivity of electricity, as no Electrical tools are devoid of terbium, neodymium, or europium metal, as it is thanks to the metal that computers and screens have become flat, and metals are used in the manufacture of modern home medical machines such as body temperature measuring devices, blood glucose meters, blood pressure and oxygen ratio, not We can limit the uses here. But the good thing about metal recycling is that the metal can be recycled over and over again without changing its properties. According to many studies, metals can be recycled over and over again without losing their properties. Steel is the most recycled metal on the planet and includes highly recycled metals such as gold, silver, copper, gold, and aluminum. The first goal is to preserve the environment and natural resources as it requires less processing power to manufacture new products using raw materials. Metals can be classified into ferrous and non-ferrous - as shown in the figure-9, Metal classification. Awareness of this waste is a key factor to stop immediately throwing it in household garbage bags, and separate it from its source, and the process of metal recycling refers to the organized collection of different metals at the end of their life, and sorting them according to the type of metal and quality. This step is followed by processing, purification and finally making new products.

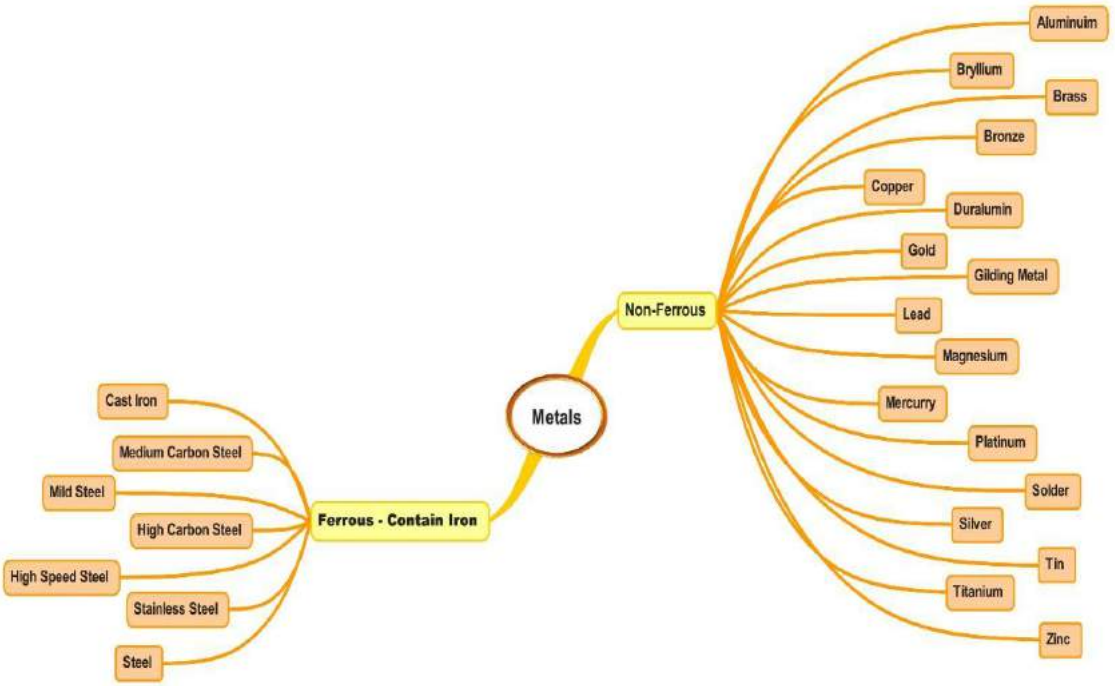


Figure-9: Metal classification

10) Sewage Treatment Residue

The issue of sewage is very necessary. Society must be made aware of the dangers of throwing all liquids, cleaning materials, oils and chemicals into sewage holes, whether in homes, salons, laboratories, garages, markets, offices, in all sources of this waste. That's because the wastewater treatment process produces a residue called sludge (or bio-solids) residue accumulated in wastewater treatment plants. Wastewater sludge is the residual solid or semi-solid material or slurry produced as a by-product of wastewater treatment processes. Here we refer to some of the main trace elements in sewage sludge: Nitrogen - Phosphorous - Potassium – Calcium-Magnesium - Arsenic – Cadmium - Chromium - Copper - Mercury - Molybdenum - Nickel - Lead - Selenium – Zinc-. Sludge pollutants include pathogens, toxic chemicals, dioxins, furans, flame retardants, metals, organochlorine pesticides, 1, 2-dibromo-3- chloropropane (DBCP), naphthalene, triclosan, nonylphenol, phthalates, nanosulfur and thousands of other substances.

Systematic and continuous community awareness will inevitably lead to the success of the waste management project.

V. RESULT AND DISCUSSION

The researcher used in a seminar entitled "Waste between Reality and Hope" at the center of a women's association for the public benefit.

In this research, he presented a study of a statistical questionnaire survey to measure the reactions about the use of mind maps in environmental awareness about waste. The questionnaire questions were as shown in Table No.: 2 which were designed for this study.

The number of respondents (64) included in this study was considered as a representative sample. Data collection was based on a paper questionnaire. Excel was used in the statistical analyses.

Table-2: A questionnaire survey of attendance was also applied to determine the most important results.

*Q	survey questions
Q_1	Age group
Q_2	Education level
Q_3	Occupation
Q_4	"Waste is a natural matter and there is no consequential harm to humans." Do you agree?
Q_5	Have you discussed this topic with friends and colleagues?
Q_6	Have you heard about the economic importance of your daily waste and that it has commercial or industrial value?
Q_7	"Establishing collection centers in residential neighborhoods to receive recyclable materials." Do you support this idea?
After this seminar	
Q_8	Have we contributed today to raising awareness of the importance of waste and its components?
Q_9	"I'm going to use mind map stickers"
Q_{10}	You as a citizen, do you have the desire now to be an effective component in benefiting from household waste
Q_{11}	You will apply the concepts of separating, reusing and stopping the purchase of harmful waste

*Q_i = Numbering questionnaire questions

III. DATA ANALYSIS

Statistical resolution analysis

Successful waste management is based on study and knowledge of a key factor that is community awareness and access to actual participation in reducing and reusing waste and separating it from its sources.

In order to find an answer to the previous questions: Statistical inference was performed as an indicator of the variables in the questionnaire data. Attention is focused when dealing with measures of dispersion about measuring the degree of difference between the different values of the quantitative variable being studied, and this is done through several different scales, each one having a measure of the degree of difference from a different corner.

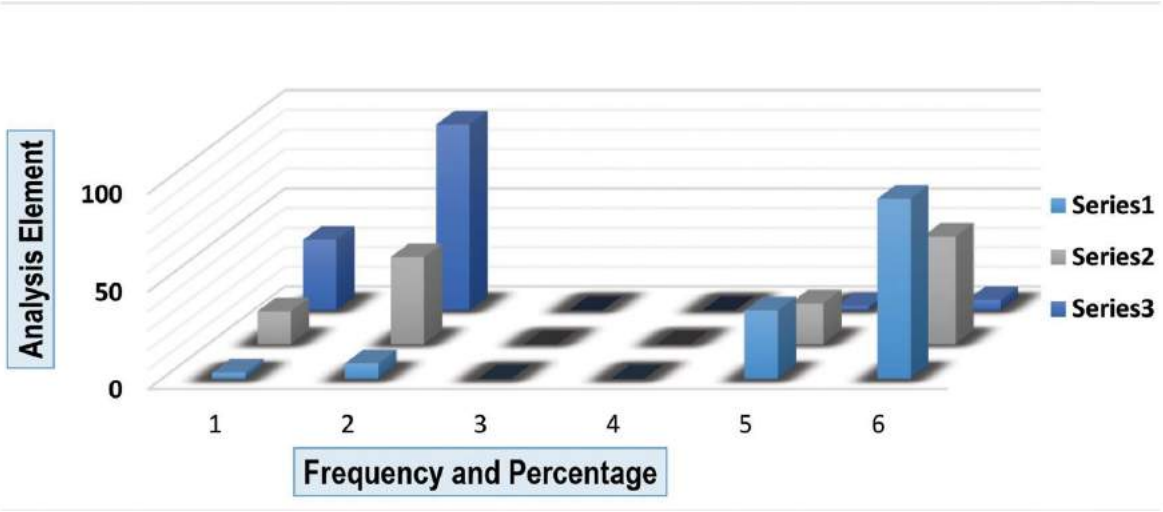


Figure-10: Statistical Inference

To obtain an accurate perception of the properties of the quantitative variable if both the measure of central tendency and the measure of dispersion are available, where measures of central tendency give a perception of the concentration of values, while measures of dispersion give a perception of the degree to which these values differ from each other. Therefore, it can be said that relying on one scale may not replace the other in the process of statistical inference figure-10, as it always results in a deficiency in the information relied upon and thus the inability to read the data statistically properly. Calculating the arithmetic mean figure-13, to express a typical value of the questionnaire data and obtaining a distinctive numerical description to describe the center of values and thus descriptive analysis of the audience's response with the lecturer, and inferring the relationships between the relevant variables in the statistical study. The results were as follows:-

- Focusing on the women's society due to the role of women in the home and their family responsibilities as a mother and wife, in addition to their role in society, has a major impact on the success of the waste management project.
- The average age of attendees was (40-50), which is a good indicator for studying the response and impact of the lecture on a segment that is the most important for the application of the study.
- The educational level and functional diversity of the attendees, a very important measure that confirms that community awareness is not limited to one group without another.
- The coefficient of variation **[**figure-12] in the variable "Question Seven: Have we contributed today to raising awareness of the importance of waste and its components" is the most dispersed variable, as the significant difference between the coefficient of variation is clear. Therefore, attention should be directed to developing and strengthening It should environmental awareness.

Figure-11,Professional Level of Attendance

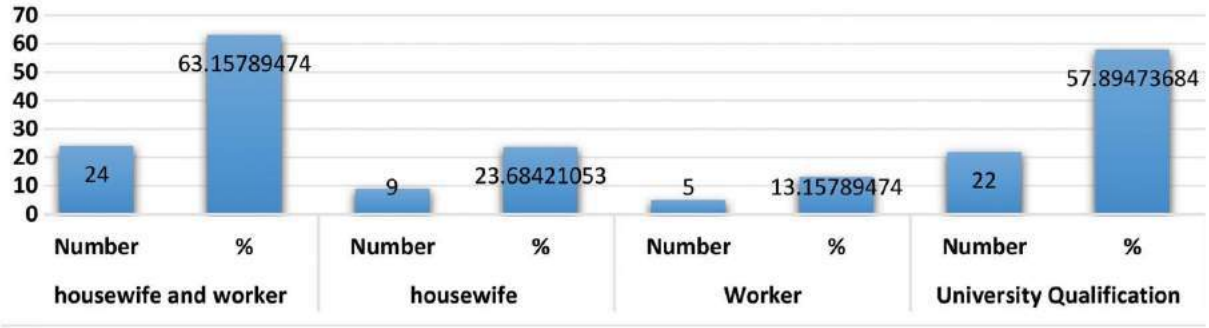
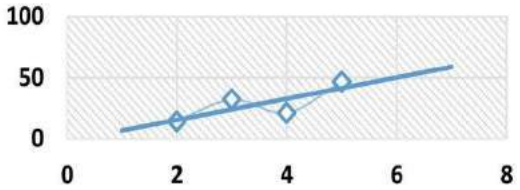
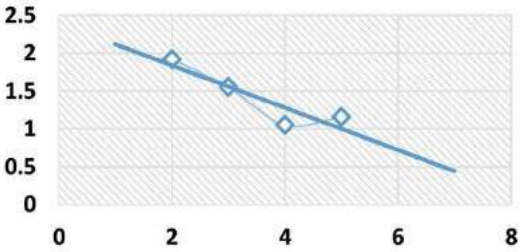


Figure-12, coefficient of Variation



- It should be noted that the summed values and the arithmetic average [figure-13] in the study community, its results indicate that the environmental awareness about the concept of waste is very close to most of the present groups, despite the different specializations and ages, to a degree that may be unnatural, which raises the fear that a stage will come in which the majority of society will become He does not care about the economic importance of waste and treat it as expired materials, if the focus is not on educating the community while continuing to develop this project.

Figure-13,Arithmetic mean

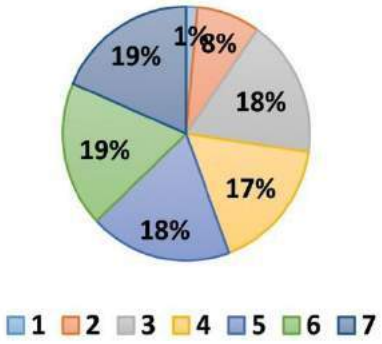


- The standard deviation figure-14, indicates that the level of public response to community participation is that individuals in communities reject the principle of neglecting waste and waste and dealing with it negatively, realizing the dimensions of this problem, and having a desire to change to the best.
- Positive answers to the last three questions (Q_8-Q_9-Q_{10}) [as shown in figure-15] confirm that:-

1. Mind maps are a successful way to simplify and explain environmental information and its circulation among people.
2. Mind maps are an effective presentation tool for understanding and simplifying information, ideas, and projects.

3. The use of mental maps as posters that are viewed daily increases the rehabilitation of the community towards participating in the successful waste management project.

Figure-15, Questionnaire Analysis



VI. LITERATURE REVIEW

We have many studies and researches that dealt with the issue of the success elements of a waste management project and how to sustain it in different parts of our planet. Here we refer to the results of some of these studies:

Justice Kofi Debrah, Diogo Guedes Vidal, Maria Alzira Pimenta Dinis -22 January 2021 Researchers have studied the problem of waste management in developing countries, identifying and analyzing knowledge and awareness of the issue of waste and its management and environmental practices on the topic. The study indicates that the level of environmental awareness of waste management issues is high among young people - high school and university students - and low among the elderly. In addition, the practical application and sound environmental practices still require joint efforts to advance them to better levels that serve the waste management project. The researchers emphasized the importance of adding concepts and practical applications to school curricula and community awareness work in order to raise environmental awareness among the elderly. The researchers stress the need to strengthen the practical and applied aspects of teachers in the field of environmental issues.

