3. A Redesign of “the Economy”
Recognizing Its Embeddedness in Society and Nature

To achieve the vision outlined in the previous section will require some fundamental changes. As Meadows has pointed out, there is a spectrum of ways we can intervene in systems [38]. She lists 12 leverage points (shown on the right) for changing systems, ranging from changing parameters all the way to changing basic worldviews. We believe that the transition to a sustainable and desirable society will require a fundamental redesign of our system utilizing all of the leverage points. But most fundamentally, it will require changing worldviews, as outlined in the vision section above. Below, we outline some of the policy, governance, and institutional design implications of that change in worldview.

<table>
<thead>
<tr>
<th>Leverage Points for Changing Complex Systems</th>
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<tr>
<td>12. <strong>Numbers:</strong> Constants and parameters such as subsidies, taxes, and standards</td>
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<td>11. <strong>Buffers:</strong> The sizes of stabilizing stocks relative to their flows</td>
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<td>10. <strong>Stock-and-Flow Structures:</strong> Physical systems and their nodes of intersection</td>
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<td>9. <strong>Delays:</strong> The lengths of time relative to the rates of system changes</td>
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<td>8. <strong>Balancing Feedback Loops:</strong> The strength of the feedbacks relative to the impacts they are trying to correct</td>
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<td>7. <strong>Reinforcing Feedback Loops:</strong> The strength of the gain of driving loops</td>
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<td>6. <strong>Information Flows:</strong> The structure of who does and does not have access to information</td>
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<td>5. <strong>Rules:</strong> Incentives, punishments, constraints</td>
</tr>
<tr>
<td>4. <strong>Self-Organization:</strong> The power to add, change, or evolve system structure</td>
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<tr>
<td>3. <strong>Goals:</strong> The purpose or function of the system</td>
</tr>
<tr>
<td>2. <strong>Paradigms:</strong> The mindset out of which the system—its goals, structure, rules, delays, parameters—arises.</td>
</tr>
<tr>
<td>1. <strong>Transcending Paradigms</strong></td>
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The problems we face—overconsumption, overpopulation, fossil fuel use, and destruction of species—are not mainly technical problems. If they were, we’d be able to solve them within a few years. The systems involved are complex and interconnected in ways that make their behavior inherently unpredictable. “As a result, the politics of communities’ and nations’ efforts to address their sustainability problems is much more important than any technical expertise they can muster” [34]. There are experts aplenty, but we cannot simply consult them for the "best" solutions, because nobody can know what those solutions are in any complete or final sense. The solutions must be explored and tested through a process of continuous adaptive learning. Deciding which options
to try means making political choices that affect everyone and require wide support and engagement. A generation after its coinage, the slogan "Power to the People" takes on a new meaning.

Because there can be no permanent solutions in a world that is ecologically and culturally dynamic, these choices will have to be made again and again as circumstances evolve. Therefore, moving toward a sustainable and desirable future will require a radically broadened base of participants and a political process that continuously keeps them engaged. The process must encourage the perpetual hearing, testing, working through, and modification of visions at multiple scales, from local to global.

The key seems to be structuring political systems so that people's decisions matter. What does all this mean? It means the most important issue we all face is democratic control of our lives. In a very real sense, all the issues of poverty, environment, justice, and community boil down to failures of democratic participation. When we complain about corporate power and the destructive effects of "globalization," we are complaining about the absence of democratic decision-making (decision-making by those who are affected by the decisions). We all want democracy. But how much time do we devote to studying how to make democracy really work? How much effort do we spend trying to re-arrange our local communities so that we make decisions by talking together? These are good questions. In sum, how can we turn our vision of a sustainable and desirable world into reality? We can start by learning how to make democracy work—really work—in workplaces, in local communities, in cities, in states, in nations, and globally [33]. How can that begin to happen? How can we shift our society from “thin democracy” to “strong democracy” [39,40]?

