

Ocean Energy with Linkages to Earth's Environmental Mechanisms, and Approach to a Total Renewable Energy Structure Plan

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Abstract

The universal force of attraction between all matter fundamentally governs Earth's environmental systems, particularly through the influence exerted by the Moon's orbit and the concept of gravitational forces. This relationship creates complex interactions among energy flows and planetary ecosystems, including processes such as photosynthesis, geothermal activity, biogeochemical cycles, and hydrological systems. These dynamic processes contribute to both the stability and evolution of Earth's systems. The Moon's gravitational force is pivotal in regulating tidal movements, which significantly impact marine ecosystems and coastal environments.

Covering more than 70% of the planet's surface, the oceans remain in perpetual motion due to Earth's natural environmental mechanisms, serving as extensive reservoirs for kinetic energy resources on a global scale. The advancement of fluid mechanics in scientific research offers significant potential for sustainable energy development, supporting long-term human well-being. The vast kinetic energy resources are available for mankind, once additional methodologies have been developed for near future projects.

However, human activities are increasingly affecting major ecosystems and the biogeochemical cycles they regulate, highlighting the urgent need for systematic identification and analysis. This situation calls for the implementation of new international regulations addressing climate change and ocean related environmental challenges that pose substantial risks to all forms of matter on Earth. It is essential to reassess current human approaches to natural biogeochemical cycles in accordance with established physical and chemical principles, including considerations informed by the modern understanding of the Periodic Table.

Keywords: Environmental Mechanisms, Fluid Mechanics, Boundary Conditions, Stratification, Kinematic Viscosity, Energy, Biogeochemical Process, Matter, Periodic Table

1. Introduction

The universal force of attraction between all **matter** dominates Earth's environmental mechanisms, with the Moon's location prominent.

This **gravitational** concept embraces the intricate relationships between energy flow and the planet's ecosystems, such as photosynthesis, geothermal activity, biogeochemical cycles, and hy-

drological cycles. Indeed, it provides an approach towards a better understanding of these mechanisms in a sustainable manner.

Long-term sustainable energy may only be achieved through a permanent (24/ 7) total supply of green renewable energy, harnessed from earth's natural energy forces. Over two thirds the surface of the planet is available, and Man now holds the knowledge to address such a global project. Proven fluid mechanics techniques,

monitored and controlled by the latest ‘advanced project management solutions’ (APMS)¹ represent the approach towards formulating a global structure plan for harnessing the kinetic energy stored in our Oceans. This to co-ordinate a framework for a range of proposed methodologies for harnessing energy, covering both the coastal waters and the high seas.

The United Nations held a Convention on the Law of the Sea in 1982, to set out a legal framework for the Seas and Oceans, to define the rights and obligations of Countries with respect to the marine environment and in 2023 formed an Agreement on the Conservation and Sustainability use of Marine Biological Diversity of Areas Beyond National Jurisdiction, which is not in force until ratified by 60 Countries², of the 143 Countries who have signed the Treaty. The 60 Countries ratification was achieved on 19 September 2025, and in accordance with article 68(1)³ the Agreement comes into force on 17 January 2026. For each state or organization, a following 30 days are required for individual acceptance.

At present the Agreement lacks any structure for essential jurisdiction to support the harnessing of huge quantities of the earth’s stored kinetic energy.

2. Oceans⁴

The Sun’s energy is directly responsible for the **stratification** process to earth’s oceans, which creates the environmental mechanisms to produce layers of transition boundaries through the ocean’s depths, vital for all marine life, as we know and understand it.

In Lakes and small bodies of water, the warm surface layer is less dense and forms a **thermocline boundary condition**, above which is the ‘epilimnion’, with the cooler water disconnected below as the ‘hypolimnion’. In the Oceans, the thermocline’s environmental mechanism is influenced by the depth of the ocean’s waves, which creates a mixing process boundary layer condition in the upper 100 metres. The temperature decreases rapidly from the mixed upper layer of the ocean (epipelagic zone) to the much colder deep water in the thermocline (mesopelagic zone).