Asmawati Desa, Nor Ba'yah Abd Kadir, Fatimah Yusooff -22 November 2012 - Universiti Kebangsaan Malaysia. The UKM researchers studied a waste education and awareness strategy in pursuit of an integrated program for the success of solid waste management projects. The researchers used the questionnaire for first-year students. The results indicated that the level of knowledge, practices and responsibility on the issue of waste management is high. The study confirmed that the university has a great responsibility in the areas of waste awareness and education, and the study added to the importance of developing a strategy that raises the level of education and awareness of waste management in order to change students' habits, behavior and practices on this issue.

Tomáš, Hák, Svatava, Janoušková, Bedřich, Moldan - Prague - (2016). The researchers discussed the need for relevant indicators to activate and evaluate the sustainable development goals on the ground, and to determine the appropriateness of results and quality applications in practice. The researchers emphasized that the sustainable development goals are in fact a policy framework, but their applications are still vague and lack accurate scientific follow-up and scientific expertise to activate them. The researchers seek to prove the importance of establishing a framework for selecting real, realistic and accurate indicators to achieve the sustainable development goals through scientific and research groups, to reach clear facts to ensure that a firm and supportive basis is laid for decision-makers, politicians and the general public about the huge number of desired goals.

Researchers O. Osibanjo and I.C. Nnorom -Nigeria - (2007), They investigated the challenges facing e-waste management in developing countries, their causes and practices of developing countries and shed light on the situation in Nigeria, in addition to that, best solutions and challenges for recycling projects and implementation of a global system of standardization adopting brands of recycled electronics for export Control of Export of electronic recyclable materials (e-Scarp).

VII. CONCLUSION AND RECOMMENDATIONS

Through the research, we look forward to supporting and presenting a national initiative and under the guise of international initiatives related to waste management and environmental preservation. Where public awareness is a critical component of any waste management programmer, because waste is a result of human activities. This research paper has shed light on some of the facts and challenges facing waste education and awareness, and their obstacles. And because the communities will remain in a state of thirst for continuous awareness of the characteristics of waste as an important pillar for the sustainability of the project and cooperation to achieve the principle of the waste management pyramid, which starts from most preferable as follows: using friendly alternative, preventing –reduce- waste, reusing waste, recycling waste, treating waste, and ends with the less preferable which is dumping waste.

Among the recommendations in this research: The projects of community awareness of continuous waste through a scientific system will lead to raising awareness of the characteristics and components of waste and help keep the community motivated to participate and results, by changing the concept that garbage is an expired material to being a raw material for a new product, and an example of this Green waste is a term coined to refer to organic waste that can decompose and has a high nitrogen content. Green waste recycling is an essential activity that can contribute to reducing greenhouse gases in the environment. The recycling of green waste also reduces dumping in landfills, as well as all kinds of waste with its different characteristics can be converted into a new product.

It is one of the most important solutions. First, Design a plan with local and community administrations, including: Providing training on waste reduction, collection and recycling. With the activation of materials to spread awareness about waste. Second, developing educational curricula for all stages to produce generations who understand the size and future of the problem and the importance of actual participation. Third, forming alliances with all stakeholders and initiatives is a prerequisite and mandatory in order to ensure the sustainability of any successful waste management activity. Forth, labeling waste [identifying waste] for its hazardous components, reusing and recycling it, and the importance of reducing its use and disposal. Fifth, create an entity between researchers, technical qualifications and state sectors for waste management.

On the other hand, the desired results are

The first result: Achieving an effective ability to divert waste, recover primary raw materials, and preserve its natural resources through the means that have been developed.

The second result: Sustainable prevention of open burning of waste through a successful project of waste management and monitoring of municipal landfills.

The third result: an effective transition from waste disposal to safe alternative use - reduce - reuse - recycle - treat - recover resources.

The fourth result: Reduce waste storage.

The fifth result: Enhancing environmental behaviors that contribute to the success of the waste management project are: Using an environmentally safe alternative - environmentally friendly - recycling, reusing and reducing waste before it leaves its primary source.

The sixth result: A societal commitment to practices for environmental sustainability and access to zero waste as well as zero landfills. The trend towards a zero waste approach may be a key

measure of the success of a waste management project and ensuring environmental sustainability.

The seventh result: The actual trend towards a 'closed loop' system for sustainable waste management.

The eighth result: the development of educational curricula for all levels of education - theoretically and scientifically - and preparing for a generation that deals with waste as raw materials for new industries and instilling the concept that the life of recycling and environmental practices is longer than the life of landfills. In addition, it protects the natural resources of our planet.

The ninth result: Providing protection for human health and the environment, and protecting them in li ht of industrial develo ment.

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The Impact of Concept-Oriented Reading Instruction (Cori) on Student Achievement and Reading Comprehension Skills in Elementary Science Teaching

Lovely Mae R. Bactong & Ronnie L. Besagas

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ABSTRACT

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The initial reading comprehension level of learners based on the PHIL-IRI shows that only 29% of students fit as Independent reader, there are 40.3% of students belongs to Instructional reading level, and there are 30.6% of students fits the Frustration level of reading and comprehension skill. These results fall short of the expectation for Grade IV students, who should be reading and comprehending independently.

Keywords: concept-oriented reading instruction (CORI), Phil-IRI, achievement, reading comprehension.

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The implementation of CORI resulted in an increase in learners' reading comprehension. Students exposed to CORI have a significantly higher mean reading comprehension score than students exposed to the conventional method. The CORI has resulted to fewer learners in the Frustration level at 8.3 %. The greater percentage of learners exposed to CORI were in the Independent level at 30.6 % and the highest were in the Instructional level at 61.1%. When it comes to student achievement in science, the use of CORI is just as effective as the traditional teaching approach.

Keywords: *concept-oriented reading instruction* (CORI), Phil-IRI, achievement, reading comprehension.

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I. INTRODUCTION

Reading is the ability to understand words contained in a document and make use of the knowledge for personal growth and development [1]. This implies making meaning out of recorded information either printed or non-printed in the life of an individual. People read for different reasons and purposes, some of which include for pleasure, leisure, relaxation, information and for knowledge.

Reading is the identification of the symbols and the association of appropriate meaning with them. It requires identification and comprehension. Comprehension skills help the learner to understand the meaning of words in isolation and in context [2].

Reading is an essential tool for knowledge transfer and the habit of reading is an academic activity that increases skills in reading strategies. To know about the world and its environment, a child helps himself through reading books, newspapers and other magazines. Once the child has been taught to read and has developed the love for books, he

can explore for himself the wealth of human experiences and knowledge through reading. Children who miss the opportunity of getting in touch with books in their early stages of life find it hard to acquire good reading habits in their later years [3]. Reading is an intellectual action which is possible only if a man forms a habit of reading and practices these from childhood.

The problem most pupils in Grade 4 is their ability to read and to become an independent level reader. For an excellent performance, there is the need for the student to form good reading and study habits. At present, due to the influence of the mass media, people do not show much interest in reading books; magazines and journals, among others [4]. Many students prefer to watch movies and other shows on the television, listening to audio-CDs, watching video-CDs, among others [5]·

One of the many issues confronting students nowadays is, perhaps, not their inability to read but their lack of interest. Many learners have difficulty in science because they are passive readers, readers who receive information without understanding. Passive readers begin reading assignments without thinking about the subject. Their counterparts, known as active readers, interact with text to construct meaning. They make predictions, ask questions, generate questions, and vigorously seek answers. For active readers, reading is a means of actively pursuing knowledge. Active readers engage in metacognition, which is an awareness of how they think. Active readers use both pre-reading and during-reading strategies to enhance their comprehension. Science students need to be as aggressive reading their textbooks. They cannot merely wait for the information to diffuse over to them, because it won't happen that way. In a figurative sense, they need to attack the text. They need to ask questions and actively pursue the answers. They need to ask "Why? How? What if? Why not?" They must pursue answers to their questions and, in turn, not be satisfied with the answers. Answers to questions should lead to more questions.

Further, the learners must know how to contextualize. Contextualization is quite similar in reading history and science. A text consisting of "the cell could not be observed because it was too dark" has different meanings depending on whether it is a leaf cell or a prison cell. The type of leaf or the location of the prison also influences interpretation. These contextual effects are profoundly important to understanding a large majority of informational texts in science [6]. Consequently, it is believed that teaching these processes to graders will be useful across subject matter areas. Such broad contextualization processes that are general to science can be measured and are correlated with diverse reading required in high school and standardized tests in prior CORI studies [7],[8]. Consequently, it is the generalizable text structuring and contextualization processes widely needed in history and science reading that we incorporated into CORI.

Additionally, the researcher observed that the learners need to improve their understanding in the text they read. The result of the Phil- IRI has shown that learners in Grade IV level in West 1 District during the Phil-iri Pretest have 29% frustration readers, 41% instructional readers, 29% independent readers. However, during the Phili-iri Posttest result the learners have 12% under frustration readers, 39% instructional readers, and 49% independent readers. Though the number of the independent readers increased the District aims to have higher percent of independent readers in the Division. This is to build a foundation of the learner's reading ability in preparation for the secondary level of their education. For the first time, Philippines joined the Programme for International Student Assessment (PISA) of the Organization for Economic Cooperation and Development (OECD) in 2018, as part of globalizing the quality of Philippine basic education reform plan. The PISA results released on Dec. 3, 2018 revealed that the Philippines scored 353 in Mathematics, 357 in Science, and 340 in Reading, all below the average of participating OECD countries [9]. The study aims to determine the effect of Concept-Oriented Reading Instruction to the pupils' science academic performance and reading comprehension skills.

II. METHODOLOGY

The study employed a quasi-experimental design with a pretest-posttest. It was quasi-experimental in nature because two intact groups of respondents were used; one was the control group, which received conventional instruction, and the other was the experimental group, which received concept-oriented reading instruction. Before the experiment began, both groups completed the Philippine Informal Reading Inventory (Phil-IRI) to ascertain the learners' reading ability. The researcher-made test was used to determine the learner's cognitive achievement.

The study took place at Fr. William F. Masterson, S.J. Elementary School, which was previously known as KM 5 Elementary School. The participants were the 72 fourth-grade students during the academic year 2020-2021. The conventional group consists of 36 students, whereas the experimental group consists of 36 students. The experimental group received lessons via online concept-oriented reading instruction (CORI), whereas the conventional group received lessons via modular instruction using the Department of Education modules.

The study used a teacher-made questionnaire that was validated by three experts from the Department of Education and the University of Science and Technology of Southern Philippines. Explicit Reading Instruction has been built upon principles of Concept-Oriented Reading Instruction (CORI) which is an instructional approach that allows learners an opportunity to engage in reading informational texts when using hands-on activities and fostering collaboration. Concept-Oriented Reading Instruction (CORI) advocated by Guthrie, McRae and Klauda (2007) incorporated classroom practices that combined reading strategy instruction, motivational-engagement supports, and content goals [10]. CORI's guiding principles comprise (1) explicit instruction in significant reading strategies on a continual basis, (2) an emphasis on vocabulary development, (3) a range of coherent contents, materials and student choices, (4) reading fluency practices, (5) time for extensive reading and (6) integrated reading-writing tasks.

The Phil-IRI was administered using a standardized test developed by the Department of Education. The Phil-IRI is an informal reading inventory composed of graded passages designed to assess an individual's oral reading, silent reading, and listening comprehension abilities. These three types of assessments are designed to ascertain the learner's level of independence, instruction, and frustration.

The participants were chosen on purpose using intact group sampling for the experimental and control groups. The number of frequencies of responses for each question was used to score the questionnaire.

III. RESULTS AND DISCUSSION

3.1 Reading Comprehension Skills of Learners Based on the Philippine Informal Reading Inventory (Phil-IRI)

The Philippine Informal Reading Inventory (Phil-IRI) is a project of the Department of Education's Bureau of Learning Delivery that directly addresses the department's mission to make every Filipino child a reader. It is built around the Department's flagship program, "Every Child A Reader," which aims to make every Filipino child a reader and writer at his or her grade level. The Phil-IRI is an informal reading inventory comprised of graded passages designed to assess an individual's oral reading, silent reading, and listening comprehension abilities. These three types of assessments are designed to ascertain the learner's level of independence, instructional ability, and frustration.

Table 1 summarizes the learners' reading comprehension levels as measured by the PHIL-IRI prior to the implementation of CORI. As can be deduced, only 29% of learners qualify as independent readers. This means that approximately three out of every ten fourth-grade students at Father William F. Masterson, SJ Elementary School are capable of reading independently with near-perfect reading and

comprehension. These students are capable of reading independently of the assistance or guidance of a teacher. On the other hand, 40.3 percent of learners are classified as having an Instructional reading level. This result indicates that approximately four out of every ten grade IV students have less reading comprehension ability and are more reliant on teacher-directed reading instruction. Additionally, 30.6 percent of learners have reading and comprehension skills at the Frustration level. These are students who have difficulty reading and are unable to comprehend what is being read.

Table 1: Reading Comprehension Skills of Learners: Phil-IRI Results

	Frequency	Percent
Frustration (58% and below)	22	30.6
Instructional (59% - 79%)	29	40.3
Independent (80 % - 100 %)	21	29.2
Total	72	100

Learners in Grade IV are expected to be proficient in reading and comprehension. This level signifies that student can now read independently and with comprehension. However, 30.6 percent at the frustration level deviates significantly from the expectation. Without comprehension, reading becomes a pointless and frustrating exercise in word calling. It is not hyperbole to assert that how well students develop their ability to comprehend what they read has a profound impact on their entire lives. Thus, a primary goal of reading comprehension instruction is to assist learners in acquiring the knowledge, skills, and experiences necessary to develop into competent and enthusiastic readers. Thus, the school's goal is to have instructional readers, more independent readers, and zero frustration level readers. When there are a large number of independent readers, it results in a higher score on national and international achievement examinations. The CORI is one strategy that has the potential to significantly improve learners' reading comprehension abilities and achievement scores.

3.2 Concept Oriented Reading Instructions (CORI)

3.2.2 Reading Comprehension Skills

Table 2 presents the reading comprehension abilities of learners exposed to two different types of instruction: conventional and CORI. As indicated, the conventional teaching approach has 19 students (52.8%) who fall into the Frustration level, 7 students (19.4%) who fall into the Instructional reading level, and 10 students (27.8%) who fall into the Independent reading level. This indicates that a greater proportion of learners are reading at the Frustration level when using the conventional method. On the other hand, the Concept-Oriented Reading Instruction (CORI) has resulted to fewer learners in the Frustration level at 8.3 %. The greater percentage of learners exposed to CORI were in the Independent level at 30.6 % and the highest were in the Instructional level at 61.1%.