The key to achieving sustainable governance in the new, full-world context is an integrated (across disciplines, stakeholder groups, and generations) approach based on the paradigm of “adaptive management,” whereby policy-making is an iterative experiment acknowledging uncertainty, rather than a static “answer.” Within this paradigm, six core principles (the Lisbon principles) that embody the essential criteria for sustainable governance have been identified [41]. The six principles together form an indivisible collection of basic guidelines governing the use of common natural and social capital assets.

- **Principle 1:** Responsibility. Access to common asset resources carries attendant responsibilities to use them in an ecologically sustainable, economically efficient, and socially fair manner. Individual and corporate responsibilities and incentives should be aligned with each other and with broad social and ecological goals.
- **Principle 2:** Scale-matching. Problems of managing natural and social capital assets are rarely confined to a single scale. Decision-making should (1) be assigned to institutional levels that maximize ecological input, (2) ensure the flow of information between institutional levels, (3) take ownership and actors into account, and (4) internalize social costs and benefits. Appropriate scales of governance will be those that have the most relevant information, can respond quickly and efficiently, and are able to integrate across scale boundaries.
- **Principle 3:** Precaution. In the face of uncertainty about potentially irreversible impacts to natural and social capital assets, decisions concerning their use should err on the side of caution. The burden of proof should shift to those whose activities potentially damage natural and social capital.
- **Principle 4:** Adaptive management. Given that some level of uncertainty always exists in common asset management, decision-makers should continuously gather
and integrate appropriate ecological, social, and economic information with the goal of adaptive improvement.

- **Principle 5**: Full cost allocation. All of the internal and external costs and benefits, including social and ecological, of alternative decisions concerning the use of natural and social capital should be identified and allocated, to the extent possible. When appropriate, markets should be adjusted to reflect full costs.

- **Principle 6**: Participation. All stakeholders should be engaged in the formulation and implementation of decisions concerning natural and social capital assets. Full stakeholder awareness and participation contributes to credible, accepted rules that identify and assign the corresponding responsibilities appropriately.

Below are examples of worldviews, institutions, and technologies that can help move us toward the new economic paradigm. In this case technologies are broadly defined as the applied information that we use to create human artifacts (printing press) as well as the institutional instruments used to help us meet our goals (taxes) [42]. The list is separated into three primary sections: respecting ecological limits, protecting capabilities for flourishing, and building a sustainable macro-economy. These are further elaborated below.

### 3.1. Respecting Ecological Limits

Once society has accepted the worldview that the economic system is sustained and contained by our finite global ecosystem, it becomes obvious that we must respect ecological limits. This requires that we understand precisely what these limits entail, and where economic activity currently stands in relation to these limits.

#### 3.1.1. Waste emission stocks and flows

There are several categories of dangerous waste emissions, including nuclear waste, particulates, toxic chemicals, heavy metals, greenhouse gases, and excess nutrients. Here, we focus on just two as examples. One of the most serious problems the planet currently faces is global climate disruption, caused by excessive stocks of greenhouse gases in the atmosphere. Another is the potentially catastrophic effect of excessive nitrogen and phosphorous emissions into aquatic ecosystems. These two categories of waste emissions serve to illustrate the general problem of waste emissions.

Climate change is an example of excessive stocks of waste; flows of the predominant greenhouse gas, carbon dioxide, are harmless if the atmospheric stock is at an acceptable level. Since energy is required to do work, and 86 percent of the energy currently used for economic production comes from fossil fuels, economic activity inevitably generates flows of greenhouse gases into the atmosphere with current technologies. Various ecosystem processes, such as plant growth, soil formation, and dissolution of $\text{CO}_2$ into the ocean, are capable of sequestering $\text{CO}_2$ from the atmosphere. However, if flows into the atmosphere exceed flows out of the atmosphere, then atmospheric stocks will accumulate. This represents a critical ecological threshold for flows, and exceeding it, risks runaway climate change with disastrous consequences. At a minimum then, for any type of waste where accumulated stocks are the main problem, emissions must be reduced below absorption capacity. The Intergovernmental Panel on Climate Change (IPCC) estimates that global ecosystems currently absorb about 20 percent
of anthropogenic emissions. Achieving stable atmospheric stocks of CO$_2$ requires emissions reductions of 80 percent, or else some means to increase the rate at which ecosystems can sequester CO$_2$.

