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Our Vanishing World: Oceans

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Theme: Environment

As the human onslaught against life on Earth accelerates, no part of the biosphere is left pristine. The simple act of consuming more than we actually need drives the world's governments and corporations to endlessly destroy more and more of the Earth to extract the resources necessary to satisfy our insatiable desires. In fact, an initiative of the World Economic Forum has just reported that 'For the first time in history, more than 100 billion tonnes of materials are entering the global economy every year' – see 'The Circularity Gap Report 2020'– which means that, on average, every person on Earth uses more than 13 tonnes of materials each year extracted from the Earth.

As I have explained elsewhere, however, the psychological damage we have all suffered, which leaves us with unmet but critically important emotional needs (and, in many cases, the sense that our lives are meaningless), cannot be rectified by material consumption. Despite this, most of us will spend our lives engaged in a futile attempt to fill the aching void in our psyche by consuming and accumulating, at staggering cost to the Earth. Identifying when we have 'enough' is a capacity that most modern humans have never acquired for reasons that can be easily explained. See 'Love Denied: The Psychology of Materialism, Violence and War'.

Hence, our world continues to vanish, as has been extensively documented. For a summary, see 'Human Extinction Now Imminent and Inevitable? A Report on the State of Planet Earth'.

And nowhere is this more evident than in **the planet's oceans, which are being systematically destroyed and where life is being progressively extinguished.**

In fact, our destruction of the oceans is now so advanced that the fish, mammals (including seals, whales, manatees, sea otters and polar bears), crustaceans (including crabs, lobsters, crayfish, shrimps, prawns, krill and barnacles), coral reefs (made up of coral polyps, marine invertebrate animals that live in colonies) and the millions of species that live in and around them (including sponges, mollusks, sea anemones, seahorses, sea turtles as well as crustaceans and an enormous variety of fish), plants (such as algae, seaweed and seagrass), microscopic organisms (residing in the ocean and on the ocean floor), invertebrates (such as sea urchins and sea slugs), birds (including better known ones such as penguins, auks, murres, razorbills, puffins, tubenoses – such as the albatross and petrels – pelicans and gulls and a great many species that are less well known), and the other lifeforms that live in and on the ocean are vanishing rapidly.

Starkly illustrating the catastrophic nature of what is taking place, one recent incident alone killed 100 million Pacific cod. See 'Ocean heat waves like the Pacific's deadly "Blob" could become the new normal'. But, tragically, such incidents are no longer unusual and, of course, they generate cascading impacts. See, for example, 'Fish all gone!... Millions of small sea birds died since 2015'.

‘How can we destroy the oceans?’ you might ask. Unfortunately, far too easily when you consider the range of assaults to which they are being subjected.

So let me give you a brief 18-point outline of what we are doing that is destroying the oceans – where life on Earth originated and which remains the planet’s main life support system by dominating the processes that keep our planet habitable such as regulating the climate by absorbing excess carbon dioxide and heat – while also giving you some idea of the impacts of this on the creatures that live in and on the oceans.

As a result of human activities that generate carbon emissions, we are dumping ever-increasing amounts of carbon dioxide into the oceans which have absorbed 20–30% of total anthropogenic emissions in the last two decades. This is causing the oceans to warm, acidify and lose oxygen, among several other adverse outcomes. See ‘The Ocean and Cryosphere in a Changing Climate: A Special Report of the Intergovernmental Panel on Climate Change’. p. 450. These adverse changes, in turn, generate a range of ‘downstream’ negative impacts. However, there are other human activities unrelated to carbon emissions that are destroying the oceans too.

So here is the summary.

1. The oceans are warming.

In relation to warming, the oceans have been heating up for several decades and, since 2005, the increase has been unchecked. Moreover, it is occurring at all ocean depths, including in the deep ocean (below 2,000 metres). In addition, the rate of warming has been increasing and the rate of ocean uptake of atmospheric CO2 has continued to strengthen in the last two decades in response to the increasing concentration of CO2 in the atmosphere. This is causing the upper ocean to stratify making the surface ocean less dense over time, compared to the deeper ocean, and inhibiting the exchange between surface and deep waters.

As one result of this ocean warming, the range of some species has expanded and, in the case of tropical species that have expanded into higher latitudes, it has led to increased grazing on some coral reefs, rocky reefs, seagrass meadows and epipelagic (near-surface) ecosystems, leading to altered ecosystem structure.

Ocean warming has also contributed to changes in the biogeography of organisms ranging from phytoplankton to marine mammals, consequently changing community composition, and in some cases, altering interactions between organisms. The net outcome is an adverse impact on marine organisms and fisheries with serious implications for human communities and food production.

Ocean warming is also manifesting in a range of diverse and unpredicted ways with one of the more catastrophic aberrations, touched on above, being the occurrence of ‘blobs’: huge patches of unusually warm ocean water that can be millions of square kilometres in size. These ‘marine heatwaves’ wreak havoc, sometimes killing millions of ocean creatures in a single incident (including by disturbing food chains), forcing others to relocate, and perhaps generating unusual blooms of toxic algae. See ‘Ocean heat waves like the Pacific’s deadly “Blob” could become the new normal’.

Among its other impacts, the warming oceans mean there is more available energy that can

be converted into cyclonic winds. Research on this subject indicates that there has been 'an increase in intense hurricane activity over the past 40 years'. See 'Hurricanes and Climate Change' and 'Changes in Tropical Cyclone Number, Duration, and Intensity in a Warming Environment'. These events cause landslides, collapses in fisheries, and damage to reefs and shallow-water habitats. When they impact on coastal communities, they kill people and destroy properties, among other outcomes. See 'The state of our oceans – The damaging effects of ocean pollution'.