Table 2: Reding Comprehension Skills of Learners Exposed to the Two Learning Approaches

Level of Comprehension	The comprehension level of the pupils exposed to Conventional Wa		The comprehension level of the pupils exposed to CORI	
	Frequency	Percent	Frequency	Percent
Frustration	19	52.8	3	8.3
Instructional	7	19.4	22	61.1
Independent	10	27.8	11	30.6
Total	36	100	36	100

According to the statistical analysis shown in Table 3, the mean reading comprehension score of learners exposed to CORI is significantly higher than the mean reading comprehension score of learners exposed to the conventional method of instruction. This result demonstrates unequivocally that CORI improves learners' reading comprehension abilities. Vongkrachang and Chinwonno (2015) examined the effect of explicit reading instruction on EFL students' comprehension and engagement with informative texts using the Concept Oriented Reading Instruction (CORI) paradigm. Pupils' reading comprehension and participation increased as a result of the implementation. Additionally, there were significant differences in the mean scores of the students' pre- and post-tests. The Reading Engagement Index (REI) and Reading Engagement Checklist revealed that behavioral, emotional, and cognitive engagements improved significantly [10].

Table 3: t-Test Results on the Reading Comprehension Skills of Learners: Conventional vs. CORI

	Mean Score (±sd)	t	df	p-value
The reading comprehension level of the learners exposed to CORI	2.22 (±0.59)	2.683	70	0.009
The reading comprehension level of the learners exposed to conventional way	1.75 (±0.87)			

$\alpha = 0.05$

Explicit Reading Instruction is founded on the principles of Concept-Oriented Reading Instruction (CORI), an educational strategy that motivates students to read informative materials through hands-on activities and collaboration. Guthrie, McRae, and Klauda (2007) proposed Concept-Oriented Reading Training (CORI), which involved integrating reading technique instruction, motivational-engagement aids, and content objectives into classroom approaches. CORI is guided by the following principles: (a) continuous explicit instruction in significant reading strategies; (b) an emphasis on vocabulary development; (c) a variety of coherent contents, materials, and student choices; (d) reading fluency practices; (e) time for extensive reading; and (f) integrated reading-writing tasks [11].

3.3 Science Achievements of Learners

The mean science achievement scores of learners exposed to the two teaching approaches are shown in Table 4. In terms of impact on science achievement, the CORI is on a par with traditional teaching methods. As demonstrated in Table 5, there is no statistical difference in science achievement between groups of students exposed to two distinct instructional approaches (p-value 0.143).

Table 4: Science Achievements of Learners Exposed to the Two Learning Approaches

Teaching Approach	Pre-Test $(\bar{x}\pm sd)$	Post-Test $(\bar{x}\pm sd)$
CORI	18.15 ± 6.00	23.31 ± 6.84
Conventional	10.18 ± 7.04	27.71 ± 5.57

Table 5: Analysis of Covariance on the Science Achievements of Learners: Conventional vs. CORI

Source	DF	Adjusted SS	Adjusted MS	F-value	P-value
Pre-Test	1	1.86	1.861	0.05	0.829
Method	1	88.98	88.981	2.28	0.143
Error	27	1054.44	39.053		
Total	29	1198.80			

The above findings appear to be inconsistent with the findings about CORI in the literature regarding scientific achievement. In one meta-analysis, CORI was found to be significantly more effective than traditional instruction at improving certain cognitive variables such as knowledge acquisition and transfer tasks in life science topics [11].

The effect of CORI on student achievement can be assessed using alternative measures such as the learner's ability to answer questions, summarize and graphically organize information, rather than solely on the basis of written exam scores, which is essentially the limitation of the current study. Nonetheless, the study demonstrated the superiority of CORI over traditional or conventional instruction by significantly improving the learners' reading comprehension skills.

IV. CONCLUSION

As an intervention, Concept-Oriented Reading Instruction (CORI) has been shown to improve Grade IV students' reading comprehension skills. In reading comprehension, the group of students exposed to CORI achieved a significantly higher mean score than the group taught conventionally. In terms of student achievement in science, the CORI is just as effective as conventional teaching methods. The CORI, therefore, can be used as an intervention strategy or as an integral part of the teaching-learning process to help students improve their reading comprehension skills and academic performance.

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The Solar Alpha Particles Invading Earth and Ischemic Heart Diseases - the Worldwide Killer Number One, Connected?

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INTRODUCTION

Charged solar particles - protons and alpha particles, with different kinetic energies are constantly reaching the Earth's orbit [1]. The kinetic energy of most of them is insufficient to penetrate deep into the Earth's atmosphere. As a result of explosive processes on the solar surface, streams of high-energy particles– with the energy of the order of several MeV to several GeV, sometimes reach the Earth's orbit.

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The Solar Alpha Particles Invading Earth and Ischemic Heart Diseases - the Worldwide Killer Number One, Connected?

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I. INTRODUCTION

Charged solar particles - protons and alpha particles, with different kinetic energies are constantly reaching the Earth's orbit [1]. The kinetic energy of most of them is insufficient to penetrate deep into the Earth's atmosphere. As a result of explosive processes on the solar surface, streams of high-energy particles– with the energy of the order of several MeV to several GeV, sometimes reach the Earth's orbit.

A worrying fact is a high correlation observed between high-energy charged particle fluxes and mortality from several types of coronary (ischemic) heart diseases, which, according to the World Health Organization (WHO) statistics, is the first in the list of the 10 most common causes of death in 2016, regardless of the state's economic situation [2].

Objective: The following are examples of high correlations between annual mortality from ischemic heart diseases and the intensity of the average annual flow of positively charged high-energy particles, mainly alpha particles, reaching Earth's orbit. The examples are from different points on the Earth's surface (from the Northern Hemisphere). A possible mechanism of the observed phenomenon is discussed. An example of the short-term impact of high-energy alpha fluxes on the area around Los Angeles, affecting the short-term female mortality in the region, is explained by the proposed mechanism.

Material and Methods: Data on solar corpuscular radiation was obtained from an NOAA site – from the Geostationary Operational Environmental Satellite series (GOES) [1]. High-energy protons and alpha particles' path length through the atmosphere and corresponding energy were calculated by PSTAR and ASTAR databases and calculators [3, 4]. Data on the geomagnetic field for Bulgaria was obtained from the website of Intermagnet [5]. Data on galactic cosmic rays were obtained from the NMDB database for 5 European neutron monitors [6, 7]. Data on Sun Spot Number [8], Solar Flare Index [9,10], Coronal Mass Ejections [11], and Coronal Holes [12], were used too.

Data for mortality of ischemic heart diseases in the interval 1999 – 2019 from reliable statistical sources – WHO [2], Eurostat [13], UN data [14], Centers for Disease Control and Prevention USA [15], Our World in Data [16], Number of Deaths by Cause, by Sex, and by Usual Residence of Deceased (Region and Province), Philippines [17] were used.

Correlation and regression analysis were used to process the data.

Results: Between the annual fluxes of protons and alpha particles on the one side and the annual male and the female ischemic diseases mortality in several countries in Europe (Figure 1), North America (Figure 2), Africa (Figure 3), and Asia (Figure 4), on the other side, a high statistically significant correlation was found.

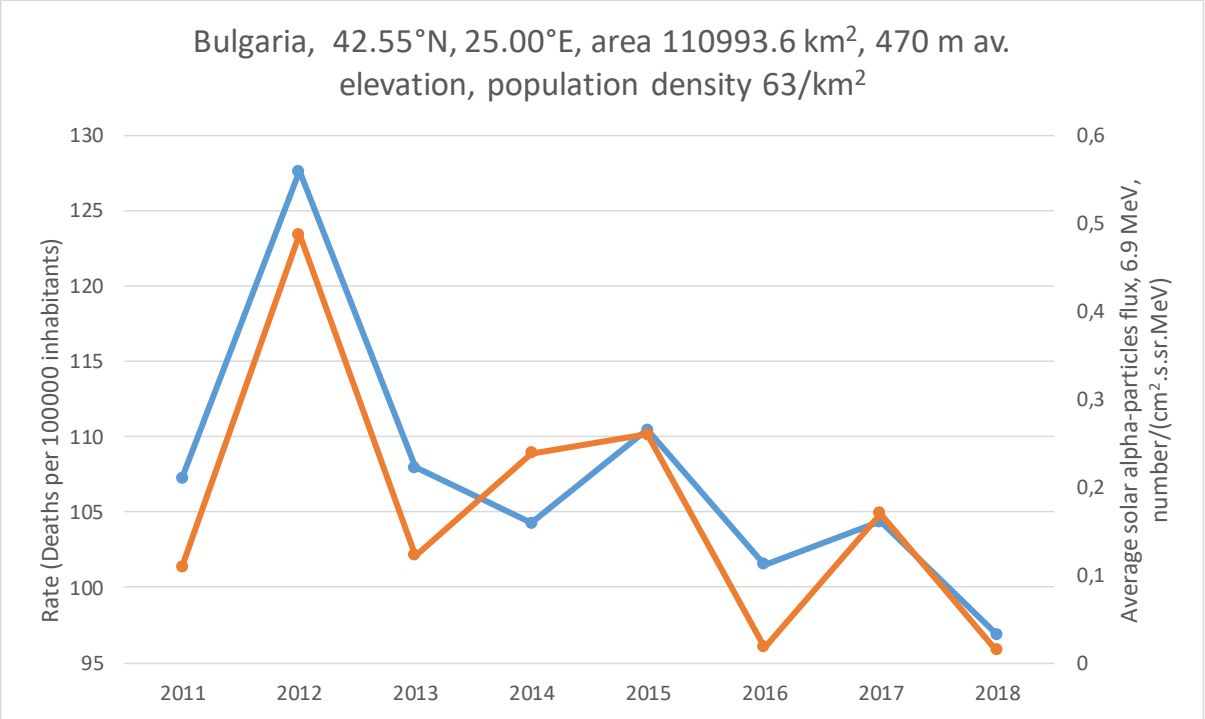

Figure 1: Correlation between females' mortality of ischemic heart diseases (International Classification of Diseases, 10th revision (ICD-10), classes I20-I25), for Bulgaria and average alpha particles flux - correlation coefficient 0,912, level of statistical significance 0,01. Mortality data are from [13], and satellites data are from [1].

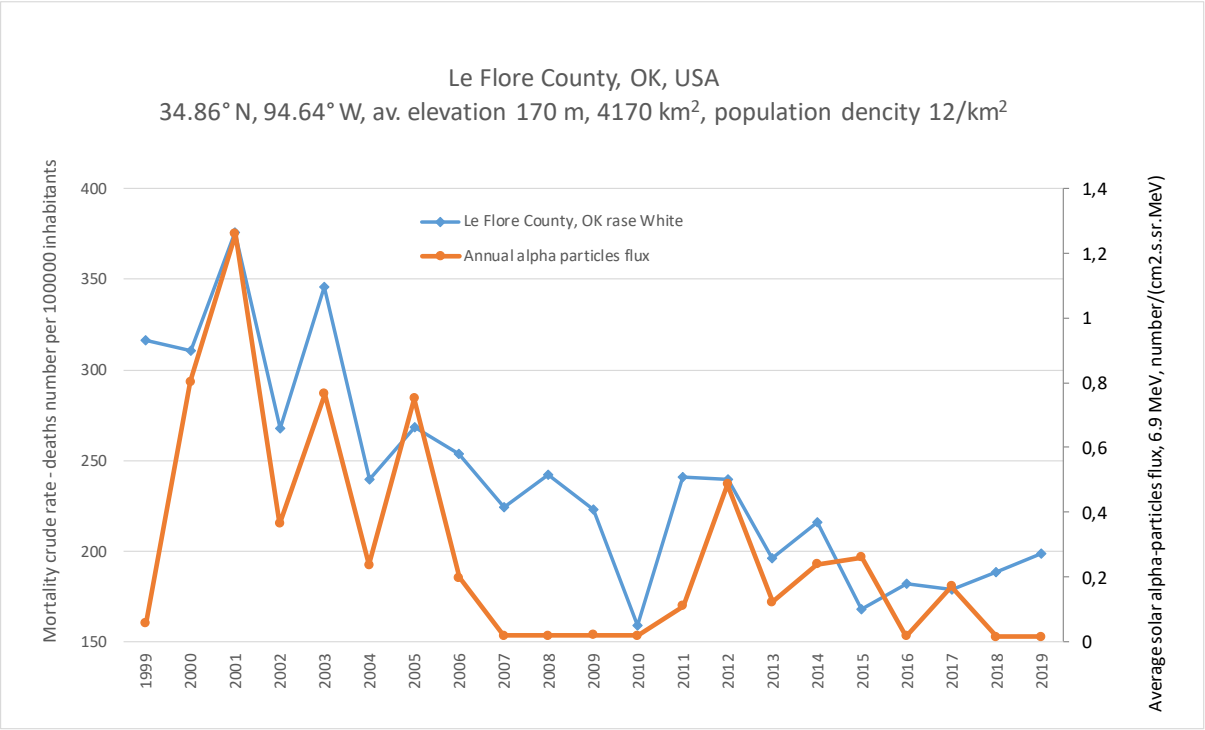

Figure 2: Females mortality from Ischemic heart diseases ICD-10, I20-I25, USA, OK, Le Flore County and solar alpha particles fluxes. Correlation coefficient 0,758, significance level 0,001. Mortality data are from [15], and satellites data are from [1].