However, it is also essential to target a sustainable atmospheric stock of CO$_2$. There is currently considerable debate about what such a stock would be, with two separate levels of uncertainty: first, what level of climate change is tolerable, and second, what level of atmospheric stocks will lead to that level of change. What determines tolerable climate change also has two components. First are the issues of impacts on agriculture, sea level rise, biodiversity loss, and so on. Second is that the threat that warming climate will create positive feedback loops leading to an even warmer climate, causing runaway climate change. There is widespread agreement that 2 degrees C is the maximum acceptable level of change. *The Stern Review on the Economics of Climate Change* argued that we should ideally target 440 parts per million (ppm) CO$_2$e, which the report estimated would impose a 6-percent chance of exceeding 2 degrees change, but that 550 ppm was a more feasible target even though it would impose a 29-percent risk of exceeding 2 degrees [43]. More recently, Stern has concluded that 440 ppm is the maximum acceptable limit. NASA climatologist James Hansen, in contrast, argues that 350 ppm is the maximum acceptable level, though he is vague about whether this is CO$_2$ itself or CO$_2$e [44]. These are all different estimates of the critical ecological thresholds for stocks. Current stocks are in the vicinity of 390 ppm CO$_2$, and 435 CO$_2$e.

There is growing evidence that current stocks are indeed already too high. There is clear evidence of global climate change in current weather patterns, and scientists predict that, even if society currently reduced emissions to zero, the climate would continue to warm for another 30 years. Furthermore, the oceans are beginning to acidify as they sequester more CO$_2$. Acidification threatens the numerous forms of oceanic life that form carbon based shells or skeletons, such as mollusks, corals, and diatoms.

The weight of evidence suggests that we have already exceeded the critical ecological threshold for atmospheric stocks. This means that we must reduce flows by more than 80 percent or increase sequestration until atmospheric stocks are reduced to acceptable levels. At this point flows could be set equal to absorption capacity, with the caveat that it does not lead to excessive acidification of the ocean. If we accept that all individuals are entitled to an equal share of CO$_2$ absorption capacity, then the wealthy nations would need to reduce net emissions by 95 percent or more. If we believe that wealthy nations should be held accountable for accumulated stocks, they would essentially need to reduce net emissions to zero or less.

Nitrogen and phosphorous emissions are somewhat different. As emission levels increase, they cause excessive growth of plant life, which rapidly sequesters the pollutants. In other words, sequestration rates increase in response to increasing emissions. However, the excessive growth of plant life can seriously disrupt aquatic ecosystems. As the plants die, the bacteria that consume them utilize much of the available oxygen, causing massive dead zones. In this case, the target of emissions reductions is primarily the flow, not the stock.

The rule for limiting waste emissions is that flows cannot be allowed to exceed absorption capacities nor disrupt critical ecological processes. If accumulated stocks already disrupt

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1 CO$_2$e is short for CO$_2$ equivalent. It is measured by converting all greenhouse gases into their CO$_2$ equivalent in terms of greenhouse effect.
critical ecological processes, then flows must be reduced below absorption capacity until stocks are reduced to acceptable levels. Quantitative restrictions are preferable to price signals, since the latter are ineffective in the presence of growing demand.

3.1.2. Renewable resource stocks, flows, funds, and services

All economic production requires the transformation of raw materials provided by nature. To a large extent, society can choose the rate at which it harvests these raw materials. Whenever extraction rates of renewable resources exceed their regeneration rates, stocks will decline. Extraction typically becomes more expensive as stocks decline, reducing economic benefits. At some point, the regeneration capacity of declining stocks will decline as well. Eventually, the stocks will reach a point at which they are no longer capable of regenerating. The first rule for renewable resource stocks is that extraction rates must not exceed regeneration rates, thus maintaining the stocks to provide appropriate levels of raw materials at an acceptable cost.

