Wise up or Die Out

Managing human consumption has a major impact on the functioning of societies, and – even more importantly – on the condition of our planet. What does the future hold?

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In the most basic terms, life can be described as the flow of energy through organisms. Over hundreds of millions of years, innumerable solutions have evolved to help organisms manage resources in the form of energy – or, in short, consume energy. The result is an extraordinary biodiversity, which – according to a vast body of research – has only reached its peak relatively recently. One of the key mechanisms supporting biodiversity has been pressure on organisms to develop different ways of obtaining energy. It started from a simple division between organisms consuming large and small particles, which in turn led to incredibly complex specializations, as illustrated by Darwin's finches. The mechanism means that pressure from individual species on the environment is spread out relatively uniformly, which in turn means that resources are also used evenly. This is especially pronounced in marine environments: large fish eat smaller fish, any debris is consumed by scavengers, while excrement provides nutrition for specialized species of coprophages and microorganisms, bacteria and fungi. Nothing is wasted, and there is no excessive consumption of or competition for a particular resource.

However, sustainable consumption became destabilized when the first eusocial species evolved; in contrast with other social species, these animals form stable, highly organized societies. There are relatively few eusocial species, and the vast majority are insects (ants, termites and bees). There are also three species of shrimps that live in colonies in tropical reefs and sponges, and three species of mammals: two species of mole-rats and contemporary humans. Although the actual number of species is low, eusocial animals have conquered the biosphere. According to E.O. Wil-

It is highly unlikely that we humans will manage to leave our Solar System and colonize Earth 2.0 anytime soon. Such an enterprise can hardly be compared with colonizing new lands beyond the ocean. Photo taken by the Mars Curiosity Rover.

son, the main proponent of the theory of humans as a eusocial species, eusocial animals comprise over 30% of the biomass in the Amazon basin.

In terms of consumption, eusocial species are highly diverse and not fussy. The majority, including termites and ants, have evolved from predators and developed highly unusual specializations, with individuals taking on roles of workers and/old soldiers. Certain species cultivate fungi in their colonies, providing them with an important and stable element of their diet on demand, although they also feed on a range of others foods which they collect and store. Wilson argues that rather than kinship and altruism towards our own relatives, it is this ability to store food in safe, guarded nests, present in all eusocial species, which has led to the development of the powerful social ties and willingness for self-sacrifice to defend the colony's home and resources.

Destructive colonies

Consumption in a eusocial colony is completely different from that of other species, which generally feed on selected morsels. An ant colony moves through the environment like a steamroller, devouring everything which can be eaten or converted to compost along the way. Its expansion is blocked most effectively by another colony, with the two engaging in a merciless battle for resources. Eusocial insects use pheromones to detect members of their own clan to cooperate with them and fight strangers. A few species have been found to have a mutation which damages

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this mechanism; affected ants are willing to collaborate with any individual of their own species even if they are from a different colony. The combined nests create a supercolony which strips the area of all resources; its consumption is practically limitless and vastly exceeds what local renewable resources can provide. As a result, after a period of rapid growth and territorial and demographic expansion (some colonies have been found to cover a territory of several square kilometers), the supercolony slowly starves.

Sound familiar? Such a model of extreme consumption leading to self-destruction is familiar to biologists from many simple ecosystems; one example is fluctuating lemming populations in the Arctic. It has also affected many human civilizations, especially during the period of transition from family groups of hunter-gatherers to larger agricultural communities. In the early days, accumulating resources allowed human populations to grow rapidly. The larger and more integrated the group, the better it is at expanding and exploiting natural resources. However, when the environment is pushed to its very limits, resources run out, resulting in soil depletion, drought, pollution and contamination, and eventually hunger and starvation. The scenario has already repeated itself on Easter Island, in parts of Africa, in Central America and in the Middle East.

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Illusory return to the past

The rapid growth of the human population around the globe and clear, progressing damage to the environment mean that many people dream of returning to a pre-industrial era. But the dream is just an illusion. A return to a supposedly idyllic time of hunter-gathering would necessarily have to start with a dramatic reduction in the size of the population. The area occupied by Poland in Central Europe currently comfortably supports around 40 million people living as part of a modern, integrated society. A postapocalyptic reality taking us back in time to the days of hunter-gatherers would mean no more than around fifty thousand people could survive in the same area.

It's also worth adding that consumption has a behavioral dimension. Accumulating resources requires a stable social system to ensure they are distributed, guarded and supplemented as required. Groups of all social species are divided into specialized subgroups or castes. In insects they are workers, soldiers, queens and drones; in humans they can be laborers, guards and owners. This has been the case for millennia, from the ancient Indian Empire through the British Empire to Tsarist Russia. It's also how future is envisioned in films and literature, for example in Stanisław Lem's Futurological Congress. This way of organizing consumption in social species brings security and minimizes aggression and competition. There are sufficient resources, there is a division of roles and while supplies are plentiful, social ties continue to blossom; in humans, this has resulted in the development of civilization, technology and culture. However, controlling the resources and caste divisions have also brought forward some of the worst human traits: feudalism, despotism, marginalization and exclusion of certain groups.

