Green growth: Restorative economics for a post-carbon planet

Economic growth is driving ecological degradation on a scale that poses an existential threat to civilization. Gross domestic product now provides a better measure of *costs* than of benefits. We must transition to clean energy and simultaneously restore degraded global ecosystems. Neither of these activities are amenable to market allocation: ecological restoration provides collective benefits and requires collective decision making, while the value of green technologies is maximized when the required knowledge has a price of zero, in which case markets will not provide it. We thus need an economic transition towards institutions based on cooperation and reciprocity. One option that can help instigate the necessary transition is a common asset trust, in which R&D into green technologies is funded collectively then freely available to all. This low-cost initial step can help to spur the cooperation required to address larger challenges.

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The world currently confronts a series of interrelated ecological and economic crises. Biodiversity sustains our ecosystems and all the services they generate, yet is currently being depleted at unprecedented levels. We are depleting renewable resources faster than they can regenerate, and using non-renewable resources to generate chemicals and waste emissions that threaten catastrophic harm to global ecosystems. Global climate change threatens catastrophic disruption of planetary ecosystems and the services they provide which are vital to our survival.

Markets are the major determinant of how quickly fossil fuels are burned, forests cut, soils mined and pollution spewed into the environment, which makes economic growth the driving force behind these crises (Daly and Farley, 2010). In turn, the driving force behind economic growth is fossil fuel consumption. All economic production requires energy, and fossil fuels account for about 80% of the energy used globally (British Petroleum, 2018). Fossil fuels are available as a finite stock that we can use to create economic products and waste emissions as fast as we choose (Georgescu-Roegen, 1971). Prior to the fossil fuel revolution, economic growth was uneven, uncertain and rare, and virtually all economic growth since then has increased the use of fossil fuels. Alternative energy sources – such as solar, wind and geothermal – are available as finite flows, and our capacity to capture them is currently inadequate to maintain the global economy, much less expand it (Hall and Klitgaard, 2011). Yet a string of recent reports suggests that failure to reduce net CO_2 to emissions to zero by mid-century poses an existential threat to civilization (*e.g.* Intergovernmental Panel on Climate Change, 2018; 2019).

The goal of this article is to explore the potential for a major economic transition. Our current era of economic growth and ecological degradation has been strongly associated with a competitive market economy driven by self-interest. This article presents the hypothesis that a sustainable economy capable of meeting people's basic needs must instead be based on unprecedented levels of cooperation and altruism. The hypothesis is not based on ideological leanings, but on technical considerations, namely, whilst the physical characteristics of fossil fuels favour competitive markets, the physical characteristics of alternative energy and the ecological crises we currently face favour cooperation and non-market allocation.

The structure of the rest of this paper is as follows. First, it argues that what we currently call economic growth is actually *un*economic, with marginal costs exceeding marginal benefits, and must be replaced by green growth and degrowth. The paper then assesses a path toward green growth, defined as a quantitative increase in what is green: the ecological infrastructure essential to humans and all other species. It presents economic cooperation as inherently more efficient than economic competition when managing our most pressing problems. The paper then focuses on human behaviour, and the extent to which we are capable of the degree of cooperation required; it concludes by suggesting a possible path towards greater global cooperation.

Uneconomic growth, green growth and degrowth

Economists almost universally accept the law of *diminishing marginal returns*. This means that the more we have of something the less an additional unit is worth. This applies not only at the level of any given commodity, but also for the economy as a whole. For example, an increase in economic production provides far greater welfare in a poor country than in a rich country. Economists also generally accept the law of *increasing marginal costs of production*, and the principle clearly extends to ecological costs. Each additional ton of greenhouse gas emissions takes us closer to the tipping point of runaway climate change, each additional fish taken from depleted stocks or hectare of forest converted to agriculture may drive a species closer to extinction. At some point, the rising ecological costs of additional economic growth must surpass the diminishing marginal benefits. When we reach that point, growth becomes uneconomic, and continued growth makes us worse off than before (Daly, 2007).[1]