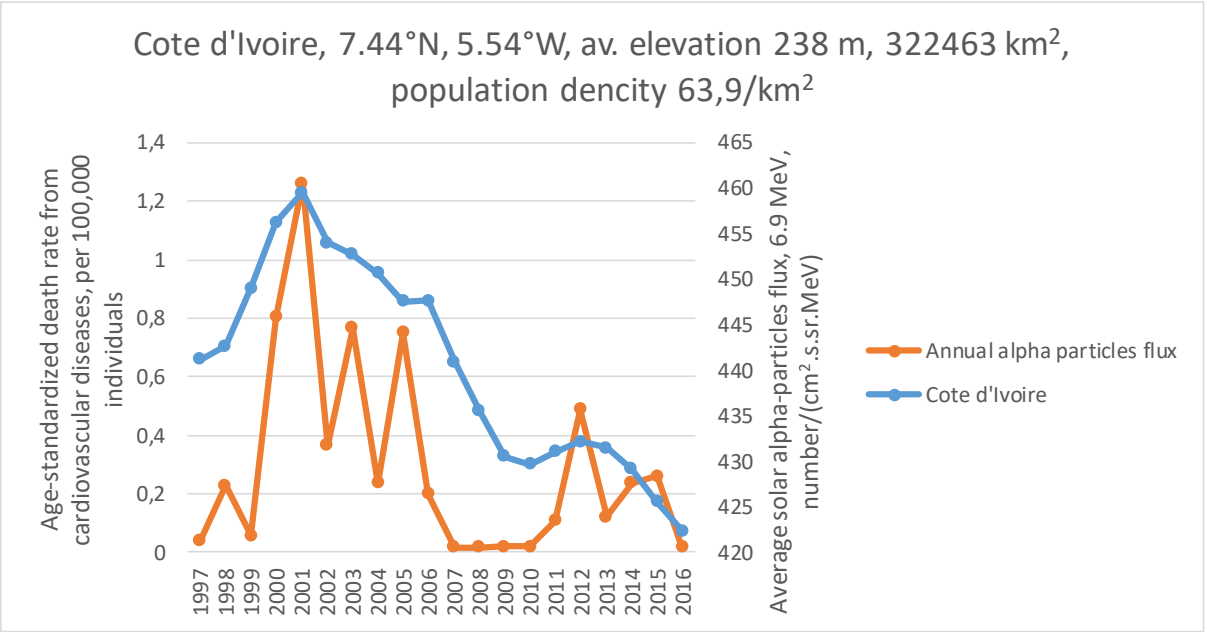

Figure 3: Ischemic heart diseases males + females mortality for Cote d'Ivoire and average alpha particles flux - correlation coefficient 0,649, significance level 0,05. Mortality data are from [14], and satellites data are from [1].

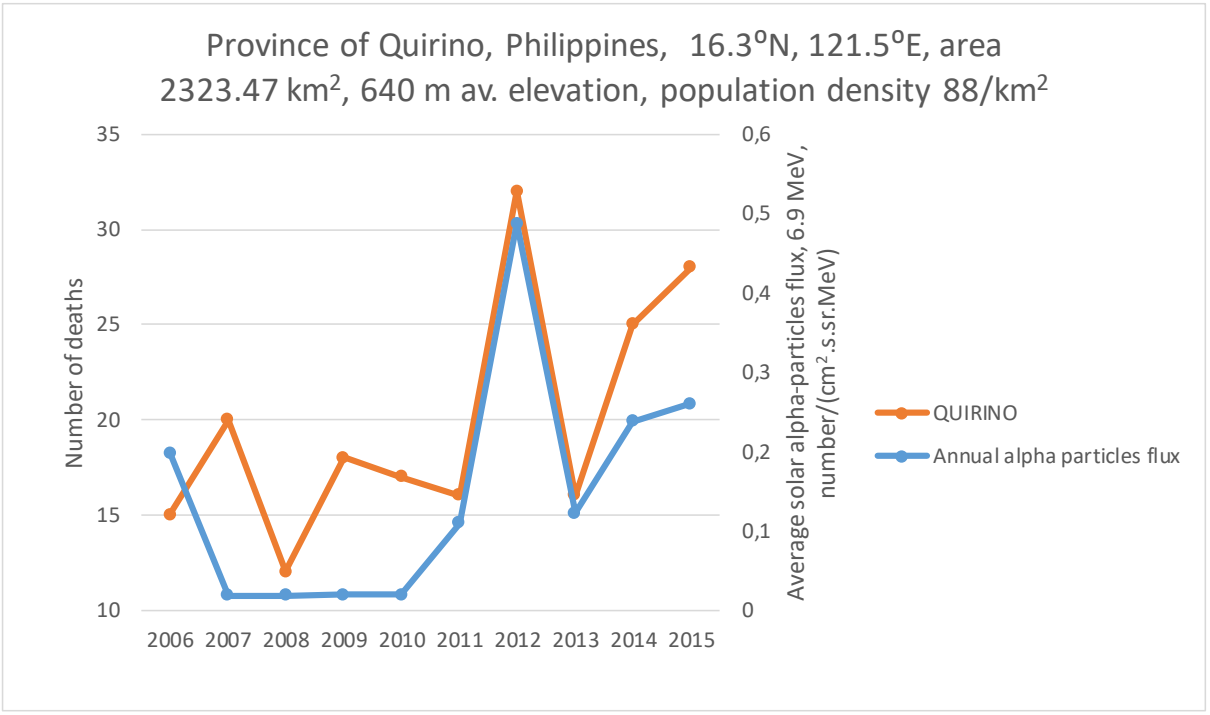

Figure 4: Females mortality from ischemic heart diseases for Province of Quirino, Philippines, and average alpha particles flux - correlation coefficient 0,815, significance level 0,01. Mortality data from [17] satellites data from [1].

A detailed description of the study is given in [18]. With the highest correlation coefficient: 0.939, a statistical significance level of 0.001, is the dependence of female ischemic heart diseases (of International Classification of Diseases, 10th revision, classes I20 – I25) on the annual alpha-particle flux for Bulgaria.

The fluxes of high-energy charged solar particles are not constant over time. Their typical duration is from hours to days, several times in the year.

No correlations were found between mortality from coronary heart disease on the one hand and geomagnetic field changes, galactic cosmic rays, solar X-rays, ultraviolet radiation, and various manifestations of solar activity [5, 6, 7, 1, 8, 9, 10, 11, 12] on the other.

Discussion: The results indicate a possible causal relationship between mortality from ischemic heart diseases and the fluxes of solar positive corpuscular radiation.

A hypothetical mechanism is proposed [18], explaining the observable data.

According to this mechanism, positively charged high-energy solar particles penetrate the atmosphere to the Earth's surface. The Earth's atmosphere is transparent for these high-energy particles in limited spots – areas of hundreds of kilometers, where: 1. At local noon (the culmination of the Sun, when the atmosphere is thinnest to be punctured by the particles) and 2. The directions of the Earth's vector of geomagnetic induction on the spot and the velocity vector of invading particles coincide (no magnetic force deflects the charged particles in their path to the surface).

The energy required for the particles to overcome the interaction with the particles in the atmosphere was estimated - from 2.5 GeV to 3.4 GeV for the protons and from 6.2 GeV to 7.5 GeV for the alpha particles [3, 4, 18]. Such high-energy particles can induce ionization and a nuclear reaction (even particles' showers) in the air and in the human body. Even a single high-energy particle could cause a series of physiological reactions in the human body, leading to heart attack and death. The contribution of these effects to the risk of mortality from ischemic heart diseases in Bulgaria was estimated at 10%, but in some countries such as Malta the share of solar positive particles on mortality from ischemic heart diseases could reach up to 40%.

The described mechanism allows for the calculation of the width of the zone of latitudes with the most intensive impact – mainly between 28°N and 48°N, but the phenomenon could be observable at latitudes outside this zone too (See Figures 3 and 4). The mechanism allows calculating the dates with increased risk depending on the latitude of the Earth's surface spots in this zone. According to satellite observational data (GOES 13), a significant flux of alpha particles with energies above 3.4 GeV is observed in geostationary orbit, while the proton flux with energies above 0.7 GeV is hundreds of times weaker. This makes it more likely to conclude that high-energy alpha particles reach the Earth's surface, and act as a trigger for blood circulatory processes that cause death.

It is not possible to predict when a stream of high-energy charged solar particles will head to Earth, but if the proposed mechanism adequately explains the phenomenon described, the days at high risk can be calculated for each latitude [18]. The wide dissemination of such information would increase life expectancy, especially for the elderly.

Los Angeles case of high-energy alpha particle flux impact on ischemic heart disease female mortality

A case of a possible effect of high-energy alpha particle flux on ischemic heart disease female mortality for the Los Angeles County, California, the United States, is interpreted below in accordance with the above-mentioned hypothetical mechanism.

The choice of Los Angeles County for the example was not accidental. 1. The region has a high population density, i.e. it was expected that the described effect would be more noticeable in the event of an influx of intense streams of high-energy solar particles. 2. The United States is

a country with a high level of medical diagnostics and perhaps the best medical statistics in the world. 3. Several intense fluxes of solar alpha particles, reaching the Earth's orbit [1] have occurred over the years in February - March when the direction of the particles' invasion was near parallel to the geomagnetic induction vector in the Los Angeles area during the Sun culmination (the local noon, Figure 5). Such events occurred in particular between March 1st and 10th, 1995 (Figure 6). The data are from the GOES 7 satellite, EPS (Energetic Particles Sensor). The data are from channel A1, registering alpha particles with energy 3.3 - 9.8 MeV. Particles with such energy cannot penetrate the Earth's atmosphere to the Earth's surface, but their flow was expected to be an indicator of the presence of high-energy particles unregistered by the satellite, emitted during the same solar processes that were caused the recorded fluxes of alpha particles.

Data for ischemic female mortality (International Classification of Diseases, 9-th revision, codes 410.0 – 413.9) was obtained through a request to the Epidemiology Unit Data Support Services, County of Los Angeles [19]. The dependence of ischemic mortality on high-energy solar positively charged particles, especially alpha particles, is more pronounced in women, although such dependence is also present in men, who die more often (and younger) than women from this group of diseases.

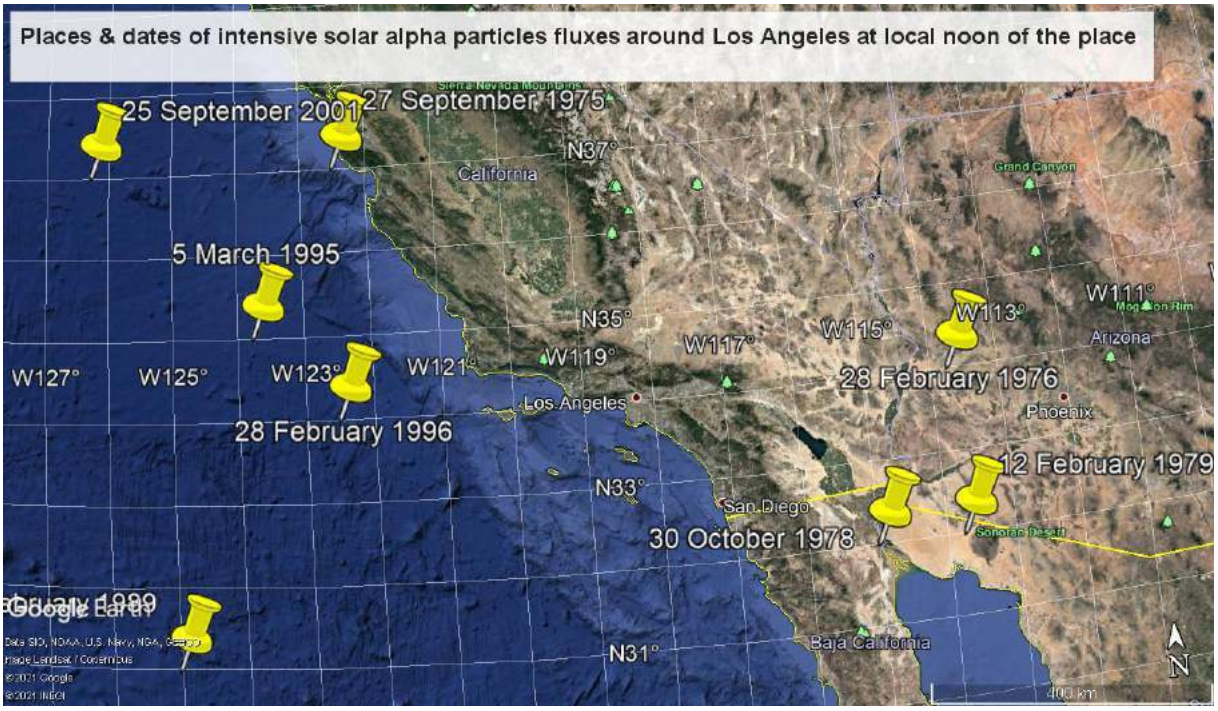

Figure 5: The events with intensive solar alpha particles fluxes over the area of Los Angeles.

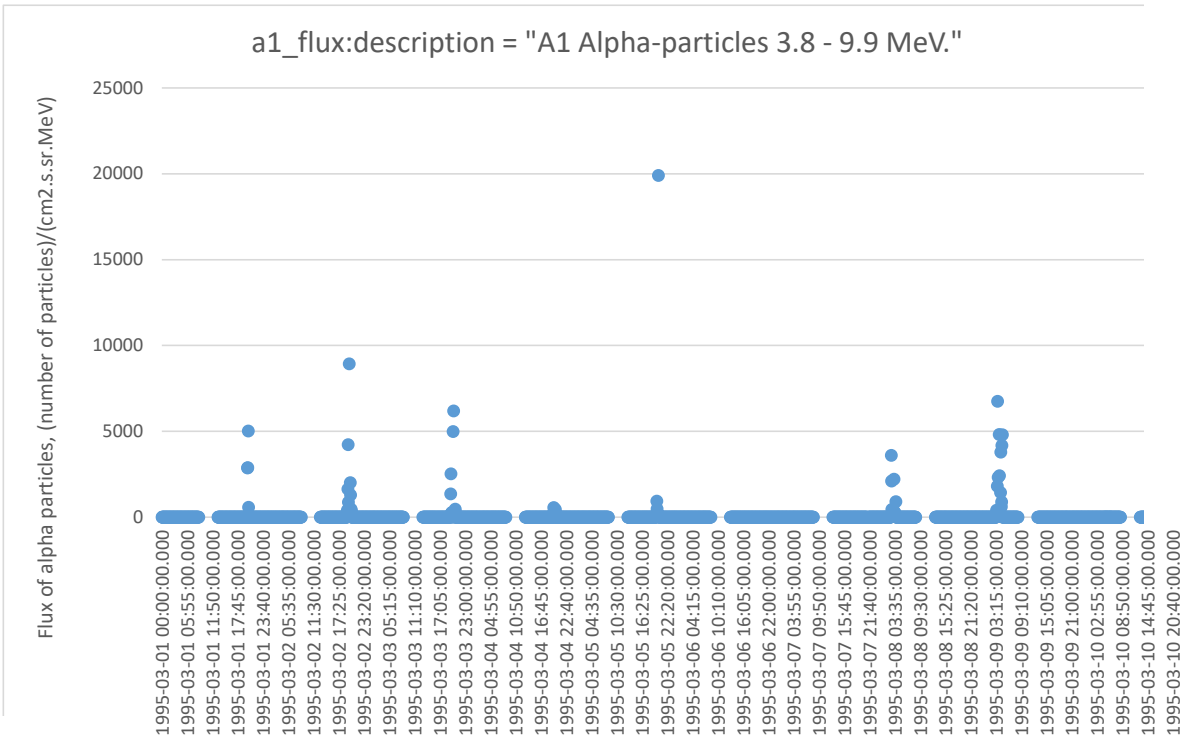

Figure 6: The events with intensive alpha particles fluxes, with maximums over the area of Los Angeles at local noon in the interval March 1st – March 10th,1995. These events were chosen because are located west of the Los Angeles area.

