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Pollution and Toxicity

Things that may interest you

- The world now has over one billion cars and vans. China alone built 20m of them in 2013.
- The top ten most polluting industries are, in order: lead-acid battery recycling, mining and ore processing, lead smelting, tanneries, small-scale gold mining, industrial dumps and scrapyards, chemical manufacture and dyeing.
- The world's most polluted cities are in Iran, India, Saudi Arabia, Nigeria, Pakistan, China and Cameroon. Many are far more polluted than Delhi and Beijing, which are famous for it.
- More than one billion people worldwide drink unsafe, contaminated drinking water, and 5,000 people die from this *every day*.
- Pollution kills at least one million seabirds and 100 million mammals every year.
- Household use chemicals ten times more toxic per acre than farmers' chemicals.

The Tibetan high lama Karmapa XVII speaks of *non-duality*, a feedback loop binding our psyches with the world, such that they reflect and interact with each other. That's to say, we and the world around us are integral and not separate. In this way of seeing things, environmental pollution is a product of a psychological contamination causing us to pollute without thinking that it makes a difference. A contaminated world pollutes our minds and emotions

in return, obscuring our perceptions and affecting our lives. So our psychological states could be said to be intimately connected with the polluted state of the world around us. That's worth thinking about.

One problem with large-scale urbanisation is not only the pollution and waste that cities generate, but also city-dwellers' loss of natural awareness – this now affects more than 50% of the world's population, including most of its decision-makers. Noise, artificial light, electrosmog and visual pollution distort our experience of life, also acting as a contributory cause of today's global epidemic of psychological depression. “*It's a shit world*”, says a teenager I know, and she is right. When pollution gives people concern, its personal health impacts usually worry them more than its environmental impacts, and this perception is the wrong way round. Dispersal and dilution in the natural environment has been the default solution for dealing with pollutants, on the assumption that nature will deal with it, but ambient concentrations have grown to a prohibitive level. Indoor pollution is a major component of people's personal toxic loading too.

Pollution is an outcome of our take-make-use-dispose economy, in which both natural and human capital are regarded as abundant, expendable and replaceable. Pollution impacts visibly on the world – for example, in the form of insect and bird population losses. But we fail to connect the dots and see pollution clearly for what it is, because we are accustomed to it – many people accept it as normal, even natural, that a grey pall hangs over a city, that waves on the beach are frothy and that overflying aircraft noise drowns out whatever birdsong is left.

According to *The Lancet*, pollution-related diseases were responsible for about 9m or 16% of all premature deaths in 2015, three times more than those from AIDS, TB and malaria combined, and fifteen times more than those from wars and civic violence. Nearly 92% of pollution-related deaths occur in low- and middle-

income countries and, worldwide, pollution-related disease is highest among minorities, children and the marginalised. Micro-doses can sometimes be worse than larger doses, and decades of pollution exposure weaken human immune, endocrine and reproductive systems, adding up to cause multiplex diseases and susceptibilities in future generations.

More than 140,000 new chemicals and pesticides have been created since 1950. Of these, roughly 5,000 high-volume chemicals are widely dispersed in the environment. Fewer than half of these volume chemicals have undergone testing for safety or toxicity, and rigorous pre-market evaluation has become mandatory only recently, in only a few developed countries. Past examples of materials found to be dangerous include lead, asbestos, DDT, PCBs and ozone-destroying CFCs. Lead in petrol was banned over 30 years ago but its century-long use embedded it in farmland soils, leaving longterm traces that continue to contaminate us now through our food – lead was used instead of ethanol because it made more money.

New chemicals are becoming ever more sophisticated. They include neurotoxicants, endocrine disruptors, herbicides, insecticides, fungicides, pharmaceuticals and nanomaterials – yes, you are ingesting traces of beta-blockers and statins, through your water and food (especially fish). Not only are their environmental effects markedly under-researched, but accepted safe toxicity levels are themselves questionable. Serious industry and regulatory inadequacies, biases and cover-ups are involved, and deregulation has removed controls that ought to be there.

Pollution hot-spots such as factories, mines, waste sites and sewage outlets are gradually being cleaned up, but ambient pollution from farm fields, vehicles, chimneys and rain is still increasing and under-regulated. Key drivers of ambient pollution are city growth, rising energy demand, increasing mining, smelting and deforestation, the global spread of toxic chemicals, heavy

application of insecticides and herbicides and increasing transportation intensity.