Economic growth is conventionally measured by gross domestic product (GDP), which fails to capture the costs of growth and hence the possibility for uneconomic growth. Furthermore, GDP responds perversely to quantitative changes in our most essential resources for which substitution is most difficult. Our demand for essential and non-substitutable resources such as food, energy, water, and lifesaving medicines is insensitive to price. That is, a small decrease in quantity supplied of such resources typically leads to a large increase in price, and *vice versa*. For example, when the supply of food grains decreased slightly in 2007–08 and 2011–12, prices doubled (Farley *et al.*, 2015). Now, GDP is the quantity of all final goods and services produced in a country multiplied by their price. Hence, when grain supply fell, its contribution to GDP nearly doubled, and the same is true for any essential resource. On the other side, increasing supply reduces the contribution of essential resources to GDP. In other words, GDP perversely shows a decrease in production as a gain in welfare, and an increase in production as a loss. Figure 1 illustrates this dynamic.

Most economists claim that adjusting GDP for inflation (or deflation) addresses these

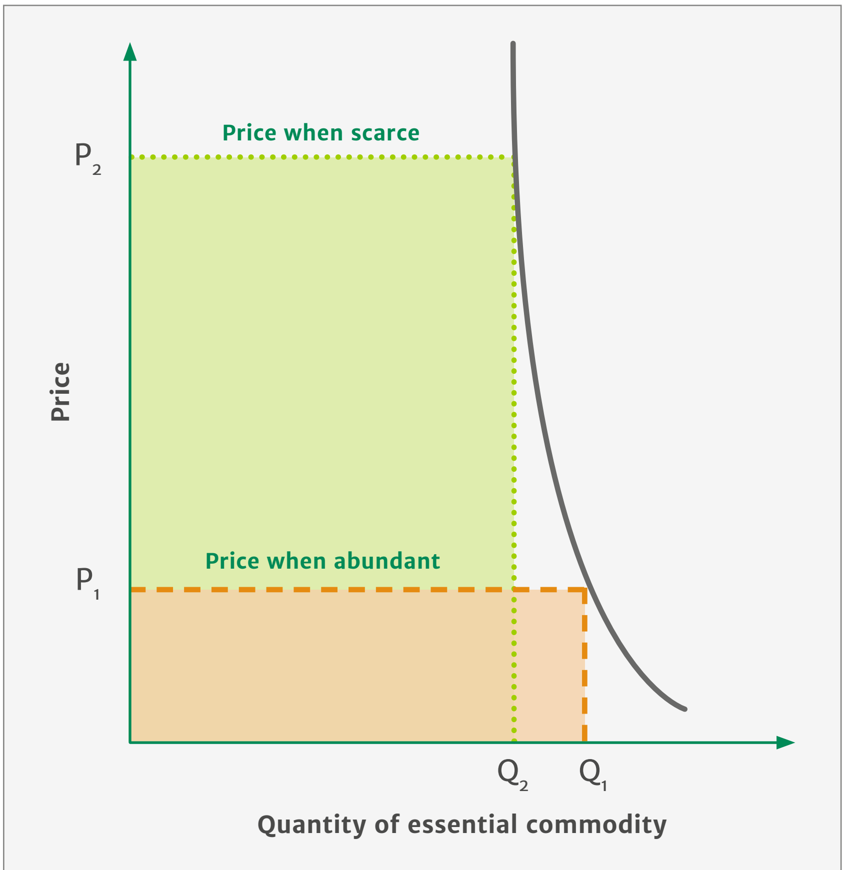

Figure 1. The contribution of essential commodities to GDP (measured by price × quantity of final goods and services) increases when supply decreases, and *vice versa*. $Q_1 \times P_1$ is clearly less than $Q_2 \times P_2$.

problems, but inflation implies an increase in overall price levels independent of supply and demand, not the response of individual commodity prices to changes in supply or demand. Furthermore, any decent indicator of economic welfare should be amenable to disaggregation – it should measure the contribution to welfare for each sector of the economy as well as for the economy as a whole. GDP clearly fails this litmus test, which leads economists to absurd conclusions. For example, several famous economists, including Thomas Schelling and William Nordhaus, have claimed that global climate change will have minimal economic impacts because it primarily affects agriculture, which is less than three per cent of GDP (Daly, 2000; Schelling, 2007).