High-energy alpha particles reach Earth's orbit in minutes after being emitted from the Sun's surface. For example, calculations show that an alpha particle with a kinetic energy of 5 GeV reaches the Earth with less than a minute delay from the light beam emitted at the same time. Figure 5 shows the places and dates where the main fluxes of solar alpha particles took place near Los Angeles when the direction of the geomagnetic induction vector in the Los Angeles area and the direction from the area to the center of the solar disk (from where the high-energy solar positive particles could invade) coincide at the local noon. For the Los Angeles area, the geomagnetic induction vector is descending from south to north with an angle to the Earth's surface (inclination) 49^0. The culmination of Sun reaches 49^0 on 5th March. The choice of the studied time interval was made for the following additional reasons.

1. As particles with higher kinetic energy have a higher velocity, it should be expected that the impact of high-energy particles on Earth's surface would be earlier in time than the arrival of the particles, registered by the satellite (if all particles are emitted by the Sun at the same time). The estimated delay for the alpha particles with a kinetic energy of 10 MeV with respect to particles with an energy of 5 GeV is about 2 hours. That is, it is expected that the fluxes with energy 3.8 – 9.9 MeV, registered by the satellites, will be shifted to the west of about 30^0 from the presumed spot in which the high-energy particles have struck (The Earth rotates around its axis at an angular velocity of 15° per hour.) I.e. it is assumed that if an unregistered flux of high-energy solar alpha particles hits the Los Angeles area, affecting coronary mortality in the county, an indicator of this impact would be a recorded flux of lower-energy alpha particles (for example, 10 MeV), which intensity maximum would occur two hours later than that of the high-energy one, and the place above the Earth's surface would be shifted by 30^0 to the west. The events with intense alpha particles fluxes recorded on 28 February 1996 and 5 March 1995 meet this condition (In Figure 5).
2. It is assumed that people in the open are at higher risk, i.e. the probability of a direct hit of a

high-energy alpha particle on a person increases with the time spent by people outdoors, i.e. when weather conditions are more favorable (the women's day March 8 is also in this time interval). For these reasons, the March 1995 event was preferred over February 1996, as we were given the opportunity to obtain data for the only one-time interval.

Table 1 shows the results of a joint study of particle fluxes and female coronary heart diseases mortality in Los Angeles County by day.

Table 1: Column designations: 1. Date; 2. A number of Females Deaths from Ischemic Heart Diseases in Los Angeles county; 3. Differences between the diurnal number of death and the minimum death (8.3.1995); 4. Diurnal instantaneous maximum of solar alpha particles flux, registered by the satellite GOES on the geostationary orbit (particles number)/(cm².s.sr.MeV); 5. Coordinates at local noon for the registered alpha particles flow; 6. Distance from the point of the instantaneous maximum to Los Angeles, km. Figure 7 represents graphically the data in table 1.

1	2	3	4	5	6
1.3.1995	17	1	5010	W123, N34.5	443,6
2.3.1995	22	6	8930	W118, N34.5	54,1
3.3.1995	21	5	6190	W124, N34.5	532,7
4.3.1995	18	2	564	W116, N35	225,5
5.3.1995	26	10	19900	W124, N35	540,4
6.3.1995	24	8	0,0796	W169, N35	too far from Los Angeles
7.3.1995	22	6	0,0597	W16, N35	too far from Los Angeles
8.3.1995	16	0	3600	E139, N35.5	too far from Los Angeles
9.3.1995	17	1	6750	E124, N36	too far from Los Angeles
10.3.1995	17	1	10,3	E91, N35.5	too far from Los Angeles

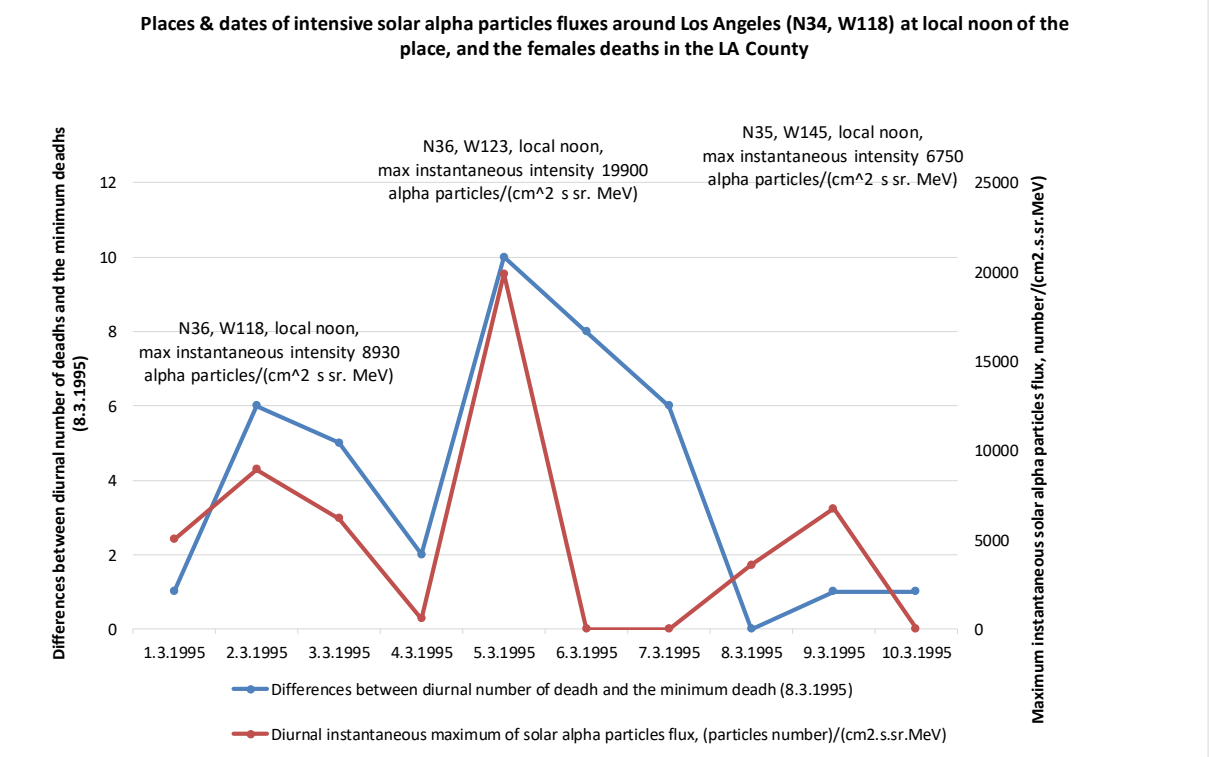

Figure 7: The solar alpha particles fluxes at local noon near Los Angeles and the female mortality from coronary diseases are highly correlated.

Los Angeles County females' deaths maximums coincide with solar alpha particles fluxes at noon in the vicinity of Los Angeles for the interval March 1st – March 10th, 1995. The number of deaths depends both on flux intensity and distance. The first flux (2.3.1995) with middle intensity, is exactly over the City of Los Angeles. The change of deaths follows exactly the change of alpha particles flows.

The second flux (5.3.1995) has the maximum intensity, it is shifted about 500 km west of the City of Los Angeles, nevertheless, it obviously impacts the number of deaths in the vicinity of Los Angeles. A gradual decrease in the deaths in the next two days after the impact is observed.

The last flux (9.3.1995) is shifted about 2400 km west of the City of Los Angeles and its deadly effect on the county is negligible.

The results support the above-mentioned hypothesis that during these solar events, which emit streams of energetic alpha particles registered by the GOES satellites, unregistered high-energy alpha particles (probably also high-energy protons) are also emitted. These high-energy particles are capable [3, 4, 18] of penetrating the Earth's atmosphere and reaching the Earth's surface in limited areas (spots) up to hundreds of kilometers in size. In such areas, the passage of particles through the atmosphere is facilitated due to the coincidence of their direction of motion with the direction of the Earth's magnetic field in the area during the local noon in the area (when the atmosphere in said direction is thinnest).

The moments of the mentioned events are unpredictable, but the probability of the Earth's surface being affected if such an event occurs is different during the year and can be calculated [18] according to the proposed hypothesis, which would save many lives, as coronary heart disease is the number one cause of death worldwide [2].

In Table 1, column 2, the number (200 in total) of female deaths from coronary heart disease for the study interval March 1st to March 10th, 1995 in Los Angeles County, is given by the day. Column 3 of the table shows the difference for each day between the number of deaths and the minimum number of cases for the interval (40 in total). Assuming that the cases listed in column 3 have been affected by high-energy alpha particles, the effect of this impact was to increase female coronary heart disease mortality in Los Angeles County by 20% over the 10-day interval studied.

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ABSTRACT

Oxygen has been shown able to be released from aqueous water when the water flows through magnetic fields. Such a production process is called magnetosynthesis and it is successful when the principle of induced current took place. Oxygen produced from this newly discovered process possessed properties differently when compared to the photosynthesis process. This study can be made when the magnetosynthesis process was carried out closed to the saturation point of oxygen dissolution equilibrium in aqueous water. At the saturation point, the exchange of oxygen atoms or molecules between these two processes has happened. This interchange state allowed a unique single steep-drop characteristic to be observed. The single steep-drop characteristic of the magnetosynthesis process provides two pieces of evidence on the properties of oxygen; they are heavier by mass and higher by oxidative power. The unique properties as discovered are supported by Einstein's Special Relativity Theory. In this matter, gamma-ray flashes are thought to produce when the hydrogen-electron pairs are formed. A mechanism where gamma-ray flashes could be produced was proposed and sufficient evidence for gamma-ray flashes to occur was outlined. The gamma-ray flashes are the clue in the inter-permutable between the mass and energy. This is the clue to let the special relativity theory take a place.

Keywords: magneto synthesis process, oxygen, oxidative power, einstein's special relativity theory, gamma-ray flashes, aqueous water.

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Production of Oxygen from Aqueous Water using the Principle of Induced Current

Part 2: Properties of Oxygen and their relationship to Einstein's Special Relativity Theory

Kin Onn, Low[α], Kee Tong, Khoo[σ], Ying Yao, Koon[ρ], Jia Xin, Chua[Ↄ] & Jia Xin, Chua[¥]

ABSTRACT

Oxygen has been shown able to be released from aqueous water when the water flows through magnetic fields. Such a production process is called magnetosynthesis and it is successful when the principle of induced current took place. Oxygen produced from this newly discovered process possessed properties differently when compared to the photosynthesis process. This study can be made when the magnetosynthesis process was carried out closed to the saturation point of oxygen dissolution equilibrium in aqueous water. At the saturation point, the exchange of oxygen atoms or molecules between these two processes has happened. This interchange state allowed a unique single steep-drop characteristic to be observed. The single steep-drop characteristic of the magnetosynthesis process provides two pieces of evidence on the properties of oxygen; they are heavier by mass and higher by oxidative power. The unique properties as discovered are supported by Einstein's Special Relativity Theory. In this matter, gamma-ray flashes are thought to produce when the hydrogen-electron pairs are formed. A mechanism where gamma-ray flashes could be produced was proposed and sufficient evidence for gamma-ray flashes to occur was outlined. The gamma-ray flashes are the clue in the inter-permutable between the mass and energy. This is the clue to let the special relativity theory take a place.

Keywords: magneto synthesis process, oxygen, oxidative power, einstein's special relativity theory, gamma-ray flashes, aqueous water.

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I. LITERATURE REVIEW

The author in their previous paper (Low et al., 2021) reported oxygen molecules can be free off from aqueous water in the case the stream of aqueous water move through magnetic fields. The authors carried out more work aimed to find out the properties of the oxygen produced from aqueous water. The authors thought that when a new natural process is discovered; there might be accompanied by some unexpected consequences. The authors examined the periodic table (Coplean. & Shrestha, 2016; Moss & Lide, 2019); the atomic mass of the oxygen was reported by scientists (Coplean.& Shrestha, 2016; Moss & Lide, 2019) is not a fixed value, indeed it is in a range. Not just oxygen; many other elements are also in a range value; however, some are fixed. Table 2 showed some examples of elements with a fixed value whereas Table 1 showed those are in a range. This analysis showed that some elements can adjust their mass although the number of protons, neutrons, and electrons in their atomic structure is the same. According to the Einstein special relativity theory, the higher the mass of an atom, the higher the stored energy in this atom. This is refer to the famous equation, $E=mc^2$. When this atom losses partial mass, it shall be transmuted into a form of energy and to be released; however Einstein did not figure out the method of how the mass of them can be reduced and the form of energy can be released. On the other hand, Einstein also did not point out how

mass can be gained from energy by transmutation.

Table 1: List of Elements with Range of Atomic Weights

At No	Symbol	Name	Minimum Atomic Wt	Maximum Atomic Wt
1	H	hydrogen	1.007 84	1.008 11
3	Li	lithium	6.938	6.997
5	B	boron	10.806	10.821
6	C	carbon	12.0096	12.0116
7	N	nitrogen	14.006 43	14.007 28
8	O	oxygen	15.999 03	15.999 77
12	Mg	magnesium	24.304	24.307
14	Si	silicon	28.084	28.086
16	S	sulfur	32.059	32.076
17	Cl	chlorine	35.446	35.457
18	Ar	argon	39.792	39.963
35	Br	bromine	79.901	79.907
81	Tl	thallium	204.382	204.385
82	Pb	lead	206.14	207.94

Source: Moss & Lide (2019) <https://iupac.qmul.ac.uk/AtWt/>.