However, this simple result ignores the fact that if renewable resources are not used for economic production, they otherwise serve as the structural building blocks of ecosystems. A particular configuration of ecosystem structure generates critical ecosystem services, including both life-support services (without which no species can survive) and the capacity of ecosystems to reproduce themselves. These services are diminished when the structure is depleted or its configuration changed. We cannot simply treat ecosystem structure as a stock that yields a flow of raw materials. We must also treat it as a fund that yields a flux of services over time. The generation of this flux of services does not require the physical transformation of ecosystem structure, and flux occurs at a rate over which we have little control.

The second rule for resource extraction and land use conversion is that they must not threaten the capacity of the ecosystem fund to provide essential services. Furthermore, the marginal economic gains from conversion cannot exceed the marginal ecological costs. In short, we face a macro-allocation problem: determining how much ecosystem structure can be converted to economic production and how much must be conserved in order to supply ecosystem services. If we proceed rationally, the first units of economic production satisfy our most pressing needs. As economic output increases, it goes to satisfy less pressing needs and wants. Furthermore, if we strive to minimize the ecological costs of conversion, we sacrifice the least important components of our ecosystem funds first. As we convert more and more, we most sacrifice increasingly important components, and hence pay increasingly higher ecological costs. When the rising marginal costs of conversion exceed the diminishing marginal benefits, then continued conversion to economic production becomes uneconomic. Our limited understanding of ecosystem structure and function, and the dynamic nature of ecological and economic systems, mean that we cannot pinpoint some precise optimum. However, it is increasingly obvious that economic growth has already become uneconomic. Rates of resource extraction must therefore be reduced to below regeneration rates in order to restore ecosystem funds to desirable levels.

3.1.3. Unacceptable tradeoffs: Ecological and economic thresholds

The necessity for imposing ecological limits on resource extraction and waste emission is straightforward. Failure to respect these limits means ecological catastrophe. However, respecting ecological limits in the short run is likely to impose unacceptable economic costs. Take, for example, the case of CO₂ emissions from fossil fuels. The marginal costs
of continued emission rates are unacceptably high. However, our economy is deeply dependent on fossil fuels. Very few of us can own or consume anything that did not require fossil fuels, including food. The economic costs of reducing emissions by over 80 percent in the short run would be unacceptably high.

Food systems are even more important than fossil fuels. Almost 1 billion people are currently malnourished. The global population is expected to increase by another 2 billion by 2050, and rising incomes will likely increase the demand for animal protein, which requires far more land and resources to produce than plant foods. The UN Food and Agriculture Organization therefore estimates that we must increase global food production by 70 percent by 2050, or face malnutrition and even starvation for the world’s poor [45]. Clearly, the benefits of agriculture are extremely high. At the same time, of the nine planetary boundaries discussed by Rockström and colleagues, agriculture is the leading threat to five of them (biodiversity loss, nitrogen and phosphorous loading, land use change, and freshwater use) and a major contributor to several others [1]. The last significant source of wild food, oceanic fisheries, is also seriously depleted, posing significant threats to marine ecosystem services [46]. Even current levels of food production may have unacceptably high ecological marginal costs, and increasing output by 70 percent certainly would. Goodland and Anhang have determined that the lifecycle and supply-chain impacts of livestock production account for at least half of anthropogenic greenhouse gases in the form of methane [47]. Since methane is a more potent greenhouse gas than CO$_2$ and has a shorter half-life in the atmosphere, a reduction of flows of methane now will have a larger and quicker effect on global warming than CO$_2$ reductions. As a result, a 25-percent reduction in meat production would almost fully achieve the goals of the recent (failed) international climate conferences. Replacing livestock products with alternatives can also decrease forest burning and allow for substantial regeneration of forest [47]. So it is the only available strategy for both reducing emissions and increasing carbon capture on a large scale in the timeframe during which it is widely agreed that climate change must be addressed.