GDP also confuses costs and benefits. As computers get better and cheaper, their individual contribution to GDP can decrease even as they provide more benefits. The development of cost-saving technologies can also show up as a decrease in GDP, such as LED light-bulbs that reduce expenditures on electricity. Far more insidious, if scientists develop a clean, sustainable alternative to fossil fuels, or any green technology, the more people who use it as a substitute for environmentally destructive technologies, the more benefits it generates. Charging monopoly prices for the technology maximizes its direct contribution to GDP, but decreases the benefits it generates and hence its value. Value is maximized when the information underlying the technology is freely available to all and contributes nothing (directly) to GDP (Farley and Kubiszewski, 2015). Depletion of natural resources decreases society's wealth, yet increases GDP, as do major catastrophes such as oil spills, hurricanes and fires (Daly and Cobb, 1994).

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Call for Artists

Stephanie Moran, Art Editor, and Salomón Bazbaz Lapidus, Art Advisor

We are inviting artists to submit artworks to *The Ecological Citizen*. We are seeking full-page spreads across 2–4 pages, single-page artworks and individual smaller drawings and images. We are looking for a range of artworks that fit with the ecocentric ethos of the Journal.

Artworks may relate to the Journal's topic areas (see www.ecologicalcitizen.net/about.html), or be images of animals and other nature including but not limited to: observational drawings, landscapes of all kinds, macro and cosmic perspectives, and animal vision.

We are also looking for artists to respond to written articles with smaller drawings; please contact the Art Editor, via the contact form linked to below, if you would be interested in making work specifically in response to submitted articles.

Artworks must be suitable to place in an online journal format, to fit onto A4 pages, and should be provided in high resolution (300 dpi) at intended size for the A4 page.

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Beyond a certain level, there is also a very weak correlation between GDP and life satisfaction. Figure 2 shows this effect, though it is evident that wealthier countries on average do seem to be marginally more satisfied with life than less wealthy countries even at high levels of income. Plotted logarithmically, we would see a linear relationship between life satisfaction and *per capita* income (Deaton, 2013), but this also makes it clear that a country must quadruple its *per capita* income to increase by one point on the satisfaction scale, and the ecological costs of achieving this in rich countries are truly astronomical. Furthermore, within a single rich country, there is negligible evidence of a correlation between satisfaction and income over time – an absence known as the Easterlin paradox (Easterlin, 1974). The dark-grey circles connected by the dark-grey line represent the US, and show how, as the US has grown wealthier *per capita*, satisfaction with life as a whole has actually declined.

GDP is a measure of value added, and hence of benefits, but it is also a measure of what we spend, a cost. Costs often correlate with benefits, as we see from the cross-country comparison in Figure 2, but not always, as we see when looking only at the US. As another example of GDP as cost, the US has the world's most expensive health care system with worse outcomes than any other wealthy nation, but with the greatest contribution to GDP (Organization for Economic Cooperation and Development, 2019). No sensible person would call for maximizing expenditures on health care,