Warming oceans also cause coral bleaching. This is because corals have algae that live in their tissues and these algae provide the coral with essential nutrients and give them their color. The warming oceans cause this relationship to become stressed, forcing the algae out of the coral. As a result, the coral becomes white, loses its main food source, and becomes more vulnerable to disease. See 'Coral Bleaching'.

Warmer ocean water causes sea level rise too because warmer water has a greater volume than colder water. Of course, sea level rise also occurs because of the additional water from melting land ice and a devastating level of rise from this cause is already 'locked in' because of past emissions. See 'Sea Level Rise!'

Ocean warming and increased stratification disturb ocean nutrient cycles and this is having a regionally variable (but usually adverse) impact on many species too.

And finally, ocean warming – most likely from ice loss in the Arctic – is weakening the Atlantic Meridional Overturning Circulation (AMOC) which is one of the key drivers of global ocean circulation; it includes the Gulf Stream that transports warm and salty tropical waters north to the western coasts of Europe where the warm water releases heat to the atmosphere, playing a key role in the warming of western Europe and thus its functional habitability. Once the tropical water reaches the south and east of Greenland, it cools before sinking to the base of the North Atlantic Ocean because it is saltier and thus denser than the surrounding fresh water. The water is then pushed south along the abyss of the Atlantic Ocean completing what has been, from a human viewpoint, a perpetual cycle. See 'Arctic sea-ice decline weakens the Atlantic Meridional Overturning Circulation' and 'Global Ocean Circulation Appears To Be Collapsing Due To A Warming Planet'. How much longer it will be so appears to defy reliable scientific assessment. But as it breaks down, the adverse outcomes multiply rapidly.

In fact, ocean circulation generally is being impacted by the warming climate, as established by a recently concluded study:

Ocean circulation plays a vital role in regulating the weather and climate and supporting marine life.... Here, we show for the first time, independent satellite observational evidence demonstrating that the large-scale ocean gyres are moving poleward during the past four decades. Further analysis based on climate models and various other data sets reveal that the poleward shifting of the ocean gyre circulation is most likely to be a consequence of global warming, which so far has not been well recognized by the public and the scientific community.... Such changes have had disastrous consequences.... See 'Poleward shift of the major ocean gyres detected in a warming climate'.

2. The oceans are becoming more acidic.

In response to the increasing carbon uptake the oceans are also becoming more acidic. This

has probably been the case for three-quarters of the near-surface open ocean since prior to 1950 and it is very likely that over 95% of the near surface open ocean has now been affected. See 'The Ocean and Cryosphere in a Changing Climate: A Special Report of the Intergovernmental Panel on Climate Change'. p. 450.

In a stark warning issued by the International Programme on the State of the Ocean (IPSO) in 2013, scientists had already noted that *the oceans are becoming more acidic at the fastest rate in 300m years*. Why? Because of carbon dioxide emissions from burning fossil fuels. 'This [acidification] is unprecedented in the Earth's known history. We are entering an unknown territory of marine ecosystem change, and exposing organisms to intolerable evolutionary pressure. The next mass extinction may have already begun.' See 'Rate of ocean acidification due to carbon emissions is at highest for 300m years'.

In its latest report, issued in 2018, IPSO declared the following: 'The ocean, by its breadth and depth, occupies more than 97% of the living space on Earth. It dominates the processes that keep our planet habitable.... But this protection comes at a cost as the ocean is now becoming more acidic.... For too long we have mistaken the immensity of the ocean for inviolability, but those days are gone, and we stand at a critical juncture. Cutting emissions, while essential, will not alone solve the environmental problems we face.' See 'Eight urgent fundamental and simultaneous steps needed to restore ocean health, and the consequences for humanity and the planet of inaction or delay'.

3. The oceans are deoxygenating.

Oxygen in the air or water is of paramount importance to most living organisms. Unfortunately, as a recent report documents in considerable detail (and which confirms earlier research), oxygen levels are currently declining across the ocean (and not just in the more widely known ocean 'dead zones': see below). See 'Ocean deoxygenation: Everyone's problem. Causes, impacts, consequences and solutions'.

Deoxygenation of the ocean is the result of two overlying causes – eutrophication (the process by which a body of water becomes overly enriched with minerals and nutrients thus inducing excessive growth of algae which absorb the oxygen at the expense of the water body) as a result of nutrient run-off from land and deposition of nitrogen from the burning of fossil fuels, as well as the heating of ocean waters as another outcome of burning fossil fuels, primarily causing a change in ventilation with the overlying atmosphere so that the oceans hold less soluble oxygen (and which is compounded by reduced ocean mixing and changes in currents and wind patterns). Ocean deoxygenation is but the latest consequence of our activities on the ocean to be recognized and is yet another 'major stressor' on marine systems.

Eutrophication has been identified as a problem in 900 separate areas of the ocean, with 700 of these suffering hypoxia (low oxygen) as a result. But because ocean warming lowers oxygen directly, it is now impacting vast areas of the ocean as well. As a result, 'the ocean has now become a source of oxygen for the atmosphere even though its oxygen inventory is only about 0.6% of that of the atmosphere'. Moreover, different analyses have concluded that global ocean oxygen content has decreased by 1-2 % since the middle of the 20th century. Given existing trends in the factors driving this change, the rate of loss must accelerate.

Obviously, the future intensification and expansion of low oxygen zones will have further

adverse ecosystem and biogeochemical consequences, particularly in combination with, and sometimes synergistically with, other threats. For example, 'ocean warming accompanied by deoxygenation will drive habitat contraction and fragmentation in regions where oxygen levels decline below metabolic requirements'.