Below the thermocline are colder, denser waters, and below 3,300 feet to a depth of about 13,100 feet, the water temperature remains constant⁵. The deeper (stratified) layers contain colder, denser bottom waters where rare and unknown life forms exist⁶.

The relationship between depth and temperature is significant, as different marine species thrive in specific layers. *This environmental mechanism may be a key area for studying the origins of life.* Creatures who live at great depths do not have air in their bodies such as the swim bladders found in fish that live in more shallow waters. Without air in their bodies, the pressure problem is solved. Fish, crab, octopus, worms, limpets and clams are just some of the creatures found in the depths of the oceans⁷.

Despite its central role in the global climate, the Southern Ocean

circulation is still one of the least understood ocean circulation systems of the planet⁸The term El Niño (Spanish for ‘the Christ Child’) refers to a warming of the ocean surface, or above-average sea surface temperatures, in the central and eastern tropical Pacific Ocean⁹. The low-level surface winds, which normally blow from east to west along the equator (“easterly winds”), instead weaken or, in some cases, start blowing the other direction (from west to east or “westerly winds”). El Niño recurs irregularly, from two years to a decade, and no two events are exactly alike. El Niño events can disrupt normal weather patterns in the United States and globally.

The structural intricacies of ocean layers are further influenced by nutrient cycles and biological activity. In the epipelagic zone, where sunlight penetrates most effectively, primary producers like phytoplankton perform photosynthesis, generating the foundation of oceanic food webs. These upper layers are teeming with life due to nutrient *upwelling, a phenomenon driven by ocean currents and the movement of tectonic plates.* As depth increases, the availability of sunlight diminishes, creating stark contrasts in biodiversity and energy dynamics between the epipelagic and mesopelagic zones.

The mesopelagic zone, often referred to as the “twilight zone,” hosts unique adaptations among its inhabitants, such as bioluminescence and specialized feeding mechanisms, enabling survival in low-light conditions.

This zone also serves as a transitional environment where carbon and nutrients are sequestered, playing a critical role in the global carbon cycle.

For example, phytoplankton, which are tiny plant-like organisms, flourish in sunlight-rich zones, whereas, zooplankton, which feast on these nutrients, occupy various depths depending on the time of day.

The ‘high seas’ is in perpetual motion, embracing vast kinetic energy resources¹⁰, sufficient for long-term sustainability, and the Oceans are earth’s ‘natural **Energy Storage** reservoirs’ for all mankind. Man’s Science is now sufficiently developed to co-ordinate and organise a Structure Plan embracing the additional methodologies¹¹ to harness all earth’s natural energy resources, based on ‘Fluid Mechanics’ concepts.

2.1. New Environmental Laws¹² to embrace the high seas vast energy resources are beyond the scope of this paper, but mention should be made that the high seas remain beyond national jurisdiction, at this time, and the new laws, when ratified, will require expansive amendments in future to embrace these natural energy resources.¹³

2.2. Coastal Management: A ‘Global Environmental Coastal Management Structure Plan Model’ is urgently required, to combat ‘climate change’ and other serious anthropological effects, which cause serious harm to the footprints of the ‘continental shelves, their margins’, and the less saline coastal waters. The

concept for ‘Integrated Coastal Zone Management’ (ICZM) was first introduced at the national policy scale in the Coastal Zone Management Act (CZMA), enacted by the Congress of the United States in 1972, though a Master Plan for coastal management remains incomplete.

An expansive structured framework is necessary, which must identify new important limbs, for a co-ordinated ‘Global Coastal Plan Structure’, namely, Environment / Total Renewable Energy / multi-national Legislative regulatory powers. The three branches to embrace existing main topics are identified as, coastal erosion, flooding, pollution (rivers discharges controls & beach), shoreline management (SMPs), ecology and habitats, climate change, and coastal adaptation also linked to potential energy tidal projects.

2.3. Ocean Pollution: Major harm is already taking place to the Oceans which represent the majority of our planet’s surface, resulting from anthropogenic behaviour. While ‘Climate Change’ has been clearly identified, it is equally important to highlight, embrace and address the two severe forms of Man’s pollution, and intrinsically linked to earth’s environmental mechanisms, causing real damage, namely Plastics and ‘aggressive Agricultural processes.