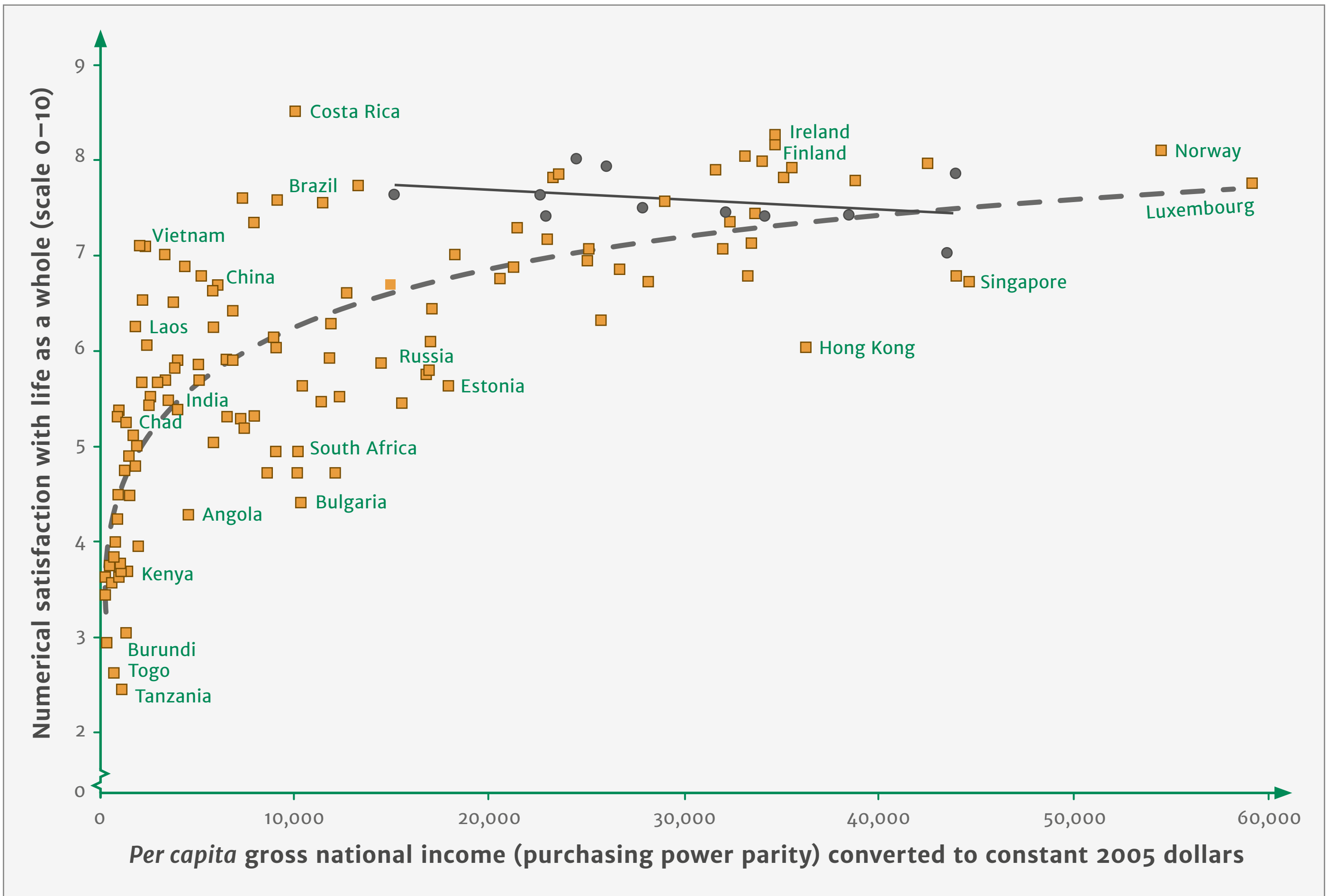

Figure 2. *Per capita* gross national income and mean satisfaction with life as a whole. The orange squares represent a cross-section of 121 countries around the world, and the dashed line a logarithmic trend. The dark-grey circles represent a time series for the United States, and the dark-grey line a linear trend. Sources: World Database of Happiness (http://worlddatabaseofhappiness.eur.nl, 2010); Bureau of National Economic Accounts, current-dollar and 'real' GDP (http://www.bea.gov/national/index.htm, 2007); World Bank Group, World Development Indicators (http://devdata.worldbank.org/data-query/, 2010).

but rather for achieving a long-lived, healthy population at the lowest possible cost. Treating GDP as a cost resolves all these perversities. Sometimes we need to spend more to get more, but pursuing increasing costs as a national goal is idiotic.