4. The oceans are being contaminated with nuclear radiation.

Greenpeace activists protest outside the Tokyo Electric Power Company (TEPCO) shareholder's meeting held at The Prince Park Tower in Tokyo. They hold a banner which reads: "TEPCO: The worst Ever Polluting Company." TEPCO is the operator of the crisis-stricken Fukushima Nuclear Power Plant which has been emitting radion since it was struck by an earthquake and tsunami on March 2011. The activists also raised a banner reading "No more nuclear" in Japanese, asking TEPCO to disengage from the nuclear industry.

Despite an extensive and ongoing coverup by the Japanese government and nuclear corporations as well as the International Atomic Energy Agency (IAEA), vast amounts of radioactive waste are being dumped into the biosphere from the TEPCO nuclear power plant at Fukushima in Japan including by discharge into the Pacific Ocean. This is killing an incalculable number of fish and other marine organisms and indefinitely contaminating expanding areas of that ocean. See 'Fukushima: A Nuclear War without a War: The Unspoken Crisis of Worldwide Nuclear Radiation', '2019 Annual Report – Fukushima 8th Anniversary', 'Eight years after triple nuclear meltdown, Fukushima No. 1's water woes show no signs of ebbing' and 'Fukushima's Three Nuclear Meltdowns Are "Under Control" – That's a Lie'.

In addition, one critical legacy of the US military's 67 secretive and lethal nuclear weapons tests on the Marshall Islands between 1946 and 1958 is the 'eternally' radioactive garbage left behind and now leaking into the Pacific Ocean. See 'The Pentagon's Disastrous Radioactive Waste Dump in the Drowning Marshall Islands is Leaking into the Pacific Ocean'.

And, of course, there are up to 70 'still functional' nuclear weapons as well as nine nuclear reactors lying on the ocean floor as a result of accidents involving nuclear warships and submarines. These are leaking an unknown amount of radiation into the oceans. See 'Naval

Nuclear Accidents: The Secret Story', 'A Nuclear Needle in a Haystack: The Cold War's Missing Atom Bombs' and, for one specific example (the former Soviet submarine *Komsomolets*), see 'Soviet nuclear submarine emitting radiation "100,000 times normal level" into sea, scientists find'.

5. The oceans are being contaminated as a result of offshore oil and gas drilling, as well as oil spills.

The complex but far-from-perfect technologies and the many environmental challenges associated with oil and gas drilling in the ocean have ensured the near-routine occurrence of often disastrous accidents which invariably lead to fossil fuels and other contaminants being discharged into the ocean, sometimes on a vast scale.

The classic case, of course, was the BP-leased Deepwater Horizon rig which had drilled a well to 35,055 feet (10 kilometers) while operating in 4,130 feet (1 kilometer) of water. The oil rig exploded and sank in the Gulf of Mexico on 20 April 2010 releasing 5 million barrels of oil into the ocean making it the worst environmental disaster in US history. It caused extensive damage to the ocean, corals and beaches and killed millions of fish, birds and marine mammals in and on the ocean. Despite a 'clean up', only one quarter of the oil was ever removed from the ocean. See 'The Dangers of Offshore Drilling'.

The simple reality is that despite the industry's safety claims, oil rig fires are commonplace. See 'Why Is Offshore Drilling So Dangerous?'

And so are oil spills into the ocean for other reasons, including from tankers – see 'Top 10 Worst Oil Spills' – as the Exxon Valdez disaster in 1989 demonstrated all too graphically. See 'The Complete Story of the Exxon Valdez Oil Spill'.

Often enough as well, oil is discharged into the ocean as a result of military activities and war. During the Gulf War in 1991, for example, vast quantities of oil were released into the Persian Gulf as a military tactic. See 'The World's Largest Oil Spill: The Gulf War Kuwait, 1991' and 'Gulf War Oil Disaster: A Brief History'.

6. The oceans are being damaged by deep sea mining.

Recent technological advances spurred by growing demand for minerals used in consumer electronics has led to increased interest in deep sea mining as the next frontier in resource extraction. Hailed as the new 'global gold rush', deep sea mining entails extracting minerals from deposits in the deep sea (approximately 400 to 6,000 meters below sea level) for use in emerging and high technology, among other sectors. Predictably, deep sea mining shares many features with past resource scrambles, including a general disregard for

environmental and social impacts, and the marginalization of indigenous peoples and their rights. See 'Broadening Common Heritage: Addressing Gaps in the Deep Sea Mining Regulatory Regime' and 'Deep-sea mining possibly as damaging as land mining, lawyers say'.

Beyond these adverse impacts, however, recent research makes it increasingly clear that deep sea mining poses a grave threat to vital seabed functions, including those played by hydrothermal vents and cold seeps, for example, which support remarkable biodiversity and sequester disproportionate amounts of carbon. Moreover, recent scientific breakthroughs have further revealed that most of the excess heat resulting from increased atmospheric concentrations of greenhouse gases has been absorbed by the deep ocean, thereby significantly limiting the climate catastrophe's impacts on the ocean's surface and on land. See 'Deep sea ecology: hydrothermal vents and cold seeps' and 'Broadening Common Heritage: Addressing Gaps in the Deep Sea Mining Regulatory Regime'.

In essence, deep sea mining threatens the 'common heritage' the seabed provides through its substantial contributions to biodiversity, climate regulation and heat storage.

7. The oceans are being polluted with industrial (including chemical) and farming wastes including pesticides and fertilizers which are generating 'dead zones', regions of the oceans that are devoid of life.