2.3.1. Plastics: The ‘Resolution adopted by the United Nations Environment Assembly’ on 2 March 2022, to ‘End plastic pollution’¹⁴, recalled the United Nations Environment Assembly resolutions 1/6, 2/11, 3/7, 4/6, 4/7 and 4/9.

They affirmed the urgent need to strengthen global coordination, cooperation and governance to take immediate action towards the long-term elimination of plastic pollution in marine and other environments, and to avoid detriment from plastic pollution to ecosystems and the human activities dependent on them¹⁵.

“The Intergovernmental Negotiating Committee to develop an internationally legally binding instrument on plastic pollution including the marine environment”, noted with concern the high and rapidly increasing levels of plastic pollution.¹⁶

Major quantities of plastic accumulate in our Oceans, particularly in huge subtropical oceanic areas called ‘gyres’. – these are massive circular currents that trap floating debris for decades¹⁷.

The draft ‘Chair’s Text’¹⁸, stated, in December 2024, the objective of this Convention is to protect human health and the environment from plastic pollution.¹⁹

2.3.2. Water Pollution from Agricultural land sources remains the major pollution discharge from rivers and estuaries into coastal waters²⁰.

3. Environmental Mechanisms

Environmental Mechanisms, embracing Photosynthesis, Geothermal activity, Biogeochemical cycles, Hydrological systems, and including fluid mechanics. techniques.

3.1 Fluid Mechanics²¹: Under man’s perceived mechanism, *if a fluid is moving slowly, within a constrained space, a shear stress is created within the liquid, called ‘viscosity’*. **Sir Isaac Newton**²² referred to this as the **‘coefficient of molecular viscosity’**²³.

*“All forms of life on earth are immersed in a fluid or another, either the air of the atmosphere or the water of a river, lake or ocean; even soils are permeated with moisture. So, it is no exaggeration to say that life, including our own, is bathed in fluids. A slightly closer look at the situation further reveals that it is the mobility of fluids that makes them so useful to the maintenance of life, both internally and externally to living organisms”*²⁴

Even Earth’s solid inner core is surrounded by a perceived molten outer core²⁵, though remains outside the general principles of Man’s science, and beyond the scope of this paper. (Reference, Endnote: *a general perception*, in Addendum 3)

The study of ‘matter’ and its transformations²⁶ is not merely academic; Man’s Laws of Science needs to underpin technological advancements and solutions to pressing global challenges, such as renewable energy and long-term sustainable resource management.

3.2. Matter is anything that occupies space, has mass, and is made up of substances called **elements**, which are composed of extremely small particles called **atoms**²⁷, and have specific chemical and physical properties. Man’s Science classifies three ‘body states’ of matter as, gaseous / fluid / solid states, with the Science **‘Fluid Mechanics’**²⁸, embracing gaseous as elastic fluids.

Man’s Science explains the **atom** structure as comprising, protons, neutrons, and electrons, *perceived within a sphere of influence*, controlled by ‘attraction’ and ‘repulsion’ forces, *and not by a boundary condition around that perceived sphere of influence*.

3.3. Size (Space): Man has no ‘real perception’ of size related to the world’s surroundings and our environment. He is unable to understand the sheer magnitude of the Universe when related to the conceived size of the perceived atom, and is beyond the scope of this paper, except to mention a general observation in *Addendum 1, Endnote*.

The complete tabular array of all **chemical** elements is classified under the **‘Periodic Table’**²⁹. The structure co-ordination of the chemical elements, organized by **atomic number**, is from the element with the lowest atomic number, hydrogen, to the element with the present highest atomic number, ‘oganesson’³⁰.

The fundamental elements interact dynamically to form **molecules**, which are the building blocks of matter. For example, water (H₂O), a critical molecule for life, exhibits unique properties like high ‘specific heat’ capacity, ‘cohesion’, and ‘surface tension’, *which are essential for regulating Earth’s climate and supporting ecosystems*.

3.4. Energy / Matter Interactions

Energy, the capacity to do work, is intricately connected to matter.

