What is causing Climate Change?

by ***Bernard Jarman***

EVERYONE TODAY IS TALKING ABOUT CLIMATE CHANGE and the need to curb ever-increasing CO_2 emissions. The very welcome consequence of this is that increasing numbers of people are now trying to reduce their environmental footprint and pursue a more sustainable lifestyle. There is also growing recognition that our pursuit of limitless consumerism is very destructive. Human actions are changing global climate patterns and the weather has undoubtedly become more unpredictable, yet is it right to assume that the emission of CO_2 is the primary cause?

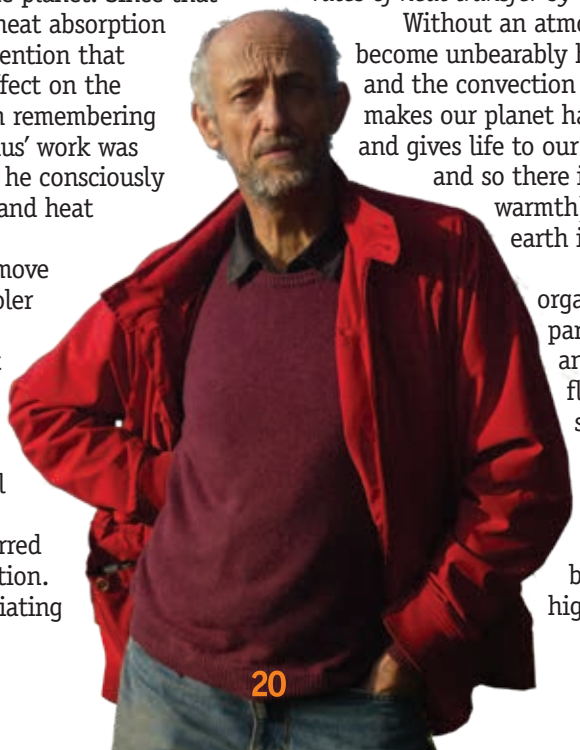
The CO_2 global warming hypothesis originated in the research carried out by Swedish scientist Svante Arrhenius. His field of research involved chemistry and physics and one of his key discoveries was that mineral salts dissociate into pairs of ionised particles when dissolved. He also sought to develop a theory that could explain the ice ages. For this he drew on the work of John Tyndall (1820-1893) a physicist who studied radiant[i] heat and demonstrated how certain gases could absorb this heat. He found that water vapour is the strongest absorber of heat and that certain compound gases notably CO_2, ozone and methane, absorb heat as well, though to a far lesser extent.

Arrhenius was able to show that an increase in atmospheric CO_2 concentrations will result in more radiant heat being absorbed. In 1896 he concluded that *"if the quantity of carbonic acid increases in geometric progression, the augmentation of the temperature will increase nearly in arithmetic progression."* Out of this he developed the hypothesis that increased concentrations of CO_2 caused by the burning of fossil fuels, will warm the planet. Since that time many scientists have verified the heat absorption capacity of CO_2 and as a result the contention that increasing CO_2 levels have a warming effect on the planet, appears indisputable. It is worth remembering however that the main focus of Arrhenius' work was on radiant heat and in his calculations, he consciously omitted to include the effect of clouds and heat convection.

Heat always has the tendency to move from something warm to something cooler and is transmitted in three different ways – conduction (the transfer of heat through solid materials), radiation and convection. As regards atmospheric warming conduction doesn't apply and radiation makes up only 8% of the total heat transmission in the atmosphere.