Despite the existence of the 'Convention on the Prevention of Marine Pollution by Dumping of Wastes and other Matter' (otherwise known as the London Dumping Convention, 1972), an international treaty 'that created a global system to protect the marine environment from pollution caused by ocean dumping' – and certainly including radioactive wastes, fossil fuels, some toxic wastes, biological and chemical warfare agents, and persistent synthetic materials such as plastic – and supposedly 'ensures that the few materials that are permitted for ocean disposal are carefully evaluated to make sure that they will not pose a danger to human health or the environment' – see '1972 Prevention of Marine Pollution by Dumping of Wastes and Other Matter (London Convention)' – the Convention must be one of the least comprehensive and most violated in international law. In any case, there is no evidence that it has any restraining impact on the actions of states or corporations as the evidence above and below demonstrates.

For example, a vast runoff of industrial wastes (including heavy metals), agricultural poisons, fossil fuels and other wastes is discharged into the ocean, adversely impacting life at all ocean depths – see 'Staggering level of toxic chemicals found in creatures at the bottom of the sea, scientists say' – and, as noted above, generating ocean 'dead zones' (of which there are many hundred): regions that have too little oxygen to support marine organisms. See 'Ocean Dead Zones Are Getting Worse Globally Due to Climate Change' and 'Ocean "dead zones" are spreading – and that spells disaster for fish'.

8. The oceans are being polluted by nitrogen.

While nitrogen is vital to the health of the ocean, like everything else that makes up the ocean, it must be in balance, not fluctuating beyond very narrow parameters. See 'Understanding nitrogen's role in the ocean'.

But it is now well past the point when this state has been the case.

This is because nitrogen is one important element of the industrial and agricultural pollution just mentioned. It is the nitrogen component in the runoffs of these wastes (such as fertilizers and sewage) into the ocean that causes harmful algal blooms, eutrophication and ocean dead zones (hypoxia) while making marine life more vulnerable to disease, reducing biodiversity in shallow estuarine waters, degrading ocean ecosystems and contributing to global warming. 'Algal blooms deplete dissolved oxygen, causing marine wildlife to suffer and become more vulnerable to toxins and disease. Nitrogen in the blooms also produces nitrous oxide (N20), a greenhouse gas far more potent than carbon dioxide. This contributes to global warming, which further degrades oceans by increasing acidity in the water as the oceans absorb more and more carbon.' See 'Stop Nitrogen Pollution of Oceans – Green Algal Slime Busters'.

9. The oceans are being polluted with discharges from warships, commercial shipping and cruise ships: bilge water, ballast water, sewage, graywater and general rubbish.

Despite the 1973 International Convention for the Prevention of Pollution from Ships, known as the MARPOL Convention, which has been routinely added to over subsequent years and gives the impression of being comprehensive, there is obviously little interest in abiding by the terms of the Convention and little evidence that most ship crews do so. Moreover, given that many provisions of the Convention focus on minimizing discharges within 12 nautical miles of land, that leaves a great deal of ocean into which such discharges can be done legally even if disposal of plastics beyond the 12 mile limit remains illegal.

In addition, while the MARPOL Convention was theoretically designed to minimize releases by both operational and accidental causes, laws do not prevent accidents as the long list of oil tanker accidents, touched on above, such as that of the *Odyssey* in 1988, the *Exxon Valdez* in 1989 and the *Haven* in 1991, resulting in massive oil discharges into the ocean reminds us. See, for example, 'Top 10 Worst Oil Spills'.

But the law is violated deliberately in any case. Bilge water – a filthy, oily mess of fresh water, seawater, chemicals, oil, sludge, and other fluids from a ship – is found at the very bottom of the ship where the two sides of the hull meet. Seawater is pumped into large ships to cool their engines and as the water moves through the cooling system it picks up loose oil and waste from the engine and this, together with oil drips from the pipes and machinery fittings, ends up in the bilge well of the ship. See 'What is Bilge Water?'

However, despite the MARPOL Convention, across the world many oceangoing vessels break these international laws and empty their untreated bilge water into the ocean. For example, in 2016 Princess Cruises, one of 10 brands owned by Carnival Corporation, the world's largest cruise holiday company, was fined £32million for bypassing oil treatment systems on their vessels, deliberately and illegally dumping thousands of gallons of oil and waste off the UK coast. See 'Cruise line fined £32m for using "magic pipe" to dump oily waste into UK waters'.

And while we are on cruise ships, of which there are more than 300 carrying half a million passengers annually – see '2018 Worldwide Cruise Line Passenger Capacity' – the glossy advertising brochures do not tell you the extraordinary downside of this holiday/travel option which, among many other problems, are an ecological nightmare for our oceans. Altogether, the 16 major cruise lines generate over one billion gallons of sewage each year, much of it raw or poorly treated and simply discharged into the ocean. And apart from the

carbon emissions (with one cruise ship producing 13 million cars worth of CO2 each day) and the oily bilge water, grey water and various other pollutants are a concern both while at sea and docked in port. See ‘16 Things Cruise Lines Never Tell You’.

And while some shipwrecks are a source of fascination for scuba divers and treasure hunters, the vast bulk of the estimated 3 million shipwrecks, particularly more recent ones, are just more junk (or even sources of contamination) in the ocean. See ‘How Many Shipwrecks Are There?’

10. The oceans are being used as a vast rubbish dump, resulting in such phenomena as the Great Pacific Garbage Patch.

We are making the oceans a rubbish dump for vast quantities of pollutants and contaminants, ranging from plastic, microplastics, microbeads and microfibers to toxic and radioactive wastes.