In physics, the 'Law of Conservation' states that *energy cannot be created or destroyed but only transformed*. This principle governs natural processes and Classifications³¹, from the photosynthesis that powers ecosystems, through biogeochemical processes, and to the *geothermal activity driving tectonic shifts*.

Fresh approaches towards a long-term Sustainable future: The connection between energy and matter is crucial in understanding Earth's systems and environmental mechanisms, as it determines the flow of nutrients, *the cycling of carbon*, and the dynamics of climate regulation.

4. Global Long-term Sustainability Energy Project (Embracing Environmental Mechanisms)

At last, Man has the knowledge to develop new innovative methodologies required to harness earth's natural energy resources. Vast kinetic energy reserves are available in the high seas, which cover over 70% of the surface of earth.

4.1. An early example of Man's Innovative ideas, was recorded in the late 60s, following research work into 'fluid mechanics' relating to 'thick liquids' for municipal sewage sludges. Research studies³² were successfully carried out on site to ascertain the effective range of '*kinematic viscosity*' of 'thick liquid' municipal sludges, embracing the importance of 'boundary conditions', and 'shear stress' mechanisms within a fluid. (Table 1) The kinematic viscosity of water was recorded at 0.000012 ft²/sec. (Reference Appendix 1) A research paper³³ was presented to the UK, Institution of Civil Engineers in 1971 and awarded recognition in July 1972. The results were adopted in the Leicester City Corporation's Sludge Disposal Project design works, to replace temporary facilities with a permanent structure, adjacent to their Compost Plant, and was successfully completed in 1970.

Table 1 furnishes the range of 'Kinematic Viscosity' figures used in the Design Works calculations for their successful "*Sludge Tankering Project*" at Leicester City Corporation's Wanlip Sewage Treatment Works.

% solids	Calculated Kinematic Viscosity	Required pipe size	Time for 1,000 galls to flow to reservoir
2.39	.0007 ft ² /sec	Transitional	Zone
2.67	.001 ft ² /sec	-	-
4.27	.00552 ft ² /sec	6" dia	22.85 mins.
4.27	.00552 ft ² /sec	8" dia	7.12 mins.
4.27	.00552 ft ² /sec	12" dia	1.44 mins.
4.27	.00552 ft ² /sec	15" dia	.585 mins.
4.45	.011 ft ² /sec	6" dia	46.00 mins.
4.45	.011 ft ² /sec	8" dia	14.32 mins.
4.45	.011 ft ² /sec	12" dia	2.88 mins.
4.45	.011 ft ² /sec	15" dia	1.175 mins.

**Range of Kinematic Viscosity values for Municipal Sludge
- Wanlip STW Sludge Project, 1971
(Imperial Units)**

Table 1

4.2. Ocean Methodologies & Legislation: With the Advent of the 'Biodiversity Before National Jurisdiction' (BBNJ)³⁴ Agreement being ratified, further important legislation is now required to embrace the additional methodologies for harnessing the natural kinetic energy storage in the Regional High Seas.

This Agreement recalled the relevant provisions of the United Nations Convention on the Law of the Sea (UNCLOS)³⁵ of 10 September 1982 and covered just the global surface for the territorial sea and its contiguous zone³⁶.

New legislation must include the regional areas of the High Seas for coastal nations, and to be embraced under the UNCLOS 'high

seas sections'³⁷, to embrace the methodologies for harnessing natural kinetic energy storage zones.

4.2.1.) One methodology to identify is in the 'Epipelagic Zone'³⁸ of the high seas, which could embrace the traversing of sailing vessels over vast areas. *Example: Fluid mechanics design techniques to be adopted to provide hulls of ships to be fitted with equipment during their passage journeys through the surface waters, to 'create / collect / Hoover / transfer / store' the continuous kinetic energy produced.* Major Energy Companies³⁹ to then be set up to prepare programmes / schedules for multiple passages across the *regional seas*, with destinations to multiple energy ports within the separate coastal management zones.

4.2.2.) Slope Currents contiguous to the Continental Shelves.