The solution to our current predicament is not conventionally defined economic growth, which is now uneconomic, but rather green growth in its most literal form – growing what is green. We must restore our seriously degraded global ecosystems in order to improve life for humans and other species. This means that we must slow the extraction of renewable resources to below their regeneration until they have been restored to levels that ensure the continued healthy function of global ecosystems. We must slow the extraction of non-renewable resources to below the rate at which we can develop renewable substitutes. We must emit wastes into ecosystems no faster than they can be absorbed, and in situations where pollution stocks have already accumulated to unsafe levels, such as greenhouse gases, we must emit wastes more slowly than they are absorbed, thus allowing stocks to decumulate. We must also strive to reduce our current population to sustainable levels, but leave this delicate topic to future articles.

While the world as a whole can no longer afford conventional economic growth, it is important to note that the world's poor do require more consumption in order to attain a higher quality of life. People who struggle to feed themselves or their children must focus on immediate survival, and cannot afford to invest in future ecological health. Most human beings would clear the last tree or kill the last fish to feed their children. Green growth will increase the productive capacity of forests, oceans and farmlands, thus helping the poor, but the poor will also require economic growth as conventionally defined. Green growth will therefore require a corresponding reduction in economic activity, or degrowth, by the world's rich.

Achieving green growth

The big question of course is how do we achieve green growth? This can be broken down into two separate questions: *where* do we invest, and *how* do we invest?

At the risk of oversimplifying, we have four types of stocks capable of yielding the flows of benefits required for a satisfactory quality of life. We refer to these as types of capital to stress that they should not be depleted, but with the explicit caveat that there is only a limited to negligible capacity for substitution between them, and most are ill-suited for market allocation.[2] Natural capital consists of the goods and services generated by well-functioning ecosystems. Social capital consists of networks of relationships, trust and community norms. Human capital includes education, knowledge and health. Built capital consists of human-made means of production and the artefacts we produce. Obsessed with economic growth, society has focused on these types of capital primarily as they contribute to GDP, driving private sector investments in the machinery and infrastructure required to transform raw materials and energy from nature into human made artefacts. We have neglected the provision, protection and restoration of non-market benefits to humans and other species, particularly those associated with natural, social and human capital.

Markets use the price mechanism to allocate raw materials to the final products that have the highest monetary value. They also use the price mechanism to ration those products, awarding them to the consumer who is willing to pay the most. This maximizes monetary value on both the production side and the consumption side. Markets are well-designed to increase GDP, albeit by allocating the marginal loaf of bread to the rich and overfed, rather than to the destitute struggling to feed their family (Farley *et al.*, 2015). However, markets only function well for resources that are both *rival* and *excludable*. A resource is rival when use by one person leaves less or lower quality for others. A resource is excludable when an individual or group can use it while preventing others from doing so. Markets are only possible for excludable resources. If exclusive property rights are not possible, then individuals can use a resource whether or not they pay for it, and there is therefore

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no incentive for the market to provide it. Markets are only appropriate for rival resources, for which one person's use leaves less for others. For such resources, rationing is necessary, and price rationing is one option. When a resource is *non-rival*, on the other hand, use by one person has no impact on use by others. This is the case for most ecosystem services, such as climate stability, and also for information.[3] My use of a stable climate does not leave less for others to use, and my use of the knowledge required for green technologies does not leave less of that knowledge for others (Daly and Farley, 2010). Using the price mechanism to ration access to a non-rival resource creates artificial scarcity, which is inherently inefficient (Kubiszewski *et al.*, 2010).

Fossil fuels are of course both rival and excludable, and hence are suitable for market allocation. Raw materials provided by nature are also rival and for the most part, we have created laws that make them excludable. Competition for such resources is inevitable, and markets may be an effective way to channel this competition towards the greater good. Market competition however is likely to be the wrong tool for achieving green growth. Many of the most important ecosystem services are both non-excludable and non-rival. We collectively share the benefits of a stable climate, a healthy ozone layer or a resilient and biodiverse ecosystem. Furthermore, one person's use of these services does not leave any less available for others, so rationing access makes no sense. Such resources are unavoidably open access, so self-interested competition will not provide them. Instead, cooperative provision, protection and restoration is required.