In relation to plastic, a major scientific study involving 24 expeditions conducted between 2007 and 2013, which was designed to estimate ‘the total number of plastic particles and their weight floating in the world’s oceans’ the team of scientists estimated that there was ‘a minimum of 5.25 trillion particles weighing 268,940 tons’. See ‘Plastic Pollution in the World’s Oceans: More than 5 Trillion Plastic Pieces Weighing over 250,000 Tons Afloat at Sea’ and ‘Full scale of plastic in the world’s oceans revealed for first time’.

Since then, of course, the problem has become progressively worse with vast quantities of plastic (entangled in other garbage) forming into floating garbage patches that are vast in size. See ‘Plastic Garbage Patch Bigger Than Mexico Found in Pacific’ and ‘Plastic Chokes the Seas’.

Furthermore, a recent UN report documenting marine debris – that is, rubbish in the ocean – noted the increasing number of marine species impacted by debris through ingestion and entanglement and provided further information on the types of impacts occurring, particularly with respect to microplastics and their physical and chemical effects. The report paid particular attention to ‘persistent, bio-accumulative and toxic substances’ (PBTs), noting the recent studies of the presence of toxic chemicals derived from plastics in marine taxa in a separate appendix. See ‘Marine Debris: Understanding, Preventing and Mitigating the Significant Adverse Impacts on Marine and Coastal Biodiversity’.

Another article highlights the now ubiquitous nature of the ocean garbage problem: There is rubbish everywhere, literally. See ‘How an Uninhabited Island Got the World’s Highest Density of Trash’.

‘Does it matter?’ you might ask. According to a UN report, it matters a great deal: marine debris is harming an increasing number of species, now more than 800, and previous research places the cost of pollution caused by marine debris at $13 billion annually. See ‘New UN report finds marine debris harming more than 800 species, costing countries millions’.

11. The oceans are being overfished and illegally fished.

Apart from the destruction wrought by aquaculture, considered in the next section, the world’s oceans are being plundered mercilessly for remaining fish stocks. In 2017, a report from the United Nations Conference on Trade and Development (UNCTAD) noted that ‘The

international community is harvesting fish at unsustainable biological levels. The Mediterranean Sea is about 70 per cent exploited; the Black Sea 90 per cent.' Of course, the fact that *the fishing industry is subsidized to the tune of $US 35 billion annually* (more than one-fifth of the annual fish market of $US150billion) adds enormous additional incentive to fish the world's oceans. Needless to say, these subsidies facilitate 'a race to the bottom' as fishing fleets compete to harvest increasing amounts of fish 'at a time when seafood is already a scarce resource'. See 'Next month's ocean conference eyes cutting $35 billion in fisheries subsidies – UN trade officials'.

Unfortunately too, despite supposed ambitions to end illegal, unreported and unregulated (IUU) fishing methods, the annual value of fish caught these ways is estimated at $US23billion. See 'More Plastic than Fish or How Politicians Help Ocean Destruction'.

In essence, with a global fishing fleet of 4.6 million vessels, massive government subsidies to encourage over-fishing, virtually nothing done to prevent illegal and unregulated fishing, and almost half the human population relying on fish for an adequate diet, the increasing biological unsustainability of fishing is destined, particularly when considered in conjunction with other threats mentioned above and below, to wreak ongoing havoc on fish populations (as well as species caught incidentally as 'bycatch') until the oceans are emptied of fish.

Moreover, given the ever-neglected synergistic impacts of the many threats discussed in this article, as well as the inevitably increasing number of incidents – such as the 'blob' that suddenly killed 100 million Pacific cod mentioned above – this can now happen very quickly.

Of course, it is not just fish that are being taken from the ocean. Many other species are heavily impacted too.

Whales have been hunted mercilessly for a very long time with the total number in the ocean reduced from about 5 million 500 years ago to about 1 million now. This has caused enormous damage to the ocean but also the biosphere as a whole given the prodigious capacity of whales to sequester carbon, for example. See 'How Whales Sequester Tonnes of CO2: Our Secret Weapon against Climate Change'. Apart from the ongoing hunting – see 'Iceland is killing fin whales for Japanese pet treats' – whales are now killed by many other human activities ranging from entanglement in discarded fishing gear and consumption of plastic – see 'Plastic Waste Kills Six-Ton Whale'– to seismic airguns which are a probable cause of beach strandings – see '337 Dead Whales In Chile Is Worst Case Of Mass Deaths So Far'– as explained below.

And sea otters – which play a vital role in maintaining the health of the ocean's kelp forests by eating the sea urchins that eat the kelp – have also been mercilessly slaughtered in vast numbers for their fur pelts in the past. More recently, however, they are being hunted by killer whales which have changed their diet to include otters because their main food source, the great whale, has been almost entirely wiped out by commercial hunting. See 'Sea Otters as Habitat Protectors'.

12. The oceans are being subjected to destructive fishing practices, such as bottom trawling, blast fishing, cyanide fishing, ghost fishing and aquaculture.

Some fishing methods are so destructive that they cause harm to the ocean environments where fish are caught. 'Bottom trawling' is one such practice: it involves fishing boats dragging large, heavy nets along the ocean floor and it is practiced on a huge scale all

around the world. Blast fishing involves the use of explosives and cyanide fishing uses poison.

Damage to the surrounding ocean – including corals, sponges, and other organisms living on the seabed – is inevitable 'collateral damage' to these types of fishing. See 'The state of our oceans – The damaging effects of ocean pollution'.

But if you think the above fishing practices are bad, consider 'ghost fishing': the damage done by the (at least) 640,000 tonnes of fishing gear that is lost or abandoned in the oceans each year. Official estimates indicate that 'ghost gear' makes up 10% of waste in the oceans. Moreover, while it has an enormous adverse impact on ocean life, derelict gear also detrimentally alters seabed and marine environments. See 'Our oceans are haunted: How "ghost fishing" is devastating our marine environments' and 'Ghost Fishing? 640,000 Tonnes of Fishing Gear Dumped in Oceans Every Year'.