- Japan's Kuroshio currents: Japan's coastline, due to unstable Tectonic plates, appear unsuitable for fixed turbines to the seabed. Reference 'Experimental verification of a floating ocean current turbine with single rotor for use in the Kuroshio current.'⁴⁰

- European "Slope Current around the British Isles, is a potential location for a European Slope Current Project, embracing stabilised bathymetric seabed profiles⁴¹.

4.2.3.) A more comprehensive range of identified methodologies are furnished in *Appendix 2 – Information Sheet – Ocean Methodologies*.

5. Summary, and Linkages to Relevant Environmental References

The Incompleteness and uncertainties of Man's Laws of Science towards a Long-term Sustainable Future have revealed much about the complexities of Earth's systems, and they also underscore the fragility of our small planet. By highlighting the principles of matter, energy, and environmental mechanisms, a sustainable future may be envisioned. This involves not only technological innovation but also a harmonious integration of human activities with the planet's natural cycles, ensuring that the balance essential for life is maintained for generations to come.

Pressure: Relentless increase in 'pressure's mechanism' throughout Earth's Ocean depths produce multiple linkage to other mechanisms, creating ever evolving environmental conditions which may be key areas for studying the origins of life as we currently understand it. Life's stratified layers, down to the Mariana Trench depth, are vital research areas for mankind.

Vast Kinetic Energy resources are available, once additional methodologies have been developed, to harness earth's natural energy resources, as it will provide a long-term sustainability for all mankind, once the World's legislation has been ratified, restructured and brought into force⁴². An approach towards a Structure Plan Model for Oceans total energy methodologies is recommended, based on proven modern project management services techniques. (APMS)⁴³.

Fluid Mechanics embraces the major 'environmental mechanisms'⁴⁴ within 'Man's Science', and is an essential tool to analyse, review, monitor and understand the actions and integration linkages' related to the multiple range of earth's mechanisms.

A new Global Organization must be established for the protection, care and maintenance of our planet, structured across the five

Definition: “A fluid is matter in a readily distortable form, so that the smallest unbalanced external force on it causes an infinite change of shape, if applied for a long enough time”¹.

Newton’s Laws of motion²:

1st Law: Motion of object remains constant unless a force acts upon it.

2nd Law: force of an object is equal to its mass times its acceleration

3rd Law: two objects apply forces to each other, equal magnitude / opposite direction.

A **Newtonian Fluid**, such as water is perceived to operate in the ‘**turbulent flow**’ zone range, with sufficient velocity to create the turbulent state. *Reference: ‘Thin Liquids’.*
Materials with different physical properties, are termed **Non-Newtonian Fluids**. Dense ‘thicker’ liquids are perceived under ‘**laminar flow**’ range. *Reference: ‘Thick Liquids’.*

Viscosity: fluid’s resistance to flow, (thickness of a fluid.)

Viscosity calculated in the Laboratory, known as **Absolute Viscosity**

Dynamic density calculated in the field, called the **kinematic viscosity**³.

Boundary Layer conditions create Inertia Force on fluid in motion.

Reynold’s No = Ratio of Forces perceived in fluid motion, [*Inertia force / viscous force.*]

Note: Can only be used for one type of boundary face, a rugosity of circular pipe.

‘Boundary Layer’: Influence on fluids flowing in circular Pipes:

‘Thick Liquids’ – Laminar flow zone properties – **Re No.** below 2300 Reynolds Number (applicable to flow in pipes only). Smooth flow conditions through circular pipes. C/S pipe velocities: 0 to Max^m in Centre. Flow conditions perceived as *shear stresses* on very large number of the ‘shear rings’ motion through the contiguous shear rings.

‘Thin Liquids’ – Turbulent flow zone properties set of curves based on pipe bore roughness.

Universal pipe friction diagram chart, adopted for pipes of all diameters and roughness, and for all velocities and ‘kinematic viscosities. The uncertain theory requires a transitional zone chequered pattern, between the 2 zones.

Laminar Flow: Poiseuille⁴ law or Poiseuille equation, is a physical law that gives the pressure drop in an incompressible and Newtonian fluid during **laminar flow** passing through a long cylindrical pipe of constant cross section.