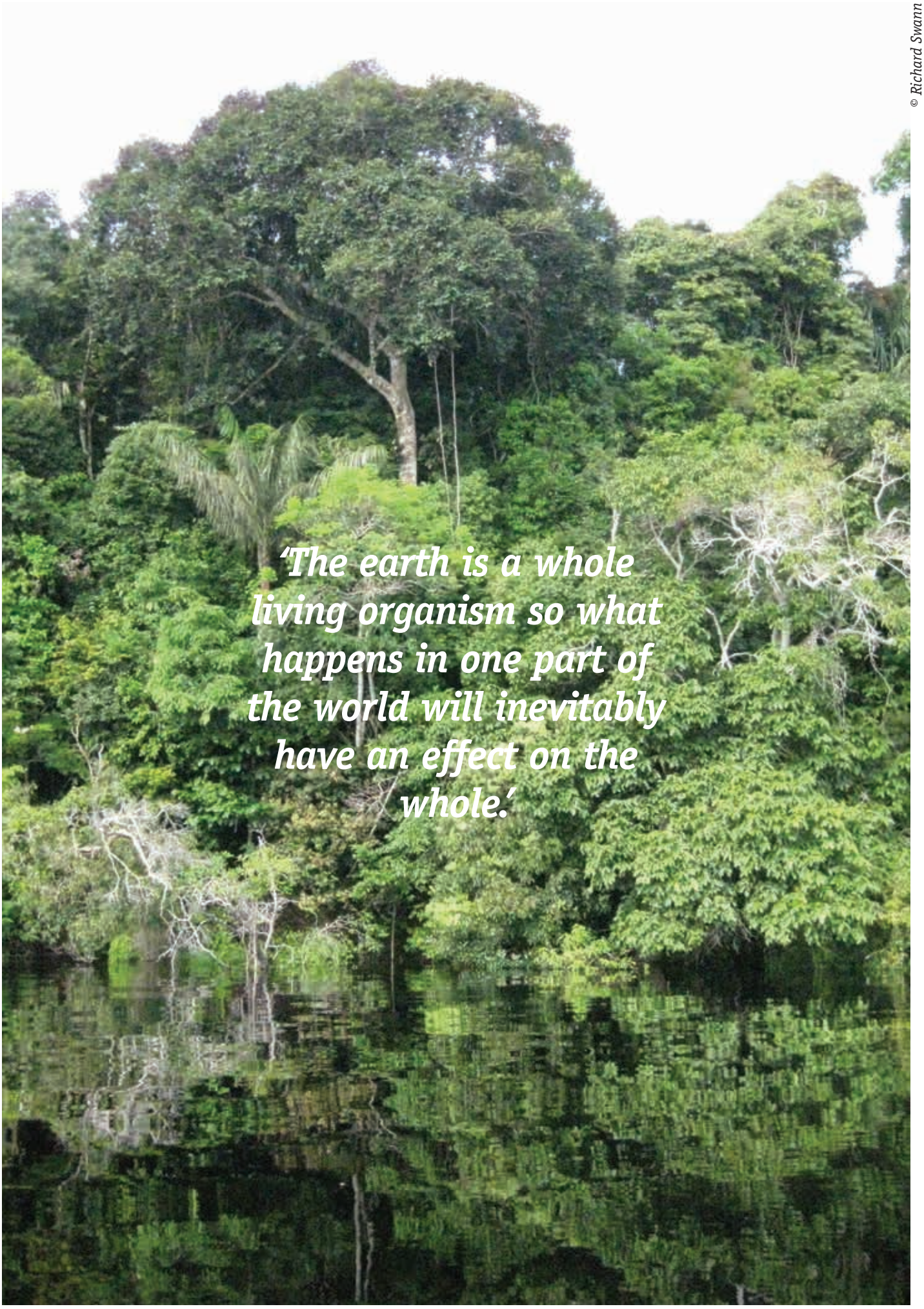
The main way that heat is transferred through liquids and gases is via convection. As soon as it is warmed by the heat radiating from the sun, other heat sources or heat reflected from the ground, the air begins to rise. Warm air rises and as it does, so it gradually cools down. Cool air holds less moisture and so clouds form. In cooling down the warmth in the air is released and escapes into space. Once it has cooled the air descends again to complete the cycle. These convection currents cause the air to circulate round the planet. Hot air from the tropics rises and then descends as cold air at the poles. The rising warm air releases rain, the sinking cold air brings high pressure and blue skies. It is the intricate and ever-changing relationship between warm and cold air masses that brings about our weather. These in turn are affected by the complex system of ocean currents in the hydrosphere and up above by the fast-moving currents of the jet stream.

In more recent research carried out in 2008[ii] it is stated that: *"The convective component of heat transfer dominates in the troposphere. When infrared radiation is absorbed by the greenhouse gases, the radiation energy is transformed into the oscillations of gas molecules, i.e., in heating of the exposed volume of gaseous mixture. Then the further heat transfer can occur either due to diffusion or by convective transfer of expanded volumes of gas. Inasmuch as the specific heats of air are very small (about 5:3 x 10-5 cal/s/cm °C), the rates of heat transfer by diffusion do not exceed several cm/s, whereas the rates of heat transfer by convection in the troposphere can reach many meters per second. An analogous situation occurs upon heating of air as a result of water vapour condensation: the rates of convective transfer of heated volumes of air in the troposphere are many orders of magnitude higher than the rates of heat transfer by diffusion."*



Without an atmosphere the earth would either become unbearably hot or unbearably cold. It is the air and the convection currents moving through it that makes our planet habitable. It is also what ensouls and gives life to our earth. The atmosphere has no roof and so there is a continuous flow of energy (and warmth) from and into outer space. The earth is no greenhouse.

The earth is a whole living organism so what happens in one part of the world will inevitably have an effect on the whole. If even the flapping of a butterfly's wings in some distant place can cause a storm[iii], then larger changes will surely do so too. Today the changes are not just natural but have been brought about by human activity. Through our highly advanced technology it has



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'The earth is still considered a resource to be exploited instead of a living being that needs caring for and managing.'

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been possible to wreak changes that no previous generation could ever achieve. Today the very fabric of life is threatened by pollution, plastic waste, radioactivity, fracking and the imminent introduction of full spectrum coverage by the proposed 5G network[iv]. All these things are affecting the climate but perhaps the most far-reaching threat to climate stability is deforestation. Our forests are not for nothing known as the lungs of the world. They not only absorb carbon dioxide and release oxygen they are also able to regulate the amount of rainfall an area receives and moderate extreme conditions of drought or flooding – quite apart from their supreme ecological value.