And if the existing overfishing and illegal fishing are not doing enough damage to Earth's oceans, every year 80 million tons – almost half of annual seafood consumption – is produced by 'aquaculture': an industry that builds floating cages for salmon, artificial ponds for prawns on the coasts, and tanks for seafood in factory buildings – that is, aquatic factory farms. Of course, aquaculture is not the solution to overfishing: it is worsening the problem. 'Trawler fleets sweep up vast quantities of wild fish and grind them into fishmeal and fish oil to feed farmed fish. Far from being "sustainable", this is an incredibly inefficient and wasteful process: it takes up to five kilos of edible fish such as anchovies, mackerels or sardines, for example, to produce a single kilo of salmon.'

Moreover, as traditional stocks of species used to make fishmeal and fish oil collapse, the industry becomes less discriminating in its selection of targeted species and frequently includes juveniles as well as rare and endangered species, including turtles, stingrays and sharks. Predictably investigators researching the problem 'did not have to dig deep to uncover shocking evidence of how this industry is trashing the oceans, but the full scale of its impacts is concealed from public view'. See 'Fishing for Catastrophe: How global aquaculture supply chains are leading to the destruction of wild fish stocks and depriving people of food in India, Vietnam and The Gambia', 'Stop plundering the oceans for industrial aquaculture!' and 'Until the Seas Run Dry: How industrial aquaculture is plundering the oceans'.

Another problem with aquaculture is the way in which disease and parasites can spread among the intensively-farmed fish with, for example, the sea louse causing enormous problems among farmed salmon in Scotland, Norway, and Canada reducing the amount of fish produced by tens of thousands of tons per year and causing increasingly drastic – that is, inhumane and environmentally harmful – responses to be attempted. See 'Salmon farming in crisis: "We are seeing a chemical arms race in the seas"'.

But disease and parasites can spread from the intensively farmed fish to wild populations too and, for example, this is causing populations of wild salmon and trout to decrease. See 'The state of our oceans – The damaging effects of ocean pollution'.

13. The oceans are being damaged by sand mining.

The largest mining endeavour on Earth, accounting for 85% of all mineral extraction, is sand mining. See 'The Hidden Environmental Toll of Mining the World's Sand'. However, one

study has suggested that existing figures 'grossly underestimate global sand extraction and use' because official statistics widely under-report sand use and typically 'do not include nonconstruction purposes such as hydraulic fracturing and beach nourishment'. See 'Global Patterns and Trends for Non-Metallic Minerals used for Construction' and 'The world is facing a global sand crisis'.

More problematically than inaccurate official statistics, however, is that sand mining, of all mining activity, is 'the least regulated, and quite possibly the most corrupt and environmentally destructive.' See 'The Hidden Environmental Toll of Mining the World's Sand'.

Why is sand mined? Sand is mainly used for the concrete that goes into building but it is also a key ingredient for roads, glass and electronics. In addition, massive amounts of sand are mined for land reclamation projects, shale gas extraction and beach renourishment programs. See 'A looming tragedy of the sand commons' and 'The world is facing a global sand crisis'.

Of course, not all of this sand comes from the oceans but plenty of it does. Moreover: 'As land quarries and riverbeds become tapped out, sand miners are turning to the seas, where thousands of ships now vacuum up huge amounts of the stuff from the ocean floor.' See 'The Deadly Global War for Sand'.

For example, Britain now gets up to a quarter of its sand from sand banks off East Anglia in the North Sea, dredging up to 10 million tons from a region where there has been concern that the loss of sediment accelerates rampant coastal erosion, as well as damaging sea-bed communities such as crabs and starfish. See 'A new sand and gravel map for the UK Continental Shelf to support sustainable planning' and 'The Hidden Environmental Toll of Mining the World's Sand'.

But much of the sand dredged from the ocean is used for land reclamation projects, particularly in Asia. Most notoriously, Singapore has created an extra 50 square miles of land, expanding its area by 20 percent. How? It imported more than half-a-billion tons of sand, most of it from Indonesia, where at least 24 small islands have reportedly been removed from the map. But countries like the Philippines, Malaysia and China are also reclaiming vast quantities of sand, usually to expand or build coastal cities and, in China's case, to dump on reefs and make islands to consolidate its territorial claims to the South China Sea. See 'The Hidden Environmental Toll of Mining the World's Sand'.

Does this cause much damage to the ocean floor? According to a United Nations Environment Program report: 'Dredging and extraction... from the benthic (sea bottom) zone destroys organisms, habitats and ecosystems and deeply affects the composition of biodiversity, usually leading to a net decline in faunal biomass and abundance'. See 'Sand, rarer than one thinks'.

14. The oceans are being damaged by port and harbour dredging.

There is growing economic and social demand for the development of coastal regions all over the world. Virtually all of these activities, such as coastal construction, land reclamation, beach reclamation and port construction/maintenance, involve dredging: the 'excavation, transportation and disposal of soft-bottom material' such as sand and debris from the bottom of ports, harbors, and marinas usually so that facilities are kept deep

enough for ships to use. Dredging is also carried out where a river or ocean currents drop lots of sediment onto the seabed, to improve water drainage from a river so that flood risk is reduced and to remove sediments on the seabed if they are contaminated with environmental pollutants.