There is competition for many oceanic resources and for global waste absorption capacity, which are both currently non-excludable. This is obvious, for example, for fisheries and oceanic mineral deposits. Less obviously, an ecosystem's capacity to absorb waste emissions is also rival. For example, global ecosystems absorb about 5 billion metric tons of CO_2 per year (Ballantyne *et al.*, 2012). If we are to avoid global climate change, we must reduce emissions to below this level, for which individuals, firms, and countries compete for access. However, limiting access requires global cooperation.

In addition to ecological restoration, green growth requires environmentally friendly technologies that meet the needs of the poor, such as clean, efficient and decentralized solar energy. Energy is such an important part of our economy that the nature of our energy sources can have a major impact on the nature of our economy: an energy transition may lead to an economic transition (Cleveland, 2007).

Careful analysis can show that cooperation is superior to competitive markets in determining which green technologies to produce, producing them at the lowest possible cost, and maximizing their value once they exist. To begin with, meeting the needs of the poor is the most cost-effective way to improve quality of life for society as a whole, but markets will only invest in technologies likely to generate profits. Given their lack of purchasing power, there is little profit to be made in producing pro-poor technologies. Markets also fail to reward the provision or protection of public goods, and therefore fail to invest in technologies that protect or restore most ecosystem services.

Markets also raise the cost of developing new technologies. The most important input into new technologies is existing knowledge – information is like grass that grows longer the more it is grazed. Isaac Newton could see farther because he stood on the shoulders of giants. Paying royalties on existing patents can significantly increase the costs of developing new technologies (Benkler, 2004).

Another difficulty with market-driven technology is that it can be difficult and expensive to make information excludable. The private sector already underinvests in green technologies since other firms can copy innovations at low cost, giving them a competitive edge over the firm that actually invested in it. The energy sector is among the least innovative of all industries, investing only about six per cent as much in research and development as the manufacturing sector (Avato and Coony, 2008). Private sector investment in energy technology (research development and employment) has in fact fallen steadily since the 1980s, and accounts for only 0.3% of sales revenue in the US (Coy, 2010). Better enforcement of patents is very costly. Technologies that generate public goods or that meet the needs of the poor produce no revenue to pay patent royalties.

Once a technology exists, market prices can actually reduce its value. If a firm develops a clean, decentralized, inexpensive and safe alternative to fossil fuels, it would be able to sell the technology at a very high cost. If firms in in India and China cannot afford to pay, they will continue to burn coal and other fossil fuels, leading to continued global climate change. The value of information is maximized at a price of zero, but at this price, there is zero incentive for markets to provide the technology (Farley and Perkins, 2013).

Agriculture is also critical to green growth – it is one of the greatest threats to ecological function on the planet (Millennium Ecosystem Assessment, 2005), yet failure to maintain agricultural output is likely to have unacceptable impacts on quality of life. Agroecology can increase the provision of ecosystem services from agricultural land and also increase food production and farmer income from ecological restoration using agroforestry (De Schutter, 2010). Agroecological technologies are meant to spread from farmer to farmer. However, the private sector generally fails to invest in agroecology (Vanloqueren and Baret, 2009), favouring instead technologies that can be patented and increase market production at the expense of ecosystems.

The solution to these problems is not better enforcement of private property rights that reduce the value of information, but rather the cooperative, public provision of green technologies that are freely available for all to use. We also need scientifically informed collective decisions on the extent of ecological restoration required to avoid ecological catastrophe and maximize social welfare, funded by cooperative investments. The question is whether humans are capable of cooperation at the necessary scale.

Is cooperation possible?

Economists have long argued that people are by nature rational, self-interested and incapable of altruism, and that competitive markets fortunately channel the egoistic behaviour of *Homo economicus* toward the 'greatest good for the greatest number.' Evolutionists similarly argued that perfectly selfish individuals would increase their fitness at the expense of altruistic ones – hence, differential fitness drives altruistic genes extinct, and thus true altruism cannot evolve through natural selection (Dawkins, 1990).