In many countries, pollution regulation is carried out by a variety of ministries and agencies, and pollutants are studied in fragmented research programmes that fail to examine the whole picture or the interreactions of pollutants when mixed. They are scantily covered in medical training. Public perceptions are carefully managed by the chemical, pharmaceutical and oil industries. Regulation of pollution and its impacts is prioritised below economic growth and portrayed as anti-business and anti-progress. Not only this, but governments and regulatory authorities tend toward bias toward polluters. The rush to introduce new chemicals, technologies and products overrides precautionary restraint, and governments prefer to do little until a fuss is made.

What of the future? The *OECD Environmental Outlook 2050* mentions 'red light' issues such as greenhouse gases, alien species invasion, untreated waste water, SO₂ and NO_x emissions and exposure to hazardous chemicals, especially in developing countries, as well as increasing premature deaths from particulates and ground-level ozone. What can be done? OECD suggests making pollution in industry and agriculture more expensive than greener alternatives, through taxes and emissions trading, tightening regulations and investing in green innovation. Public education is also needed, to reduce consumer demand for polluting agents. These measures are relevant, but a deeper, more systemic change is needed: we need to reduce pollution to an absolute minimum, bringing it within the bounds of nature's limited capacity to deal with it.

Air pollution. This includes carbon monoxide (CO), sulphur dioxide (SO₂), chlorofluorocarbons (CFCs) and nitrogen oxides (NO_x) produced by industry, motors, waste burning, fires, war and other sources. Photochemical ozone and smog are created when

NO_x and hydrocarbons react in sunlight. CO_2 emissions affect climate change. Particulate matter - dust, smoke and chemicals - hangs over urban areas and circulates worldwide in the jetstream, dropping on land and water, altering chemical balances in nature and affecting weather conditions over long distances.

Soil contamination derives from pesticides, fertilisers, spilled, leaked or dumped chemicals, agricultural slurry and air and rain pollution. The biggest contaminants are hydrocarbons, heavy metals, MTBE, herbicides, pesticides, plastics, chlorinated hydrocarbons and bacteria. Once this happens, soil integrity and biodiversity break down and never fully revive.

Water pollution comes from commercial and industrial discharges and spills (chemicals and heavy metals), untreated sewage (organic and chemical discharges), treated sewage (chlorine, pharmaceuticals, chemicals, detergents and microplastics), urban rainwater runoff, air deposition, agricultural contaminants (pesticides, fungicides and fertilisers), waste dumps, paint, wood preservers, suntan lotion and multiple other sources, affecting rivers, lakes, oceans and aquifers. Organic and phosphate discharges from industrial farming and meat production cause algal blooms, ocean eutrophication and dead zones near the mouths of big rivers. Water courses and oceans have been permanently changed in chemical balance and biodiversity. Even after clean-up, mercury, arsenic, radioactive particles, phosphates, radionuclides and more are permanently deposited in riverbeds and on ocean floors.

Radioactive contamination comes from nuclear power, nuclear accidents, dumps, past weapons tests and hospitals - and it is long-lasting. Nuclear detonations in the 1950s still affect us now.

Electromagnetic radiation pervades the atmosphere: you are bathed in it. It is intense indoors and in cities, around transmitters, power lines and microwave beams and from buried power supplies. The introduction of 5G, smart meters, the internet of things and driverless vehicles will amp this up

immensely. EM is transmitted through rainwater, rivers and aquifers as well as in the air and through anything metal (mattress bed springs, keys, coins, vehicle, train and aircraft bodies). Bizarrely, hospitals are among the worst EM environments. Much of the research on its effects is unreliable and dishonest, left to 'big wireless' companies with a stake in the business. Medical reporting on its health effects is scanty (brain tumours, nervous and immune system problems). Research on its effects on nature, the atmosphere and weather is thin and disregarded. When proper objective research and public awareness eventually emerge, the public response is unpredictable because the useful technologies spreading this invisible pollutant cannot easily be phased out.

Plastics range from bottles, bags, condoms and fishing nets to microplastics, clothing particles and disintegrated plastic items. Even biodegradable plastics are harmful - their constituents disintegrate but do not disappear. An estimated 8m tons of plastics enter the oceans every year, particularly from Asia. The faunal death rate from entanglement and contamination is high, and microplastics are now known to be inside fish, sea mammals and humans, suspended in aquifer water and mixed into soil and sand. Plastics float in huge quantities in ocean gyres, in the Mediterranean and China Sea, and they blow across the most remote of wildernesses. We breathe plastic particles and eat leached chemicals from food packaging on a daily basis.

Litter. Packets, cigarette butts, cans, bottles, dumped waste and metal scrap. Cigarette butts are deposited at a rate of 5.6tn per year globally. They take five years to decompose and for the carcinogens, pesticides and nicotine in them to disperse into the environment.