Turbulent Flow: Darcy⁵ Equation is a **theoretical** equation that predicts the frictional energy loss in a pipe based on the velocity of the fluid and the resistance due to friction. It is used almost exclusively to calculate head loss due to friction in **turbulent flow**.

End Note: Temperature has a major effect on the viscosity of any fluid.

Information Sheet

12 September 2025

Subject: Additional Methodologies to harness Ocean Energy in the Regional High Seas⁶.

 Augmentation of present Methodologies to harness vast kinetic energy resources in the High Seas⁷.

Proven performance of existing methodologies (Continental Shelf)*(1. La Rance⁸ Tidal Power Station / 2. MayGen⁹ Tidal Power Station)*1. *Tidal Range Projects* in coastal waters

Sihwa Lake Tidal Power Station is the world's largest tidal power installation, with a total power output capacity of 254 MW Megawatt. (When completed in 2011, it surpassed France's 240 MW La Rance Tidal Power Station, which was the world's largest for 45 years.) It is operated by the Korean Water Resources Corporation.

2. *Tidal Stream Projects* in coastal waters

MayGen Tidal Energy Project, continues to break records, delivering over 37GWh of clean and predictable renewable energy¹⁰.

“In December 2024, the final turbine of the four turbines for Phase 1 were deployed, and therefore the site is now fully operational. This means that the site is delivering 6 MW of power”¹¹.

3. Thermal energy – due to the temperature gradient between the sea surface and deepwater can be harnessed using different Ocean Thermal Energy Conversion (OTEC) processes.

4. Salinity Gradients: At the mouths of rivers, where fresh-water mixes with salt water, energy associated with the. Salinity gradient can be harnessed using pressure-retarded reverse osmosis process and associated conversion technologies.

Classification requirements for High Seas expected methodologies to harness Kinetic Energy resources in Oceans.

5. Epipelagic Zone (mixed layer) : *Ocean Passage collection projects* in regional high seas.
Reference 6.2.(i)

Mesopelagic Zone – restricted to transition zone for carbon sequestration.

6. Slope currents contiguous to continental shelves.¹²

Continental Slope Stream Projects

5. Arctic Ocean¹³ Deepwater current along Oceans' transition zone

Deep Stream Oceans Projects.

References:

Energy Act 2023. General reference: Schedule 16 – Mergers of energy network enterprises.
 Reference, Part I - New Domestic Law, Patentability, Inventive step.

Historical Information:

- Plastic was first developed in mid-19th Century as replacement for natural materials such as ivory and tortoiseshell.¹⁴
- 1st Synthetic plastic, called celluloid. – created by John Wesley 1869. First produce photographic film, later consumer products: combs, buttons, billiard balls, etc.
- Early 20th Century, invention Bakelite. This paved the way for mass production of plastic products.
- Plastic packaging became most visible use of plastic in our daily lives. Environmental Impact. Can take hundreds of years to decompose.
- Plastic in Food and Beverage Industry. -keep food fresh and prevent spoilage.

Ocean Plastics – Useful information:

- Nearly half plastic sinks because of low buoyancy.
- Other half floats – majority does not go far out to sea. 80% beach on coastline within month.
- HDPE¹⁵ likely to travel long distances.
- Plastic accumulates in huge subtropical oceanic areas called gyres. -massive circular currents that trap floating debris for decades.
- 5 gyres in our oceans. Great Pacific Garbe Patch(GPGP) , in North Pacific, between Hawaii & California. (Estimated twice size of Texas.)
- Around 100 million kilograms of plastic estimated in (GPGP)- 1.8 trillion pieces larger than 0.5 mm. About 8% of the mass is microplastics.

Microplastics are plastic pieces that measure less than five millimetres across. (Some microplastics have formed by breaking away from larger plastics that have fragmented over time. Others have been made small intentionally, for example cosmetic microbeads used in facial scrubs.)