More recently, however, behavioural economics and many other fields have investigated the ways in which people frequently care about fairness and the well-being of others, and are fully capable of altruism and cooperation. For example, in an experiment known as the 'dictator game,' an individual is asked to divide a sum of money with another anonymous individual. Any division is acceptable. A perfectly selfish individual would always offer zero, but most individuals offer something, often half. In a variation called the 'ultimatum game,' the receiving individual has the right to accept or reject the offer. An 'economically rational' individual would offer a minimal share, and an 'economically rational' recipient would accept it. In real life, however, most players offer a substantial share, with 50% being a modal offer, and most recipients reject offers they deem too low. In other words, the recipient is willing to sacrifice his or her own welfare in order to punish the offerer for being too selfish. When individuals are punished for being selfish, they are likely to be less selfish in the future (Henrich, 2016).

Adding more complexity, in the 'public goods game' all individuals are offered an initial sum of money, any portion of which they can keep or return to a common pool. Money in the common pool is doubled and redistributed equally to all. If all return their money to the common pool, all double their money. This is the cooperative outcome. However, individuals who hold their money also receive a share of the common pool. No matter what other players do, a single individual will do better holding

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“We must hope we can develop new cultural innovations that allow us to scale cooperation to the global level.”

on to his initial endowment. However, when all individuals do so, social welfare is minimized. Played for a single round, some players donate all their money, some a portion, and others none. Played for repeated rounds, high donaters realize they are being exploited, and tend to reduce their donations accordingly, until after repeated games the average donation falls to zero. In contrast, in another variation of this game, contributions are public knowledge and players are allowed to punish defectors, spending one dollar to take away three dollars from selfish individuals. The punisher sacrifices her own welfare to punish others. When this rule is allowed, selfish individuals do poorly. After several rounds such games converge toward everyone donating the full endowment (Boyd *et al.*, 2003; Bowles and Gintis, 2004; Henrich and Henrich, 2007). Both theoretical and empirical studies have identified additional mechanisms that promote cooperation, including reciprocity, indirect reciprocity and group identity (Henrich and Henrich, 2007; Gintis, 2011; Nowak and Highfield, 2011).

Evolutionists have also made some very interesting theoretical and empirical breakthroughs. There is growing agreement that cooperative, altruistic behaviour can emerge at the group level. An empirical example can be helpful. Take a beaker of bacteria including *Pseudomonas fluorescence*. The bacteria compete for oxygen from above and food sources in the liquid. Competition grows fierce. A mutation of the *Pseudomonas fluorescence* emerges known as the ‘wrinkly spreader.’ This mutation creates a film binding wrinkly spreaders together in a cooperative mat that floats on the surface. With access to oxygen and nutrients, cooperators outcompete other *Pseudomonas*. However, within the cooperating group, bacteria can revert to the ancestral type that does not generate the film, yet remain buoyed up on the film of the cooperators, using the energy saved for reproduction. The selfish bacteria thus out-compete the cooperative bacteria within the group. However, as the population of selfish bacteria increases, the colony loses its buoyancy and plunges to the bottom (Rainey and Rainey, 2003). In other words, colonies with more cooperative individuals outcompete colonies with fewer cooperative individuals, and natural selection across groups favours altruism. At the same time, the selfish individual out-competes cooperative individuals within the group. There are thus evolutionary pressures driving both cooperation and selfishness. Humans evolved in small groups on the plains of Africa. Those groups with the most cooperators outcompeted the others and left more descendants (Wilson and Wilson, 2007). Cultural innovations, which are also subject to natural selection, have allowed us to promote cooperation and punish defection (Boyd and Richerson, 2005). In fact, the success of humans as a species and the success of specific human societies has depended on the ability to cooperate at larger and larger scales (Wilson, 2012; Harari, 2015).

The take home message from these studies is that humans exhibit a range of personality types from perfectly selfish to perfectly cooperative. We can develop institutions that will promote selfishness or cooperation, as required by the nature of the problems we face. We must hope we can develop new cultural innovations that allow us to scale cooperation to the global level.