The model of consumption typical of solitary species or those living in small family groups is dictated by day-to-day situations. Not being able to store up resources means uncertainty about the future, and it requires robust defense of grazing or hunting territory. Jared Diamond describes hunter-gatherers societies which survive into the present day, living just like their ancestors did during the Stone Age, in his book The World Until Yesterday. The societies are surprisingly aggressive, both towards groups intruding on their hunting territory and towards members of their own community. To survive, hunters must guard their territory very closely, so there is no room for social movement, development of complex cultural relationships or technology. Life is dominated by a struggle for survival. Consumption is sustainable; it cannot be any other way, since resources are gathered by a small group of people who don't gather anything beyond what's necessary right now. For humankind, there is no returning to the past.

Meat-free hope

So, taking account of the dwindling resources, what model of consumption has been proposed by ecologists? First of all, humankind needs to stop eating meat and farming animals for slaughter, since it is the most energy-inefficient way of obtaining food. Meat is a luxury product; if inhabitants of Africa and Asia consumed it at quantities matching those of Americans and Europeans, we would need another Earth to support the combined appetites. By applying state-of-the-art agricultural and biotechnological solutions, we could feed around twenty billion people, but this would require dedicating all landmass to producing

food. Oceans provide something of a safety buffer, but this is assuming that we don't eat fish at the top of marine food pyramids. Cod and mackerel are the ocean's equivalents of lions and tigers, and eating apex predators is clearly a waste of energy. Solar energy is converted into organic matter through photosynthesis by microscopic phytoplankton; this is eaten by equally microscopic zooplankton, which in turn is consumed by larger zooplankton. The next elements in the food pyramid are fish of increasing size. It should be noted that large herbivorous fish are a rare exception, and the vast majority of large fish are predators. Only 10% of energy is transferred from one trophic level to another, with the remaining 90% being used for growth, warmth and other life processes such as reproduction. Due to their large size, lands plants can be eaten directly by large herbivores such as antelopes and cattle. Humans can support themselves by cultivating large plants for consumption or farming herbivores which feed on them, resulting in a short trophic pyramid and lowered energy losses. Using oceans to produce food comes up against the technological issue of using microscopic plants and herbivorous animals; this leaves the option of consuming predators, which is energetically wasteful.

Cosmic move

In 2017, Stephen Hawking said in a TV documentary that the human race needs to think about colonizing another planet. Although his words were highly speculative, the idea has been simplified and seized on by businessmen and technocrats. According to them, our planet will become uninhabitable in the next two to three hundred years, so our only option is to start preparing to move humanity elsewhere. In February 2018, Elon Musk launched the Falcon Heavy rocket towards Mars. Industrialists have hailed the concept because it supports the development of technologies and industries in order to explore other worlds once Earth's resources are depleted. However, the solution – used back in the sixteenth century by Europeans hoping to ease overpopulation and satisfy their hunger for new land and resources by exploring new continents – is not practical on an interplanetary scale. Migration beyond our Solar System and finding and populating Earth 2.0 is hardly comparable to colonizing new areas on the other side of the Atlantic or Pacific.

While humankind's main goals remain development and driving growth factors, it's difficult to be optimistic about the future. Consumption must be rationalized and limited, but it requires far-reaching social change, on a scale similar to the shift from hunter-gatherer societies to agricultural communities. Our energy demands, which underlie consumption, are largely solvable. For example, we could shift from food based on photosynthesis – either consuming plants directly or indirectly through a meat-based diet – to products created using chemosynthesis. We know of rich ecosystems of organisms in the abyssal zone, which do not depend on sunlight and obtain energy by metabolizing methane and sulfur compounds. Such ecosystems could be used as the base of trophic pyramids in place of plants.

However, utilizing bacteria to produce food using state-of-the-art biotechnologies won't solve the problems of overpopulation and social tension resulting from the social structures required in the production, distribution and control of resources. All studies into the effects of overpopulation show that it leads to increased aggression and antisocial behavior, even when food is plentiful. Wilson writes that no one would wish to live on an Earth populated by 20 billion people, where there is simply no room for anything apart from humans and the products they consume. Perhaps Lem's idea from The Futurological Congress – where people are living in an illusion while their bodies are in suspended animation fed intravenously – could even become conceivable. We have to conclude that the only real alternative seems to be a dramatic reduction of demographic growth.

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Let's assume Wilson is correct and the behavioral model of early humans as hunter-gatherers was simply a natural strategy of favoring our own species (the "selfish gene"), while the evolution of modern humans as farmers has shifted towards the behavioral model based on social selection (protecting joint resources). It follows that traits we believe to be virtuous support social behavior (sacrifice for one's own society, cooperation), while vices are throwbacks to our ancient hunter-gatherer roots (selfishness, ruthlessness). Stabilizing the rate at which we consume resources by using state-of-the-art technologies may eliminate social tensions, but life under hugely overpopulated conditions will require another major behavioral shift. The problem is that no one today has any idea what such a social model might look like.

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