But, of course, all of this comes at a cost to the local ecology. Notably, in many cases, dredging has contributed to the loss of coral reef habitats. This can occur directly, due to the removal or burial of reefs, or indirectly, as a consequence of stress to corals caused by elevated turbidity and sedimentation. Dredging can also affect surrounding areas in a number of ways including turbid plumes, sedimentation and the release of contaminants. See 'Environmental impacts of dredging and other sediment disturbances on corals: A review'.

Dredging does not only adversely impact coral reefs, however. Dredging also kicks up a lot of debris into the water disturbing the resident plants and animals. And when the collected sediment is dumped at sea, it again disturbs the resident organisms.

15. The oceans are being damaged by the increasing spread of invasive species.

Invasive species are those animals or plants from another region of the world that arrive in a new environment where they do not belong. They can be introduced to an area by ship ballast water, accidental release, ocean temperature rises allowing them to migrate, attachment to ship hulls or floating plastic, and most often, by people. Invasive species usually do not have natural predators in their new environment which means their populations can increase rapidly. They often compete with indigenous species for local resources, can permanently alter habitats, destroy biodiversity and lead to the extinction of plants and animals. See 'What is an invasive species?'

The lionfish is an excellent example. A carnivorous fish native to the Indo-Pacific, it is now an invasive species in the Atlantic, notably the U.S. southeast and Caribbean coastal waters. Because the lionfish is a top predator, it has the capacity to harm reef ecosystems by competing for food and space with overfished native stocks such as snapper and grouper. Scientists fear that lionfish will also kill off species, such as algae-eating parrotfish, that will allow seaweed to overtake the reefs. The lionfish population is continuing to grow – a mature female releases roughly two million eggs a year – and to expand its range. With no known predators, this invasive species is causing enormous damage in its new home. See 'What is a lionfish?'

You can read more examples of invasive species in the article '5 Invasive Species You Should Know'.

16. The oceans are being damaged by the live trade in fish and coral for the aquarium industry.

Because it is difficult to breed marine fish in aquariums, they must be captured from the wild. The tropical seas around Indonesia, the Philippines, Sri Lanka, the Maldives, and the central Pacific Islands including Hawaii are particularly popular as sources for these fish but there are other sources too. Because ornamental fish are in high demand and can have a very high market value, they are being caught in ever larger numbers threatening the sustainability of the fishery and the habitat in which they are caught. For example, the Yellow Tang, which cannot be bred in captivity, is one of Hawaii's most targeted fish with

fishers taking somewhere between 2 and 10 million Yellow Tangs every year. As a result, its population has plunged in recent years. See 'The state of our oceans – The damaging effects of ocean pollution' and 'The Hawaii Legislature wants to stop the aquarium fish trade. The governor has other ideas'.

Not content with reef fish alone, however, since 1990 the aquarium trade has seen a shift in consumer preference from fish-only aquariums to miniature reef ecosystems. As a result, the most recent estimates suggest that the trade targets over 150 species of stony corals, hundreds of species of non-coral invertebrates, and at least 1,472 reef fish species from 50 families.

Hence, with about 1,800 species of fish traded internationally for some 2,000,000 (private and public) aquariums worldwide – see 'Revealing the Appetite of the Marine Aquarium Fish Trade: The Volume and Biodiversity of Fish Imported into the United States' – and the industry worth about $5billion annually – see 'The Hawaii Legislature wants to stop the aquarium fish trade. The governor has other ideas' – the trade in fish and coral is now a major global enterprise.

Little, if any of it, however, is sustainable. Even worse, virtually all of the saltwater fish that are captured for aquariums are caught illegally using cyanide. This also kills non-targeted fish and coral (at the rate of one square meter per fish captured) as collateral damage. As the coral on the reef is progressively killed, reef fish, crustaceans, plants, and other animals no longer have food, shelter, and breeding grounds and these impacts ripple up the food chain affecting thousands of species. Given that reef habitats provide food for tens of millions of people and contribute to the livelihoods, through commercial fishing and tourism, of many more, capturing fish using cyanide is utterly destructive. See 'The Horrific Way Fish Are Caught for Your Aquarium – With Cyanide'.

17. The oceans are being damaged by the increasing level of noise pollution.

Several studies have revealed the nature and extent of the damage caused to ocean life by human activities that generate noise in the oceans. And there have been calls by scientists to protect marine life from such noise. See, for example, 'Marine Life Needs Protection from Noise Pollution'.

The main noises are generated by nuclear explosions, ship-shock trials (explosions used by the Navy to test the structural integrity of their ships), seismic airgun arrays, military sonars, supertankers, warships, merchant vessels (of which there are now more than 53,000 in the world: see 'Number of ships in the world merchant fleet'), fishing vessels and pleasure craft (such as speed boats and jet skis). For example, seismic airgun surveys to discover oil and gas deposits are loud enough 'to penetrate hundreds of kilometers into the ocean floor, even after going through thousands of meters of ocean'. See 'A Review of the Impacts of Seismic Airgun Surveys on Marine Life'.

The damage these noises cause to marine mammals include disruption of feeding and breeding habitats – see 'Fin whale (Balaenoptera physalus) population identity in the western Mediterranean Sea' – hearing loss – see 'Marine seismic surveys and ocean noise: time for coordinated and prudent planning'– physiological changes such as stress responses to trauma and a weakened immune system; behavioral alterations such as avoidance responses; a change in vocalizations or through masking (obliterating sounds of interest); interference with communications, particularly among species, such as humpback and fin

whales, that communicate over distances of at least tens of kilometers; and through impacts on prey. Seismic airguns are a probable cause of whale strandings ('beachings') and deaths as well. See 'A Review of the Impacts of Seismic Airgun Surveys on Marine Life'.

