



## Life in Abundance

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*Isaiah 24: 4–6    2 Corinthians 9: 8*

It is hard to think of a time in the past when the Earth Sciences and Economics spoke to one another; the time frames of the disciplines differ greatly. But now is an exception. Earth scientists have found evidence that in the early post-War years there was an abrupt shift in the imprint of the human presence on the biosphere. They have proposed 1950 as the year we entered the Anthropocene, a human dominated planet. Earth scientists tend to express their findings in leaden prose, but in this case the sub-text has been one of alarm.

Economists in turn have noted that since 1950 there has been a sharp and continual improvement in the global standard of living. Since 1950, per-capita global GDP has increased more than five-fold (to some 20,000 international dollars); population has increased more than three-fold from 2.5 billion to 8.1 billion; life expectancy at birth has increased from 46 years to 72; and the proportion of people in extreme poverty has declined from more than 60% to less than 10%. Economists air these statistics triumphantly to counter the gloom of Earth scientists and ecologists.

It may sound paradoxical, but both responses are correct. Our enormous post-War economic success has been achieved by an accumulation of produced capital (roads, buildings, ports, machines) and human capital (health, education, skills), but at the expense of natural capital (wetlands, grasslands, mangroves, coral reefs, woodlands, forests, lakes, soil, and such global assets as the atmosphere and the oceans). Natural capital has been degraded and depleted beyond any past human experience. We have undermined Mother Nature to create our prosperity.

Global climate change is one sign of our overreach. Species extinction is another. Current estimates of the total number of species (of eukaryotes) lie in the range 8–20 million, there may be a lot more species. Fewer than 2 million have been recorded, but the rate of extinction is estimated today to be 100–1,000 times the extinction rate over the past several million years, of some 0.1–1 species per million per year. Taking the upper values for illustration, and assuming there are 15 million species today, some 1.5 million species will be extinct in the next 100 years, or 10% of the current number of species.

Nature is a self-regenerative but degradable asset, supplying us with a wide variety of goods and services. It proves useful to divide them into two categories: *Provisioning Goods* – food, water, timber, fibres, pharmaceutical products, and non-living material; *Maintenance and Regulating Services* – decomposition of waste, climate regulation, nitrogen fixation, air and water purification, soil regeneration, pollination, and so on and so on.

Using our ingenuity, we humans convert provisioning goods into the final products that, at market prices, add up to GDP. But it is Nature's maintenance and regulating services that furnish us with provisioning goods. By mining, quarrying, and otherwise transforming the landscape (forests making way for agriculture and plantations; grasslands transformed into pastureland; and so on), we have increasingly drawn on provisioning goods. We subsidize ourselves to the tune of 3–4 trillion dollars a year to mine Mother Nature for her provisioning goods, in effect setting a negative price for them. It has been estimated that the global demand for Nature's provisioning goods exceeds her ability to meet that demand on a sustainable basis by a multiple of 1.7, which is why ecologists say that we need 1.7 Earths to meet our demand sustainably.

The problem is, there is a tension between provisioning goods on the one hand and maintenance and regulating services on the other: as we demand more of the former, we eat into the space required for the supply of the latter. But the latter, that is, maintenance and regulating services, are fundamental, for without them there would be no provisioning goods. So, by over-extending our demand for Nature's provisioning goods, we reduce her ability to provide maintenance and regulating services; and that endangers the future availability of provisioning goods. Scientists call this positive feedback.

Why is there such an overreach? There are three reasons: Mother Nature is mobile (the wind blows, birds and insects fly, rivers flow, ocean currents circulate), and her processes supplying maintenance and regulating services are in large measure both silent and invisible. (Think of what goes on deep in the soil or in the oceans.)

These three characteristics make it difficult, nigh impossible, to observe or verify acts that desecrate the natural world. (In other contexts, such acts would be called vandalism.) Which means neither the Law nor Social Norms can be deployed successfully to moderate our behaviour.

In a video that was placed on the internet last year, the New York Times summed up a way out of our dilemma, with the prescription: 'Pay-For-What-We-Use'. But as neither the Law nor the force of Social Norms of behaviour can make us pay, what remains is self-monitoring of personal conduct. Ultimately, we must be our own judge and jury if we are to protect Nature, which is to say, protect ourselves.

How can we get ourselves to be both judge and jury? Or to put it in the economist's language: how can we create the incentives to behave? It seems to me we can only do that if we develop a love for Nature. For if you love a being, you will want to protect her.

When I was in middle school in Varanasi, India, students, and staff assembled twice daily, when our music teacher and his students would chant or sing Vedic hymns that spoke to Mother Nature's rhythms – the seasons, dawn, dusk. And there were, of course, creation hymns. Invocation of the silent and unobservable processes giving rise to those rhythms brought we students in touch with what I can only speak of as the transcendent.

Which is why it seems to me we can develop a love for Nature only if we develop an understanding of her processes, to appreciate the rhythms of the bewildering range of periodicity and spatial reach that she displays. And the only way to obtain a glimpse of that is education. It seems to me education curricula should include Nature studies from the earliest years of schooling, carrying on as a matter of course through the latter years of schooling. It is only when we begin to appreciate beauty in what we otherwise see as muck in marshes and woodlands that we develop a sense of wonder at Mother Nature's processes. And that is when we begin to appreciate her abundance.