Plastics. In the Ocean: <https://noc.ac.uk/under-the-surface/ocean-plastics>

Reference: Conventions & Assemblies:

United Nations Environment Assembly of the United Nations Environment Programme
UNEP/EA.5/Res.14

Distr.: General 7 March 2022

‘Intergovernmental Negotiating Committee to develop an international legally binding instrument on plastic pollution, including in the marine environment’

1 December 2024

CHAIR’S TEXT1

Addendum: Beyond the scope of this paper – General reference only – linked to other papers through the footnotes.

Addendum 1: Perceived Structure of the Atom

Perceived Definition: Atoms consist of a **nucleus** containing **protons** and **neutrons**, surrounded by **electrons** in shells. The numbers of *subatomic particles* in an atom can be calculated from its atomic number and mass number¹⁶.

Man's Science: *Atoms are perceived to be extremely small, positively charged nucleus surrounded by a cloud of negatively charged electrons.* The nucleus is perceived to be less than one ten-thousandth the size of the atom the nucleus contains more than 99.9% of the mass of the atom¹⁷.

Size: A convenient unit of length for measuring atomic sizes is the angstrom (Å), defined as 10^{-10} metre. The radius of an atom measures 1–2 Å. Compared with the overall size of the atom, the nucleus is even more minute. It is in the same proportion to the atom as a marble is to a football field. In volume the nucleus takes up only 10^{-14} metres of the space in the atom—i.e., 1 part in 100,000. A convenient unit of length for measuring nuclear sizes is the femtometre (fm), which equals 10^{-15} metre. The diameter of a nucleus depends on the number of particles it contains and ranges from about 4 fm for a light nucleus such as carbon to 15 fm for a heavy nucleus such as lead. Despite the small size of the nucleus, virtually all the mass of the atom is concentrated there.

Perceived Structure: The protons and neutrons form the atom's central nucleus.

(The ordinary hydrogen atom is an exception; it contains one proton, but no neutrons.)

Protons have a positive electrical charge.

Neutrons are electrically neutral—they carry no charge.

Circling the nucleus is a cloud of Electrons, which are negatively charged.

Perceived like opposite ends of a magnet that attract one another, which binds them to the nucleus.

*The nucleus is small and dense compared with the electrons, which are the **lightest charged particles in nature.***

The electrons circle the nucleus in orbital paths called shells, each of which holds only a certain number of electrons. The outer shell is the valency shell¹⁸.

An ordinary, neutral atom has an equal number of protons (in the nucleus) and electrons (surrounding the nucleus); thus, the positive and negative charges are balanced.

Some atoms, however, lose or gain electrons in chemical reactions or in collisions with other particles.

Ordinary atoms that either gain or lose electrons are called ions. If a neutral atom loses an electron, it becomes a positive ion. If it gains an electron, it becomes a negative ion.

These basic **subatomic particles—protons, neutrons, and electrons**—are themselves made up of smaller substances, such as quarks and leptons.¹⁹

As Perceived through quantum physics: The electron wave is uniform in all directions from the nucleus, is peaked at the centre of the atom, and has the same phase everywhere. Higher energy levels in the atom have waves that are peaked at greater distances from the nucleus.

Quantum Physics definition: Atoms, the smallest particles of an element that exhibit the properties of that element, consist of negatively charged electrons around a central nucleus composed of more massive positively charged protons and electrically neutral neutrons.²³ Jun 2019

Endnote: *Perceived as a shell, or wave? Or created, or formed by another undiscovered energy theory?*

Addendum 2:

UK Agricultural legislation controls reference chart²⁰

Specific Reference: Sam Boyle, The case for Regulation of Agricultural Pollution.

Protecting our Water, Soil and Air, A Code of Good Agricultural Practice (DEFRA, 2009), Chapter 4 (Replaces 3 Codes - Water / Air / Soil)

Manure Management Plan: a step-by-step guide for farmers (DERA, 2003)

Water (Prevention of Pollution) (Code of Good Agricultural Practice) Order 2009, SI No.46

Water Resources (Control of Pollution) (Silage, Slurry and Agricultural Fuel Oil) (England) Regulations 2010 (SI 2010 No.639)

Water Resources (Control of Pollution) (Silage, Slurry and Agricultural Fuel Oil) (England) (Amendment) Regulations 2010 (SI 2010 No.1091)

Explanatory Memorandum (the SSAFO Regs)

protection of waters against pollution caused by nitrates from agricultural sources. (91 /676/EEC).