Table 2: List of Elements with Fixed Atomic Weights

At No	Symbol	Name	Atomic Wt
2	He	Helium	4.002 602(2)
4	Be	Beryllium	9.012 1831(5)
9	F	Fluorine	18.998 403 163(6)
10	Ne	Neon	20.1797(6)
11	Na	Sodium	22.989 769 28(2)
13	Al	Aluminium	26.981 5384(3)
15	P	Phosphorus	30.973 761 998(5)
19	K	Potassium	39.0983(1)
20	Ca	Calcium	40.078(4)
21	Sc	Scandium	44.955 908(5)
22	Ti	Titanium	47.867(1)
23	V	Vanadium	50.9415(1)
24	Cr	Chromium	51.9961(6)
25	Mn	Manganese	54.938 043(2)
26	Fe	Iron	55.845(2)

27	Co	Cobalt	58.933 194(3)
28	Ni	Nickel	58.6934(4)
29	Cu	Copper	63.546(3)
30	Zn	Zinc	65.38(2)
31	Ga	Gallium	69.723(1)
32	Ge	Germanium	72.630(8)
33	As	Arsenic	74.921 595(6)
34	Se	Selenium	78.971(8)

Source: Moss & Lide (2019) <https://iupac.qmul.ac.uk/AtWt/>.

When the authors studied the available energies in science; the authors found that the most closely related form of energy that relates to the inter-transmutable concept of energy and mass as pointed out by Einstein is the gamma rays. In 1900, French chemist Paul Villard (Lucas, 2015) observed the existence of gamma rays when he was investigating radiation from radium. The gamma rays are emitted by a nucleus in an excited state. The emission of gamma rays does not alter the number of protons and neutrons in the nucleus (Maghraby, 2017). Such emission shall be accompanied by a reduction in mass. This is fundamental to the atomic bomb. A large number of gamma rays emissions were reported by Tore Straume (Straume, 1995) when atomic bombs happened at Hiroshima and Nagasaki.

Terrestrial Gamma-ray flashes were observed by scientists (Smith et al., 2005) from the earth's upper atmosphere. They were initially found out that when cosmic rays particles (mostly protons) that arrive at the top of the earth's atmosphere collide with thunderclouds shall emit gamma-ray flashes. In their further report (Dwyer & Smith, 2012), they found that even thunderclouds were not in sight, they detected gamma-ray flashes in the middle of the Sahara Dessert. They pointed out that gamma-ray flashes can be produced when there are charged particles such as electrons. Dwyer and Smith (Dwyer & Smith, 2012) did not put in conclusion the reason gamma-ray flashes can be produced when charged particles such as electrons are present. They claimed surprise for two and a half centuries scientists still have an incomplete understanding not only of how thunderclouds make gamma rays but even of how they make simple lightning.

1.1 Introduction

Upon observation that oxygen can be produced from aqueous water, the authors performed further experiments by repeating several magnetic treatments on the water stream. This aimed to study the properties of oxygen molecules that are just produced by the magnetic treatment. When more experiments are repeated up to a saturation point, oxygen captured in water due to magnetic treatment shall be saturated; perhaps at this point, a comparison between those available in the atmosphere and those in the water can be made. Such comparison can reveal the difference in properties of the oxygen.

II. METHODOLOGY

This work started with advanced filtration on normal tap water. Once tap water is filtered to drinking water quality and with low dissolved oxygen content, the proposed magnetosynthesis experiments can be carried out. All samples of water; before filtration, after filtration, and after the magnetosynthesis process was performed with advanced measurement on pH, conductivity, dissolved oxygen, and oxidative-reductive potential.

2.1. Preparation of Materials, Apparatus, and Instruments

In this research, it is vital to prepare magnetic materials with micron or nano sizes. The authors have selected iron oxides which are well known for their soft magnetic behavior and the oxides are of pigment grade so that their particle size can be small to provide a maximum number of magnetic

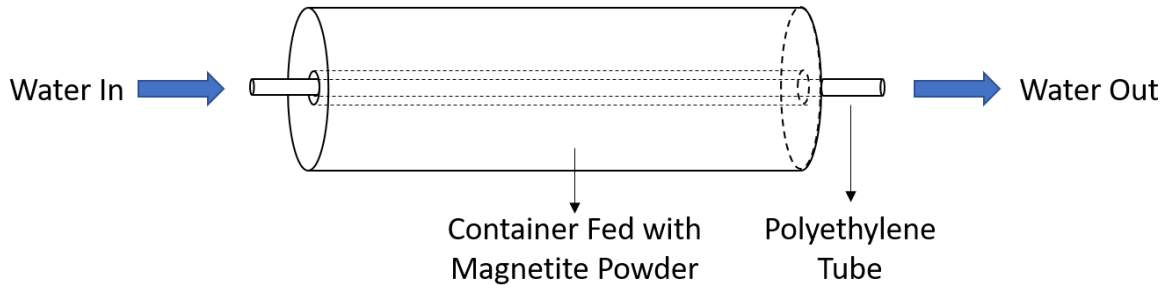
particles. The authors were used suitable apparatus to contain iron oxides so that magnetic particles can be in-placed to provide fixed sites of magnetic field for water treatment. After the water was treated with the described magnetic field, a few testing instruments were employed to obtain relevant data to support the proposed oxygenation mechanism.

2.1.1. Materials

A kind of magnetic material to represent any magnetic source was prepared in this study using micronized iron oxide particles (magnetite powder). The magnetite powder was prepared using the method described in a United States patent (Kin Onn Low, 2008) with the patent number US7347893B2 to provide the magnetic fields for the water treatment. The magnetite powder consists of 80 - 90 % Fe_3O_4 and 10 - 20 % carbon with other trace elements such as SiO_2, Al_2O_3, etc. The powder as described in the patent possessed pigmentation power to many kinds of engineering materials, such power elaborated in the patent has pointed the mean size of the powder to below 1 micrometer.

2.1.2. Apparatus: Magnetic Treatment Device

The apparatus to provide the magnetic treatment to the water was prepared by feeding magnetite powder (as prepared from Section 2.1.1) into a cylindrical container (base diameter of 6.5 cm and height of 20 cm) with an internal tubular hollow tube of 1 cm diameter at the center of the container. The hollow tube was used to accommodate a foreign polyethylene tube with a 6.35 mm internal diameter as illustrated in Figure 1. This container was constructed using stainless steel SS304.



Source: Self sketching from the experimental setup

Figure 1: Illustration of water flowing through the container fed with magnetite powder.

2.1.3. Apparatus: Water Filtration System

A system of water filtration was prepared in this study so that a water source of sufficiently clean and low dissolved oxygen content can be obtained. This is essential because relatively clean water can avoid unnecessary disturbance to the final experimental results. Aqueous water with low dissolved oxygen content is necessary for this experiment so that when oxygen frees off from aqueous water molecules, it can be identified easily by further measurements.

This water filtration system was set up by connecting filters in sequence as shown in Figure 2. The functions of each filter are listed in Table 3.

Table 3: Functions of filters

Sequence	Types of Filter	Function
1	Pre-carbon	Removal of chlorine, pigments, and heavy metals
2	Anti-bacteria Silver Carbon	Anti-bacteria and viruses
3	Alkaline Minerals Enhancer	Supply of cations minerals such as Ca, Mg, Na and K
4	Carbon Block	Removal of ethylene, dichloride, bleach, pesticide, and odors

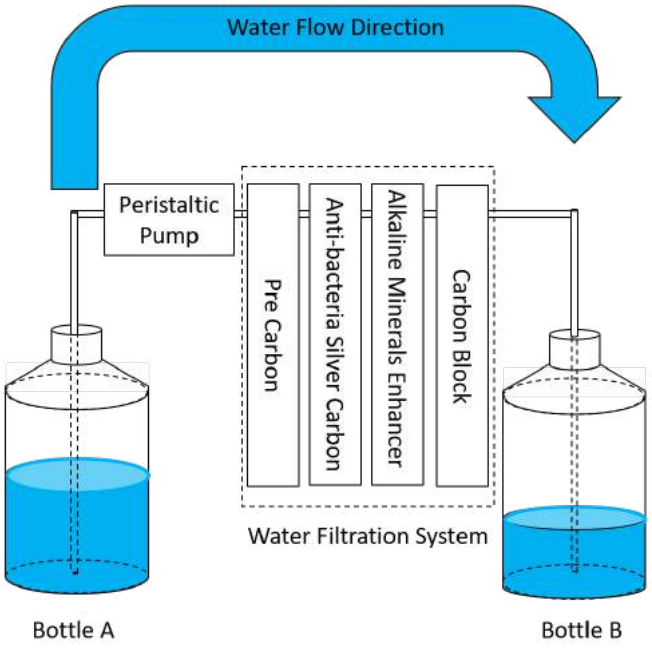
Source: Million Water Sdn Bhd <https://www.millionwater.com/technology/>

In the following discussion, the filters will be labeled according to their sequences in Table 3, i.e. 1 for pre-carbon, 2 for anti-bacteria carbon, 3 for alkaline minerals enhancer, and 4 for carbon block filter. The sequence of filters can be altered according to researchers' requirements.

2.1.4. Apparatus: Water Pumping System

The water pumping system was employed to provide flow ability to the intended water. This is essential so that the aqueous water can move from the water source to the destination. This movement is crucial to ensure the aqueous water move through the prepared magnetic field.

The water pumping system in this study was made up of 2 polypropylene bottles, 1 peristaltic pump, and polyethylene tubes with diameters of 6.35 mm. The peristaltic pump was used to pump the aqueous water from one bottle (Bottle A) to another bottle (Bottle B) using an interconnected polyethylene tube. All the fittings were tightened to prevent water from leaking during the pumping process. This water pumping system is illustrated in Figure 2.



Source: Self sketching from the experimental setup.

Figure 2: Illustration of the water pumping system with the filtration system

2.2. Experimental Procedures

The experiments can be carried out when all materials and apparatus described in Section 2.1 are ready. The experiment will start by filtering the tap water to desired properties and then follow by magnetic treatment of the filtered water. During the magnetic treatment, the production of oxygen occurs and that produced oxygen can be tested using the proposed instruments.

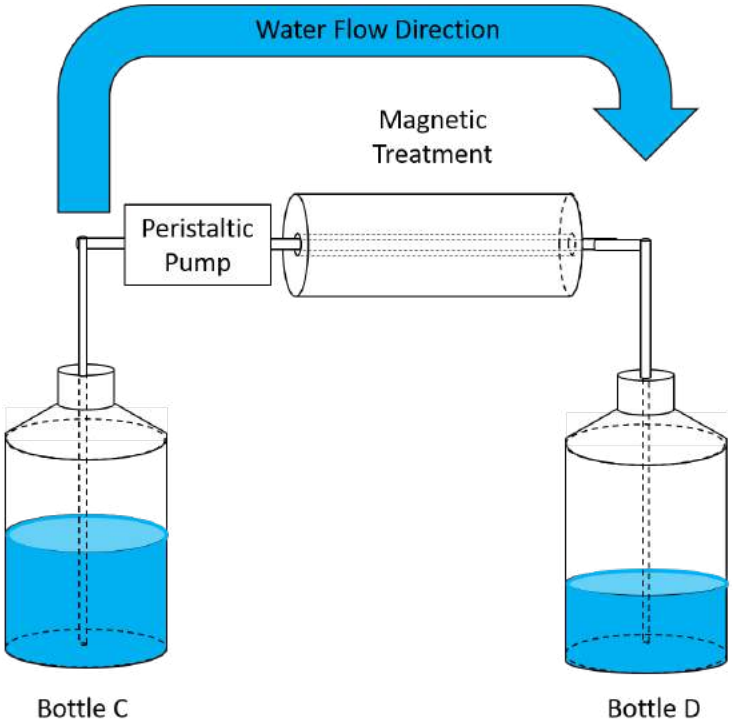
2.2.1. Filtration of Tap Water

The water source was supplied as tap water. The tap water is filtered using all 4 filters in Section 2.1.3 to serve two purposes. The first purpose is to reduce the dissolved oxygen content, whereas the second purpose is to simulate the naturally available earth rainwater which is composed of, Mg, Na and K ions (Salve et al., 2008).

2.2.2. Oxygenation Experiment (using Magnetic Field

The magnetic field was provided by the device as described in Section 2.1.2. A sample of the original water source was kept as a reference. The oxygenation experiment was conducted repeatedly from the first cycle to more cycles as shown in Figure 3. In the first cycle, aqueous water from a water source was flown to the magnetic field and collected for analysis. The production of water sources is as described in Section 2.1.4. The aqueous water sample from the first cycle was collected for analysis. This was repeated for the subsequent cycles and all collected aqueous water samples were analyzed. All results of the analysis were presented in Figure 4.

Experiments with repeated 10 cycles were conducted in this study. The interval duration between each cycle was less than 10 minutes and all relevant analyses were performed as described in Section 2.3.



Source: Self sketching from the experimental setup.

Figure 3: Illustration of the water magnetic treatment

2.3. Instrumentation

The water source as well as all samples collected in Section 2.2.2 were immediately tested for dissolved oxygen level (DO), and oxidation-reduction potential (ORP) using the instrument as listed in Table 4. All measurements were conducted using their standard operating procedures as provided by their respective manufacturers.

Table 4: Devices for water testing

Property	Device	Manufacturer
DO	ProODO Optical Dissolved Oxygen Meter	YSI
ORP	ULTRAPEN™ PT3 ORP Pen	Myron L ®

Source: Devices information.

III. THE MAGNETO SYNTHESIS PROCESS AND ITS MECHANISM

The authors in their previous work (Low et al., 2022) had discussed this mechanism where oxygen can be free off from aqueous water during the magneto synthesis process. This magneto synthesis process begins from the generation of electrons when the water, H_2O molecules move in any magnetic field. The generated electrons, e^- are negatively charged particles and thus are affinitive to the positively charged hydrogen ions present in the aqueous state. Once they are successfully paired, the system of water has lost the hydrogen ions. Such losses result in the in-situ increment in the concentration of the hydroxyl, OH^- ions in the original water molecular system, hence pH shall increase.