Tech waste (e-waste) is produced at a rate of 50m tons per year. It contains lead, barium, cadmium, dioxins, heavy metals and other ingredients, often in complex and microscopic forms that are currently unrecyclable. Your mobile phone is a box of concentrated contaminants.

Fisheries pollution, mainly from discarded fish waste and fish farms, spreads bacteria and viruses, harming living fish and birds with rotten, infected and contaminated food.

Thermal pollution comes from power plants and industry, cities and heating systems, affecting water and air temperatures, mainly in densely-populated and industrial areas.

Light pollution not only obscures the moon and stars but it affects animal behaviour and plant growth - worst in developed countries and areas with dense populations.

Noise pollution affects animal communication and plant growth. Undersea noise (ship engines, drilling, wind turbines, sonar) affects fish and cetacean communications. Ambient noise on land (industry, motor vehicles, fans, aircraft, tractors) affects human stress and health levels.

Visual pollution has a depressing and de-sensitising effect, negatively affecting social behaviour and attitudes toward the environment. It includes transmitters, advertising, unsightly surfaces and shapes, poor architecture, industrial sites, waste dumps, scarred land and obscured panoramas. Visual inputs are an important form of human and animal nourishment.

Indoor pollution includes smoke, particulates, chemicals, static electricity and electromagnetic radiation, nowadays exacerbated by heat insulation, wi-fi and electronics.

Invasive species. This happens largely in connection with trade and deliberate introduction. It includes plants, insects, animals, fungi and viruses that overcome native species by competing for nutrients, space, light, water or food. This affects biodiversity and ecosystem adaptability. When invasive species overwhelm indigenous species, the effect is negative overall, though invaders do in some cases improve biodiversity too.

One key problem is that pollutants are treated in isolation from each other, without being treated as a mixture of complementary and inter-reacting chemicals and effects. They are assigned 'safe' levels

based on short-term, narrow-scope research, but the effect of *all* pollutants, or of particular combinations, added together over many decades or generations, is both unknown and ignored. Omitting to practice the precautionary principle means that, even when specific dangers are discovered, chemicals and toxins have already been deposited in rivers and in people's livers, and it is by this time too late. Even if a person enters into a health detox regime, those toxins are then redistributed into the wider environment through excreta, only partially filtered out in sewage-cleaning processes.

In short, we're in a mess and we're poisoning ourselves and our home world. We have known this since at least the 1960s, and we have failed, individually, as nations and as a planetary race, to do much about it. The consequences in health, mental health, social distress, the natural environment, the seas and the atmosphere are vast and will reveal themselves throughout the 21st Century and beyond. Today's cocktail of well-known private and public health problems are rarely ascribed to pollution and toxicity for deeply political reasons.

We are all variously guilty of permitting and failing to question this. In some cases, deliberate deception by polluters and wilful blindness by the wider public constitute crimes against humanity yet to be identified. In future, people will wonder why this was allowed, and they will nevertheless, at the time, still pay the price for it, long after large-scale pollution has long been abandoned.

However, such abandonment is not easy, since many pollutants – plastics and EM-radiation for example – are valuable and not easily replaced, so simply banning pollutants will not help overall. Some issues can arguably be dealt with, such as the replacement of pesticides and chemical fertilisers with advanced organic growing procedures, but plastics and radio telephony are more difficult. Much of the solution lies in human usage-reduction and the exercising of due care with polluting materials. But even then, if millions of people use ecological household products, their disposal

and dispersal in such scale is still problematic. We have a big problem, and we pay a price particularly for erroneous pollution-related decisions made a century and more ago.

Useful links

Environmental Outlook to 2050, OECD, 2012.

<http://www.oecd.org/env/indicators-modelling-outlooks/oecd-environmental-outlook-1999155x.htm>

The World's Worst Pollution Problems, Pure Earth/Green Cross, 2016.

<http://www.worstpolluted.org/docs/WorldsWorst2016Spreads.pdf>

Air Pollution, Our World in Data (Max Roser). <https://ourworldindata.org/air-pollution>

Sixty-five Interesting Facts about Pollution.

<https://www.factretriever.com/pollution-facts>

Wikipedia (*good for links and references*):

Air pollution https://en.wikipedia.org/wiki/Air_pollution

Water pollution https://en.wikipedia.org/wiki/Water_pollution

Soil Contamination https://en.wikipedia.org/wiki/Soil_contamination

Radioactivity https://en.wikipedia.org/wiki/Radioactive_contamination