**Implementation of the Nitrates Directive in England
7th Report 2007-8**

From Council Directive 91/676/EEC (OJ L375, 31.12.1991, P1)



The Nitrate Pollution Prevention Regulations 2008 No. 2349

Explanatory Memorandum



The Protection of Waters against Pollution from Agriculture - Consultation on Implementation of the Nitrates Directive of 2013 - 2016 (December 2011)

Fulfils Defra's obligations under the Directives to carry out a review every 4 years of its designations of Nitrate Vulnerable Zones (NVZs)

Guidance on complying with the Rules for Nitrate Vulnerable Zones for 2013 to 2016



Nitrate Pollution Prevention Regulations 2015, (SI 2015 No.668)



Nitrate Pollution Prevention (Amendment) (No.2) Regulations 2016 (SI 2016 No.1254)



Environmental Permitting (England and Wales) Regulations 2010 SI No. 675

Environmental Permitting (England and Wales) Regulations 2016 SI 1154

Regs 12, 38-41, 44 and Schedule 21



Reduction and Prevention of Agricultural Diffuse Pollution (England) Regulations 2018 (SI 2018 No 151)

Explanatory Memorandum (enforced by EA)



Floods and Water (Amendment etc.) (EU Exit) Regulations 2019 (SI 2019 No.558)

Regs 13 &16 cover and amend SI 2010 No.1091 / NPPR 2015

Reg 4 amends s93 WRA 1991, to ensure it's 'fit for purpose' review every 4 years begins on 1st January 2016

Earth's Environmental mechanisms embrace earthquakes and Volcanos, which is beyond the scope of this paper, except to mention their influence on Man's science theories.

Seismology: *the scientific study of earthquakes* and the generation and propagation of **elastic waves** through planetary bodies. Predicting earthquakes is the Holy Grail of seismology, **but despite intensive research, not a single warning sign has proved reliable.**²¹

The speed at which seismic waves travel depends on the properties of the material that they are passing through. For example, the denser a material is, the faster a seismic wave. P waves can travel through liquid and solids and gases, while S waves only travel through solids²².

Earth's Structure: is made up of three different layers: The **crust** / **The mantle** / **The core**.

Lithosphere: Crust, 5-70km thick (70% ocean, cradled in crust) & uppermost solid mantle.

Mantle- Solid – 2850km thick. Upper part partially melted, called Asthenosphere.

Core- 3470 km thick, formed as **Outer Core** –liquid -2200 km // **Inner core** – solid -1270 km.

Earth orbits the Sun, completes one rotation every 23.9 hours. It takes 365.25 days to complete one trip around the Sun: for yearly calendars, consistent with orbit around the Sun, **every four years one added day, and every 4th year - leap year**²³.

The Inner & Outer Cores

The solid inner core, suspended within the liquid outer core and anchored by gravity²⁴, has been inferred to rotate relative to the surface of Earth or change over years to decades²⁵ based on changes in seismograms from repeating earthquakes and explosions.

The structure of the Earth's inner core is not well known between depths of ~100–200 km beneath the inner core boundary. This is a result of the PKP core phase triplication and the existence of strong precursors to PKP phases, which hinder the measurement of inner core compressional PKIKP waves at epicentral distances between roughly 143 and 148^o²⁶.

Unlike the mineral-rich crust and mantle, the core is made almost entirely of metal—specifically, iron (Fe) and nickel (Ni). The shorthand used for the core's iron-nickel alloys is simply the elements' chemical symbols—NiFe²⁷.

Endnote: If the fluid outer core is spinning integrally with the Earth, creating the magnetic forces, and the perceived solid inner core is suspended within the elastic fluid's outer core, what effect will the exact position of the suspended Inner Core have towards earth's environmental mechanisms, and what are the boundary transition conditions between the outer core's soft fluid matter and the solid core?⁷³.

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