When x mole of the electron can be produced from the principle of induced current, the overall dissociation equilibrium of the water during the magnetosynthesis process can be represented by the following equation:-

$$H_2O_{(aq)} \rightleftharpoons x\,(H^+ \ldots e^-)_{(aq)} + (1-x)\,H^+ + OH^- \qquad \text{Eq. 1}$$

When the hydroxyl ions became excessive to the water system; the above equation can be written as:-

$$H_2O_{(aq)} \rightleftharpoons x\,(H^+ \ldots e^-)_{(aq)} + (1-x)\,H^+ + x\,OH^- + (1-x)\,OH^- \qquad \text{Eq. 2}$$

Hence x mole of OH^- is excessive to the original water system. According to Le Chatelier's principle, the excessive OH^- is forced to be dissociated according to:-

$$4OH^-_{(aq)} \rightarrow 2H_2O_{(aq)} + O_{2\,(g)} + 4e^- \qquad \text{Eq. 3}$$

These equations implied that x mole of OH^- will produce $\frac{x}{4}$ mole of oxygen molecules, however, when these equations are combined, the variable x can be omitted. The overall equilibrium of water during the magnetosynthesis process can be written as: 66

$$2H_2O \xrightarrow[\text{magnetic field}]{4\,e^-} O_{2\,(g)} + 4\,(H^+ \ldots e^-)_{(aq)} \qquad \text{Eq. 4}$$

Eq. 4 is a very important equation; it implied the following matters:

a) When $4e^-$ can be produced by the principle of induced current and can be captured by the water, Eq. 4 could take place. However, the capture of e^- by water does not happen at all times; its dependency is not known at the time moment.
b) When the capture of e^- took place, every $4e^-$ can trigger 2 molecules of water to dissociate one molecule of oxygen. This shall coproduce 4 pairs of hydrogen-electron pairs.
c) Two pairs of hydrogen-electron pairs were initially thought to combine to form a molecule of hydrogen gas consisting of 2 atom hydrogen and they share $2e^-$ at their valence shell. However, the authors had experimented by using a hydrogen meter to try to detect hydrogen production, the result was not detected. Hence, the conversion of

hydrogen-electron pairs in aqueous water to produce hydrogen gas is not yet successful. Such conversion perhaps can be assisted by other additives in the water.

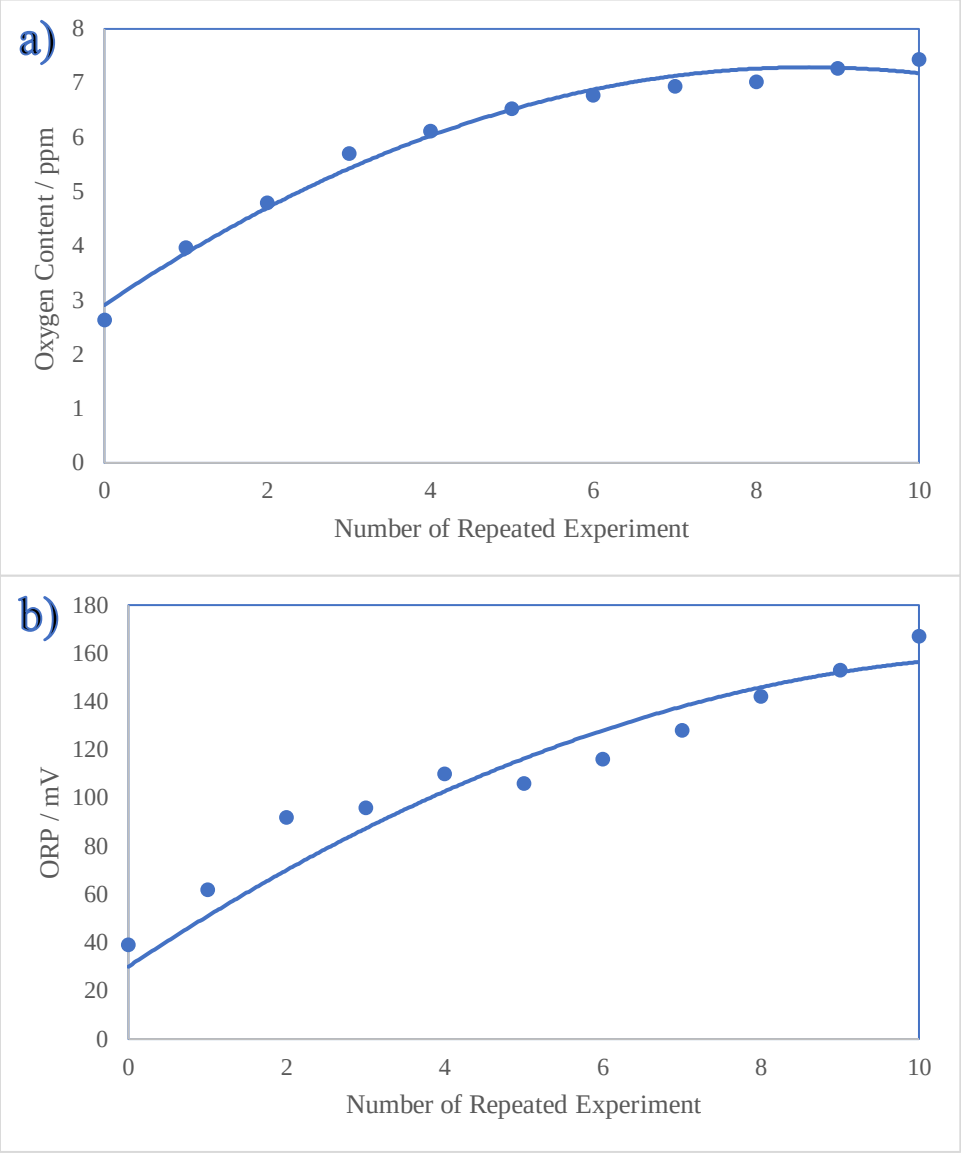
d) Since the detection of hydrogen gas were not positive; perhaps the hydrogen-electron pairs can exist in the following manners

I. The hydrogen-electron pairs will be dissociated. Such dissociation is followed by electron discharge (perhaps this is the reason for lightning) and the dissociated hydrogen ions (proton) cause the water to turn acidic (reason of distilled water or rainwater is acidic) (Kanokvalai et al., 2013; Khoon et al., 2011; Low et al., 2022). It is felt likely that such dissociation will only be triggered whenever there is a process where energy (any form of energy) is utilized, during energy utilization, electrons paired to hydrogen will be broken off and to be utilized by the process. Common processes in the discussion are lightning where massive electrons are pulled down to earth. Another process is the condensation of steam to make distilled water, where energy is to be absorbed to condense the steam.

II. In the case there is no process where energy is utilized the hydrogen-electron pairs are thought to continue to exist in the aqueous water. However, when electrons continue to be produced by the magnetic field, these electrons are affinitive to the positively charge hydrogen ions although the ion is already paired with one electron. The authors felt likely that such collision is possible due to the mass of the proton (hydrogen ion) being 1836 times the mass of an electron (NIST, 2019). Such collision to the hydrogen-electron pair will be able to produce gamma-ray flashes as proposed in Section 5 3 .

IV. RESULTS

The authors had presented the results for the production of oxygen from aqueous water in their previous paper (Low et al., 2022). These results are for 10 cycles of water flowing through the magnetic field. The authors had confirmed oxygen production each time aqueous water was flowing through the magnetic field. These results are presented in Figure 4.



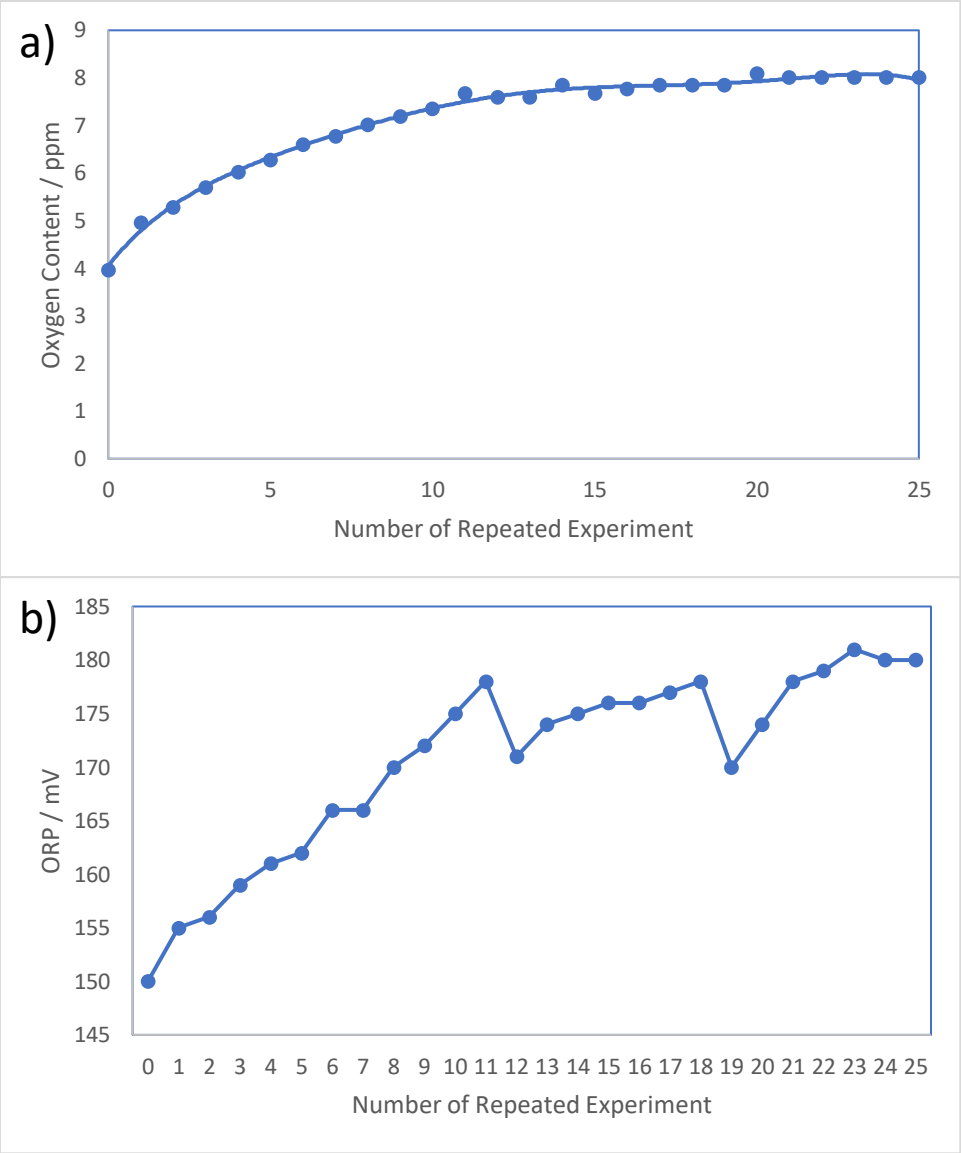
Source: Data collected from the experiment

Figure 4: Relationship of (a) DO and (b) ORP of the water in repeated oxygenation experiments

In the subsequent sections, the authors think that when the number of cycles increases by more than 10 cycles, the content of oxygen that can be produced may exceed the saturation point. The study of the properties of oxygen can be done when the oxygen produced from water started to mix with the oxygen from the atmosphere when the saturation point is approaching.

4.1 Results: Multi-cyclical Oxygenation Experiment Approaching Saturation Point

The authors think that their previous experiments as reported in Section 4.0 did not perform an adequate number of cycles for further observations and discussions. A continuous experiment was performed to obtain more cycles. The experiment was continued to 25 cycles of oxygenation event. The entire 25 cycles took about four hours to complete; this includes the measurements of DO and ORP of each cycle. The results of these 25 cycles are plotted in Figure 5.



Source: Data collected from the experiment

Figure 5: Variations of (a) DO and (b) ORP with number of repeated experiments

The sample of water that was exposed to the air (without any magnetic treatment) for 4 hours recorded an increment of oxygen content from 3.97 to 5.7 ppm, whereas the ORP increases from 150 to 173 mV. In these 4 hours, the same water source (control sample) was undergone 25 cycles of oxygenation treatment using a magnetic field. All oxygen contents in each cycle are continuously increased until they reached saturation at 8.01 ppm when the experiment progressed to the 21st cycle. Further cycles did not show further increment in DO or oxygen content; hence, saturation point was reached. However, the ORP increment has a single steep-drop-like stair at the 11th to 12th cycles. The increment showed a continuous trend until it reached another single steep-drop at the 18th to 19th cycle.

The result obtained in this multi cyclical experiment confirmed the findings In Section 4.0. The multi-cyclical experiment has once again confirmed the oxygenation mechanism in Section 3.0. In this multi cyclical experiment, the authors are in the purpose to study the oxygenation in more cycles so that the phenomenon of oxygenation during the saturation of dissolved oxygen in the aqueous water can be studied. Some unexpected observations occurred in the period

before, during, and after the saturation of oxygen dissolution in the water. The steep-drop characteristic of the curve drawn in Figure 5(b) is not coincident and it carried a lot of information for discussion in the following sections.

V. DISCUSSIONS

The observations in the multicycle oxygenation experiments up to the saturation dissolved oxygen point in the aqueous water revealed that the oxygen produced by the magnetosynthesis process possessed different properties from the oxygen normally available in the atmospheric air. The authors had observed that the oxidative power of the oxygen produced from the magnetosynthesis process is higher and this is surprised to find it out in modern science. These sections are discussed in detail the effect of this finding for future investigation and development in many new branches of science.