But studies of fish, turtles and invertebrates such as squid also reveal a range of adverse impacts to anthropogenic noise including seismic air guns. Fish have exhibited damaged ears, decreased egg viability, increased embryonic mortality and damage to brain cells. Turtles have exhibited behavioural change and hearing loss with squid suffering internal injuries with organs and ears badly damaged. See 'A Review of the Impacts of Seismic Airgun Surveys on Marine Life'.

18. The oceans are being damaged by wildfires.

Just because the oceans cannot burn, it does not mean that they are not adversely impacted by wildfires. Apart from the people and wildlife they kill, wildfires leave vast amounts of charred plants and ash behind which subsequent rains wash into creeks and rivers where it flows into coastal lakes, estuaries, and seagrass and seaweed beds with a range of adverse impacts on the ocean and life that occupies these areas. For a fuller explanation in one recent context, see 'Australia's Marine Animals Are the Fires' Unseen Victims'.

Summary

As can be seen from the evidence presented above, the oceans are under siege on a vast range of fronts. They are being stripped of everything of value to humans (ranging from its many creatures, such as fish and whales, to products such as sand, oil and minerals) while having a monumental range and quantity of garbage and pollutants (ranging from household to radioactive waste) dumped into them.

Is anything being done? Not really. There are some tokenistic efforts to tackle the plastics problem by cleaning the occasional beach and ongoing calls to limit certain forms of resource exploitation or waste dumping but all international laws in relation to this are largely ignored with impunity. Other efforts have less than marginal impact. Of course, there is also plenty of talk, including that which will take place at the forthcoming UN Ocean Conference in June 2020 when powerful corporate interests will again ensure that nothing profound happens.

So while there is considerable but still utterly inadequate attention given to the climate catastrophe and some activists draw attention to other threats to human survival (such as the nuclear threat, the biodiversity crisis, the dangers of electromagnetic radiation and especially 5G, geoengineering, and destruction of the rainforests), the ongoing threat to the biosphere as a whole, including the oceans, attract only marginal attention and, sometimes, tokenistic responses.

And because human beings are so psychologically dysfunctional and, so far at least, incapable of responding strategically to our multifaceted crisis, the urge to consume and accumulate will continue to overwhelm serious efforts to avert our own extinction.

Saving the Earth's Oceans

If you wish to fight powerfully to save Earth's biosphere, including the oceans, consider joining those participating in 'The Flame Tree Project to Save Life on Earth' which outlines a simple program to systematically reduce your consumption and increase your self-reliance

over a period of years.

Given the fear-driven violence in our world which also generates the addiction of most people in industrialized countries to the over-consumption that is destroying Earth's biosphere – see 'Love Denied: The Psychology of Materialism, Violence and War' – consider addressing this directly starting with yourself – see 'Putting Feelings First' – and by reviewing your relationship with children. See 'My Promise to Children' and 'Nisteling: The Art of Deep Listening'. For fuller explanations, see 'Why Violence?' and 'Fearless Psychology and Fearful Psychology: Principles and Practice'.

If you wish to campaign strategically to defend the oceans then consider joining those working to halt the climate catastrophe, end military activities of all kinds including war, and halt all forms of resource extraction from the oceans as well. See Nonviolent Campaign Strategy which already includes a comprehensive list of the strategic goals necessary to achieve two of these outcomes in 'Strategic Aims'.

In those cases where corrupt or even electorally unresponsive governments are leading the destruction of the oceans – by supporting, sponsoring and/or engaging in environmentally destructive practices – it might be necessary to remove these governments as part of the effort. See Nonviolent Defense/Liberation Strategy.

You might also consider joining the global network of people resisting violence in all contexts, including against the biosphere, by signing the online pledge of 'The People's Charter to Create a Nonviolent World'.

Or, if none of the above options appeal or they seem too complicated, consider committing to:

The Earth Pledge

Out of love for the Earth and all of its creatures, and my respect for their needs, from this day onwards I pledge that:

1. ***I will listen deeply to children (see explanation above)***
2. ***I will not travel by plane***
3. ***I will not travel by car***
4. ***I will not eat meat and fish***
5. ***I will only eat organically/biodynamically grown food***
6. ***I will minimize the amount of fresh water I use, including by minimizing my ownership and use of electronic devices***
7. ***I will not buy rainforest timber***
8. ***I will not buy or use single-use plastic, such as bags, bottles, containers, cups and straws***
9. ***I will not use banks, superannuation (pension) funds or insurance companies that provide any service to corporations involved in fossil fuels, nuclear power and/or weapons***
10. ***I will not accept employment from, or invest in, any organization that supports or participates in the exploitation of fellow human beings or profits from killing and/or destruction of the biosphere***
11. ***I will not get news from the corporate media (mainstream newspapers, television, radio, Google, Facebook, Twitter…)***

12. ***I will make the effort to learn a skill, such as food gardening or sewing, that makes me more self-reliant***
13. ***I will gently encourage my family and friends to consider signing this pledge.***

Do all these options sound unpalatable? Prefer something requiring less commitment? You can, if you like, do as most sources suggest: nothing (or its many tokenistic equivalents). I admit that the options I offer are for those powerful enough to comprehend and act on the truth. Why? Because there is so little time left and I have no interest in deceiving people or treating them as unintelligent and powerless. See 'Human Extinction by 2026? A Last Ditch Strategy to Fight for Human Survival'.

Conclusion

Every person on Earth depends directly on the ocean. It covers 71% of the Earth's surface and contains about 97% of the Earth's water. It generates 50 percent of the oxygen we need and is home to up to 80 percent of all life.

Yet human activity is destroying it. You can make choices that make a difference. Or leave it to others.

*

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