Conclusion: A path towards cooperation

The fossil fuel powered, growth-oriented market economy has played a critical role in increasing human living standards, but at the same time has caused myriad problems that threaten the survival of human civilization and innumerable species. As determined by their physical characteristics, fossil fuels were well adapted to a market economy as long as their emissions had negligible impact on humans and other species – but this is no longer the case. We must now urgently replace fossil fuels with solar energy while slashing overall energy use, restoring degraded ecosystems, and continuing to satisfy the basic needs of all in an era of green growth. Green growth must be driven by the goals of ecological sustainability and just distribution, which in turn require economic institutions based on cooperation. The process of developing these institutions will inevitably be based on trial and error. As we learn to cooperate at some scales for some problems, it will facilitate cooperation at larger scales and for other problems.

Since many of the most serious threats to global ecosystems were caused by the excessive consumption of the wealthiest nations, who have the most resources to spare, these nations should fund an open access common asset trust for green technologies. The models for this approach should be land grant universities (restored to their original role as the generators and disseminators of new ideas freely available to all) and commons-based peer production – the process underlying the development of open access software (Benkler, 2004), but with public funding. The resulting knowledge would be free to all who become members of the common asset trust, on the condition that all resulting improvements to the technology also remain free to use (Mustonen, 2003). In addition to reducing the costs of developing new knowledge and increasing the benefits, it would eliminate the considerable expenditures on patent enforcement. All members of the common asset trust would be encouraged to contribute to such an effort to the best of their abilities. Since some green technologies may cost more than fossil-fuelled alternatives, members of the common asset trust should impose substantial tariffs on non-members. Many economists are worried that some nations would 'free ride' on investments by others. However, such 'free-riding' on green technologies would help to protect the environment and thereby provide benefits for those countries that made the initial investments. That is, it is in effect impossible to free ride on green technologies. While information should be free, there is unavoidable competition for the green commodities it is used to produce. Market firms could compete to produce them at the lowest possible cost.

A green technology common asset trust is likely to be a sensible, efficient and relatively low cost approach to addressing some of our global challenges, but is clearly inadequate to address them all. The hope is that initial contributions by rich nations will lead other nations to reciprocate. Countries will bond together as members of a single group. Members will punish non-cooperators with substantial trade barriers. Reciprocity, group membership and altruistic punishment all build trust and promote cooperation, thus facilitating future efforts to tackle more complex challenges, such as large scale restoration of global ecosystems.

Capitalist, growth-oriented markets played a critical role in society's unprecedented wealth, but are equally responsible for the existential threats to human civilization and current ecosystems. Capitalism prioritizes individual choice: it becomes inefficient in a world of collective benefits and suicidal in one of collective costs. We thus require alternative economic institutions that prioritize ecological restoration and just distribution, such as common asset trusts with inalienable rights for future generations. Which institutions are most suitable depends on our goals and the resources at our disposal. From our current state, the price mechanism can be a useful feedback loop for addressing some problems, but believing prices alone will achieve some optimal equilibrium is magical thinking. On the other hand, I prefer apples to oranges, and markets are good for addressing questions of taste. Markets embedded within strong social norms of sustainability and justice may prove useful for achieving other goals as well. ■

> "It is in effect impossible to free ride on green technologies."

Notes

1 I do not believe this 'point' is identifiable, quantifiable or fixed, but, in all likelihood, rich countries are engaged in uneconomic growth.

2 While I dislike the efforts to place monetary value on natural capital, even mainstream economists acknowledge the basic principle that capital should not be consumed.

3 It should be emphasised that I do not define ecosystem services as the benefits humans derive from nature, but rather in the Georgescu-Roegen (1971) sense of a *fund-service*. Ecosystems generate ecosystem services at a specific rate over time, and are not physically transformed into the services they generate. A forested watershed can regulate and purify a certain amount of water per day, and

is not physically transformed in the process. In contrast, forests are physically transformed into timber or fire wood at a rate we choose, a process that unavoidably affects ecosystem services. Just as public services are intended to serve all members of a human community and are explicitly outside the market sphere, ecosystem services serve all members of the biotic community and are equally ill-suited to market allocation.

“Capitalism prioritizes individual choice: it becomes inefficient in a world of collective benefits and suicidal in one of collective costs.”

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