5.1 Discussion

The Oxidative Power and Its Relationship to Einstein Special Relativity Theory

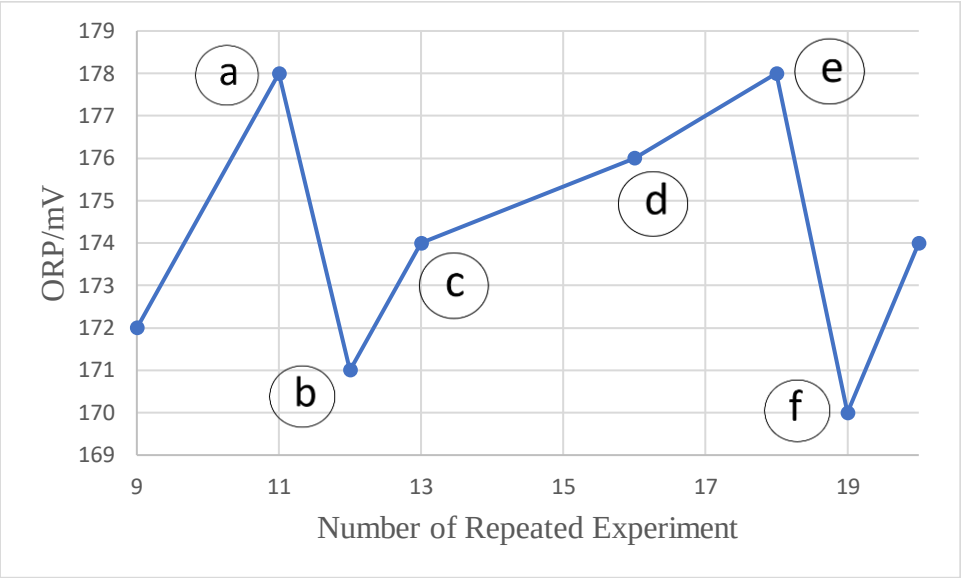
When a molecule of oxygen is used to oxidize a substance, its partial equation of oxidation can be written as:

$$O_2 \longrightarrow 2O^{2-} - 4e^{-} \qquad \text{Eq. 5}$$

In this partial equation, 4 electronic energy shall be released by one oxygen molecule as according to Eq. 5 and it is used to oxidize substances in the aqueous water and it is measured by the ORP meter as the ORP values. The positive sign of the ORP values denotes oxidation occurred. The continuous increment in ORP up to the first steep-drop which occurred at 11^{th} to 12^{th} cycles indicated that more production of oxygen contributed to higher values of ORP at each cycle. The steep-drop characteristic of this experiment indicated a drastic drop in ORP while the number of oxygen molecules continues to increase. This is anticipated that a sufficient amount of oxygen atoms that carry low oxidative energy than normally produced oxygen atoms from the oxygenation mechanism has appeared. Such appearance is extraordinary!

The steep-drop characteristic is thought to occur when massive desorption of oxygen atoms (produced from the oxygenation mechanism) happened due to the inability of the water matrix to hold the sufficiently large amount of dissolved oxygen. This inability occurs when the dissolution equilibrium between oxygen molecules in the air and the water matrix has reached the equilibrium constant. This shall occur when the system reaches a saturation state. At this state, when massive desorption of oxygen outflow to the air, there shall be a net inflow of oxygen molecules from the air to occupy some of the vacancies in the water matrix. This conclusion is made based on the Newton Third Law that the outgoing trust must be the same as the in-flowing trust. Therefore the net inflow of oxygen molecules from the atmosphere (oxygen not from the oxygenation mechanism) is thought to carry low oxidative power that contributes to the sharp drop of the ORP values. It was thought that immediately after the single steep-drop occurred, the dissolution equilibrium has been shifted lower due to the in-flow of oxygen molecules of the type of lower oxidative power. Such assumption shall not be logical in the case both types of oxygen carried the same mass. Such assumption can be made logically in the case the in-flow oxygen carried a lighter mass compare to those of out-flow oxygen. When the in-flow atoms of oxygen carried a lighter mass, there shall appear more or extra spaces to accommodate new oxygen atoms that could be produced from further magnetosynthesis processes in the future experiment. Hence, further cycles showed a continuous increase of ORP until the next single steep-drop characteristic occurred. This is because when the oxygenation experiment continues to the next cycle, those newly produced oxygen can be absorbed but not desorption and it was observed similarly in the subsequence few cycles. The same phenomenon continues to the second single steep-drop point and continues to more steep-drop points until the grand saturation of oxygen dissolution in water can be achieved. In this experiment, the grand saturation of dissolved oxygen was recorded to be 97% (8.01 ppm) as in Figure 5(a).

To explain the above observation in detail, the authors sketch the single steep-drop concentration in Figure 6 and to illustrate for an explanation as below:



Source: Data collected from the experiment

Figure 6: The graph of ORP against the Number of the repeated experiment from 9 to 20.

At point a: Aqueous water system attained equilibrium saturation level.

At point b: Excessive oxygen produced from magnetosynthesis process released to the atmospheric due to aqueous water system has exceeded saturation. At the same time, oxygen from the atmospheric air entered the aqueous water system due to Newton's Third Law.

When points b, c, d, and e are on rising trend: The rising trend indicated oxygen produced from the magnetosynthesis process could accommodate or absorb in the aqueous water system. This is evidence that more "place" available in the aqueous water system appeared so that newly produced oxygen from the magnetosynthesis process can be absorbed. The appearance of "new place" is extraordinary and this is the evidence those oxygen entered from the atmospheric air as explained in Point b possessed a smaller size or lighter mass. When examined the periodic table, evidence of higher mass oxygen does exist. Hence lighter mass oxygen was present in the air and they present in majority quantity so that those entered aqueous water systems are lighter mass.

At point e and f: Second equilibrium saturation level attained and second single steep-drop cycle commerced.

5.2 Discussion

The Einstein's Special Relativity Theory on Energy and Mass Inter-permutatable

The authors have pointed out the evidence that oxygen produced from the magnetosynthesis process possessed higher oxidative power and heavier mass when compared to common oxygen from the atmospheric air, perhaps the majority are produced from the photosynthesis process. From Eq. 5, it is obvious that when the oxygen possessed a heavier mass, the oxidative power that could be contributed by the oxygen would be higher. Hence, conclusion 5.1 was made. When the mass of an atom is concerned, the only reason the atom could gain heavier mass should point to Einstein's Special Relativity Theory. However, Einstein did not mention the method of how the nucleus of an atom can transmute to heavier mass when energy is absorbed. The authors studied the prior art, as in the literature review, it was revealed that when a nucleus is decayed, gamma

rays could be produced. Since the mass and the energy obeyed the principle of conservation, on the other hand, it can be proposed that when a nucleus received gamma rays, the nucleus could gain mass. The existence of gamma rays in aqueous water must have appeared so that the oxygen when produced by aqueous water using the magnetosynthesis process could gain heavier mass when compared to photosynthesis. Such a proposal by the authors is important to science and shall be a breakthrough in the present materials science for advanced material processing. The problem now is; why there are gamma rays!

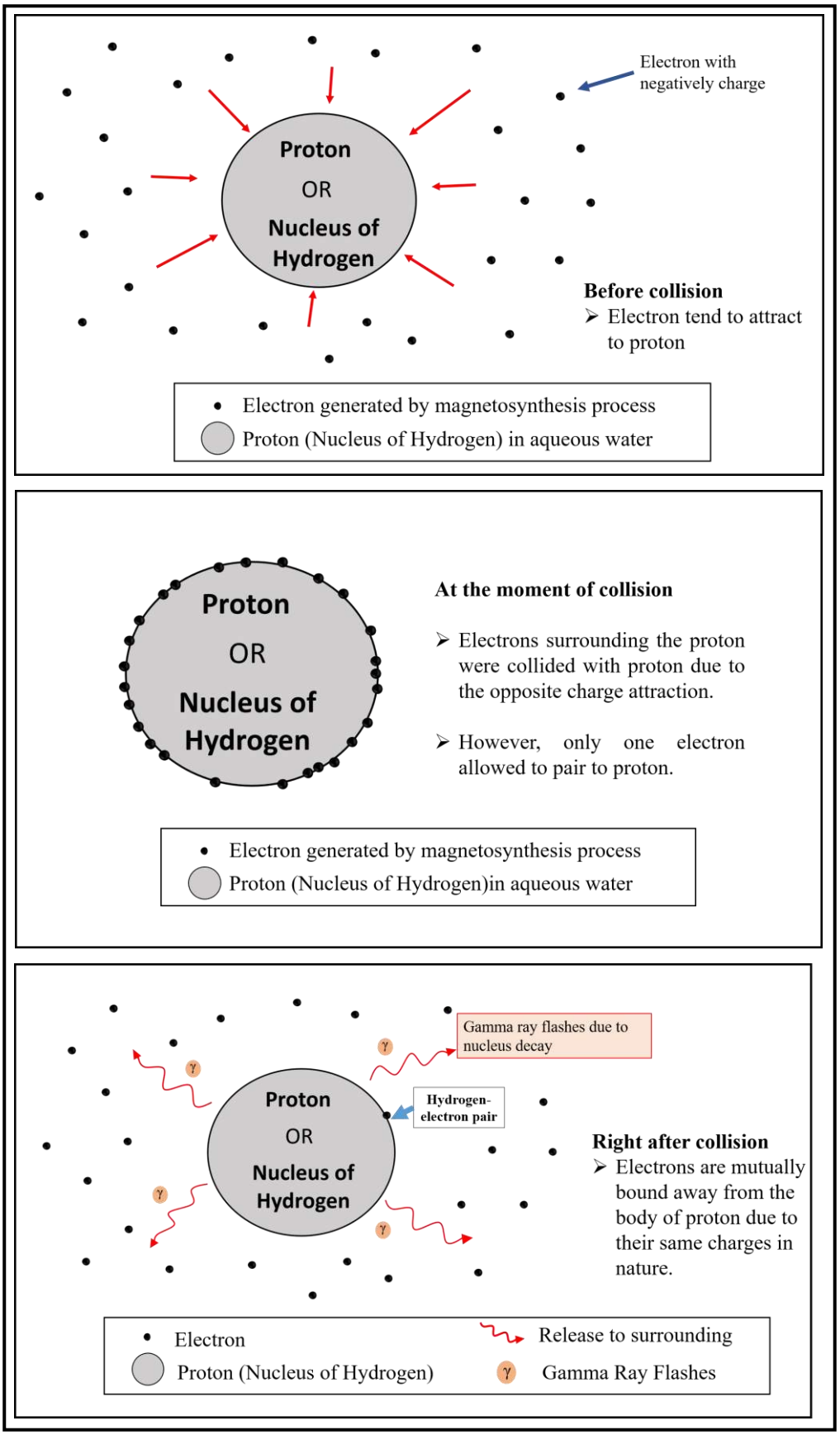
5.3 Discussion

The Proposal on Gamma Rays Production to Cause Heavier Mass and Higher Oxidative Power of Oxygen Production

It is well known that gamma rays can be produced when a nucleus is decayed. It is no doubt that in this case, the authors could point out nucleus decay happens, gamma rays must have been produced. The secret hides in the hydrogen-electron pairs that the authors have proved their formation and such formation led to the production of oxygen as reported in Section 4.0. The authors were pointed out all the facts reported in this paper were started with the principle of induced current. In this principle, a massive amount of electrons could be generated; including the one paired to the proton; however, still much more than the single one that paired to the proton.

The clue to the production of gamma rays as a result of nucleus decay lies in the size or the mass of the proton. The mass of a proton is indeed 1836 times the mass of an electron. As a result of the mass being tremendously bigger than an electron, at the moment those electrons when adhering to the proton must not only be a single electron, rather they are a lot! Perhaps 100 electrons adhere to one proton at a moment, in the next moment, when hydrogen (proton) - electron pair formed, the excessed 99 electrons shall be expelled away from the body of proton as a result of those electrons are carried the same negative charge. The said proton is a hydrogen ion and it is the nucleus of the hydrogen. Before those electrons are expelled away from the body of the proton, those electrons and the proton are in fact the constituent of the nucleus of hydrogen; hence when those electrons are leaving the proton, the nucleus decay phenomenon appeared. Those electrons when leaving the nucleus produced gamma rays; either those electrons permutated to be gamma rays energy or fresh gamma rays could be produced. Hence, many scientists discovered terrestrial gamma-ray flashes in the air [Doğru et al., 2005; Dwyer & Smith, 2012] when electrons are also present. The authors have graphically illustrated the above proposed gamma-ray flashes production mechanism in Figure 7.

The authors felt likely that when the hydrogen-electron pairs are formed, and in the case the induced current continues, more electrons are possible to adhere to the proton due to its size being huge compared to the electron. Collision of the electron could continue to occur to adhere to the hydrogen-electron pair due to the huge size difference. Such adherence to proton followed by rebound could happen several times until an equilibrium is achieved. In this method, the production of gamma-ray flashes is continuous so long as the electron can be obtained from the principle of induced current.



Source: Self sketching

Figure 7: Graphical illustration for proposed production of gamma-ray flashes by magnetosynthesis process

III. CONCLUSIONS

When aqueous water is flown through magnetic fields, the aqueous water shall be dissociated to produce oxygen molecules and hydrogen-electron pairs. The authors observed the equilibrium of the oxygen dissolved in the aqueous water when closed to saturation, it is concluded that the properties of the oxygen produced by the magnetosynthesis process possessed properties different than those available in the atmospheric air. The authors concluded the properties of the oxygen produced from magnetosynthesis are different than those from photosynthesis. It is anticipated the majority of the oxygen in the atmospheric air is contributed by the photosynthesis process. In this context, the oxidative power and the mass of the oxygen produced from the magnetosynthesis process are higher and heavier than those from photosynthesis. In this relationship, the authors discovered that not only oxygen and hydrogen-electron pairs are produced by the magnetosynthesis process, but gamma-ray flashes are also produced.

Gamma rays are widely known to be produced when a nucleus is decayed. It is also well-known that protons are the nucleus of hydrogen. As a result of the principle of induced current could produce a massive amount of electrons, the authors thought that when the hydrogen-electron pairs are formed, the hydrogen ions or the protons shall expel those extra electrons that were previously adhered to their bodies. Such expulsion is the same as the decay of a nucleus because electrons are leaving from the nucleus of hydrogen (proton). Hence, gamma-ray flashes are produced.

The authors also thought that for Einstein's Special Relativity Theory to take place, gamma rays are the clue in the inter-permutable role for mass and energy. When the mass permutates to energy, gamma rays will be produced, and vice versa. Hence, when gamma-ray flashes are produced by the hydrogen-electron pairs, the oxygen when received the gamma-ray flashes, the oxygen gain mass. This is the reason for the difference in properties when oxygen is produced from magnetosynthesis compared to those produced from photosynthesis.

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