According to the Tree Foundation, 51% of the earth's original forest cover has been lost. Loss of tree cover has a direct effect on the local climate and a large forest such as the Amazon rain forest produces 50% of its own rainfall through transpiration. It can therefore be safely assumed that a further loss of global forest cover will have an increasingly significant effect on the global climate. Indeed, according to a 2005 study undertaken by NASA *"Deforestation in the Amazon region of South America (Amazonia) influences rainfall from Mexico to Texas and in the Gulf of Mexico. Similarly, deforesting lands in Central Africa affects precipitation in the upper and lower US Midwest, while deforestation in Southeast Asia was found to alter rainfall in China and the Balkan Peninsula. It is important to note that such changes primarily occur in certain seasons and that the combination of deforestation in these areas enhances rain in one region while reducing it in another[v]".* This clearly shows that by removing vast areas of forest, the living rhythmic system of the earth (its natural convection currents and air circulation), becomes chaotic and unpredictable.

It also goes on to point out that *"Deforestation does not appear to modify the global average of precipitation, but it changes precipitation patterns and distributions by affecting the amount of both sensible heat and that which is released into the atmosphere when water vapour condenses, called latent heat," "Associated changes in air pressure distribution shift the typical global circulation patterns, sending storm systems off their typical paths."*

The rapid loss of tropical forest – currently an area the size of the UK is destroyed each year – is thus arguably the greatest driver of climate change. Forest degradation is also occurring in temperate and polar regions too. Deforestation in the world's mountain regions results in massive flooding downstream and we may well ask what climatic consequences the destruction of Boreal forest in Canada and Siberia is having.

But there are of course many other issues that we need to address if we are to secure a healthy and balanced world ecosystem. Biodiversity loss in many regions has become acute – not because of global warming – but because of toxins in the air and water, the ruthless extraction of resources and a system of industrial agriculture that seeks to dominate rather than work with nature. Monotonous and near lifeless landscapes devoted to monocultures and vast-scale production, render landscapes incapable of ameliorating the climate. The elemental forces of wind, water, snow and fire are then no longer tamed, but take on gigantic form and bear with them enormous powers of destruction when they are released – fire storms in Australia, hurricanes in the US and elsewhere huge floods.

Something needs to change in the way we approach the earth. We need urgently to re-think our economic

'…the focus should be on enhancing the life and fertility of the soil by having a closed farm organism and a carefully carried out system of composting and soil management'

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system. Our western growth economy only succeeds by exploiting the poorest in society, the developing world and the planet. The earth is still considered a resource to be exploited instead of a living being that needs caring for and managing. If we had a system whereby every resource that is mined or manufactured is returned to the earth at the end of its useful life in a form that allows for its re-incorporation into the natural order without toxins and residues, it would become sustainable but our capitalistic system could not function. We need a new system that is based on mutual service instead of personal profit. Only then can we meet the huge task that is facing us. The indigenous peoples of the earth have long known how to manage fire and water in the landscape and use them carefully to support their production systems. Today however we need to manage not only the untamed earth but also the land which has been cultivated, exploited, industrialised and effectively ruined. This we can only do from a spiritual vantage point.

The climate crisis we are facing will not be solved by focusing on the reduction of carbon emissions. Carbon is an essential building block of life and indeed there is much evidence to show that increased carbon dioxide in the air improves plant growth. This does not of course alter the fact that as much carbon material as possible should be retained in the soil to build up its humus content and retain soil fertility. All organic residues that arise on the farm should be incorporated without wastage and leaching or dissipation as carbon dioxide – in other words the focus should be on enhancing the life and fertility of the soil by having a closed farm organism and a carefully carried out system of composting and soil management.

A key element of biodynamic agriculture involves the use of biodynamic sprays. Amongst other things they serve to activate life processes and bring them into movement. This means enhancing the engagement of plant and soil, stimulating the breathing in and out of carbon dioxide, oxygen and nitrogen, maintaining a dynamic equilibrium and keeping the earth alive. And this is what the sun is doing for our whole planet. Its warmth brings the air and water into movement and ensures that it becomes neither too warm nor too cold. But to be fully effective it also needs a healthy ecosystem. However, when the lungs of the earth are harmed and too much of the forest is removed, the delicate and complex equilibrium of the earth's climate is disturbed, and unpredictable weather events as we experience them today become more frequent.

(i) Radiant heat originates primarily from the sun. It is transmitted through the air or a vacuum and then absorbed to a greater or lesser extent by the solid and liquid materials of the earth. Some is then radiated back into the atmosphere and absorbed by water vapour and other gases, retaining warmth in the atmosphere.

(i) G V Chilingar, L F Khilyuk of University of S California and OG Sorokhtin of Russian Academy of Science, Moscow 'Cooling of atmosphere due to CO2 emission' Taylor & Francis 2008

(iii) Edward Lorenz (1917-2008) meteorologist and father of Chaos Theory discovered that tiniest of changes could have a huge effect.

(v) G Millar & Y Roux "and not only bees …" Star & Furrow 2020

(v) Goddard Space Flight Centrem, 2005 "Tropical deforestation affects rainfall in North America," https://news.mongabay.com/2005/09/tropical-deforestation-affects-rainfall-in-north-america