3.1.4. Redirecting technology toward sustainable solutions

Conventional economists have long assumed that technological progress would overcome any resource constraints and allow endless economic growth [48]. A far less challenging, but still formidable, goal for technological progress would be to help stave off the looming crises already caused by endless growth described above. To do this, we would need to make rapid progress on alternative energy technologies and develop alternative approaches to agriculture. Given the urgency of the problem, we must assess various types of institutions and disseminate these technologies as quickly as possible.

Today, much research and development is performed by corporations driven by economic incentives. But, there are a number of serious problems inherent to market driven research. First, it can be difficult and expensive to make information excludable (i.e. to prevent people from benefiting from information unless they pay). The private sector is unlikely to produce non-excludable information, since other firms can simply copy it at low cost, giving them a competitive edge over the firm that actually invested in it. Patents can make information relatively excludable, but then anyone who uses that information in subsequent inventions must pay for the right to do so. Unfortunately technologies that generate public goods (such as climate stability) or that meet the needs of the poor (such as affordable food) produce no revenue to pay patent royalties. Such royalties are therefore an added deterrent to generating these technologies. For example, some scientists developed golden rice, a genetically modified strain that produces vitamin A
and improves quality of life for the malnourished poor. However, after developing this technology, the scientists discovered that they had potentially infringed on 70 separate patents, which have proved a serious obstacle to distributing the rice to poor farmers [49].

The solution to the conflict between food production and ecosystem services would appear to be agro-ecology - projects that increase the provision of ecosystem services from agricultural land and also increase food production and farmer income from ecological restoration [50]. However, the private sector generally fails to invest in agro-ecology [51], favoring instead technologies that increase market production at the expense of ecosystems.

Alternative energy supplies are also critical. However, the energy sector is among the least innovative of all industries, investing only about 6 percent as much in research and development as the manufacturing sector [52]. Private sector investment in energy technology (research development and employment) has in fact fallen steadily since the 1980s, and accounts for only 0.03 percent of sales revenue in the United States [53].

Cooperative, public-sector investment efforts, in contrast, would address these problems. The public sector by definition is interested in the provision of public goods. Research financed by the public sector can be made freely available for all to use, eliminating the costs of protecting intellectual property rights. A meta-study of returns to research and development typically conducted by the public sector found average annual rates of return of 80 percent [54].

Markets are simply ill-suited for producing information at lowest possible cost. The most important input into new technologies is existing knowledge; information is like grass that grows longer the more it is grazed. When patents raise the price of accessing this knowledge, it raises the price of developing new information.

Furthermore, markets reduce the value of information once it has been developed. 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, potentially too high for firms in developing countries to afford. These firms would then continue to burn coal and other fossil fuels, leading to continued global climate change. Paradoxically, 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. The solution is not to create 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.

Since many of the most serious threats to global ecosystems were caused by the excessive consumption of the wealthiest nations, those same nations should provide the bulk of the funding required for R&D in the green technologies that solve those problems. Ideally, all nations would contribute to such an effort to the best of their abilities. Many economists are worried that some nations would free-ride on investments by others. However, free-riding on certain technologies would help protect the environment and also provide benefits to those countries that made the initial investments.

**3.1.5. Stabilization of population**

One potential solution to these apparently irreconcilable goals is to stabilize or even reduce global populations. With a world population that is surpassing 7 billion, increasing in food and energy prices due to lack of resources [55], slowing of development in already
underdeveloped countries due to overpopulation [56,57], and a lack of jobs [58], there has been a refocusing on population stability, often in the form of family-planning policies. Family-planning has been proven to be very cost effective [59]; for every dollar spent on family planning, the United Nations has found that two to six dollars can be saved in the future on other development goals [60]. Recently the United States and the United Kingdom once again increased their foreign aid funding towards international family planning [61].

An estimated one-third of global births is the result of unintended pregnancy [62]. More than 200 million women in developing countries would prefer to delay their next pregnancy or not have any more children at all [63]. However, several barriers prevent many of these women from making a conscious choice: lack of access to contraceptives, risk of side effects, cultural values, or opposition from family members [64,65].

One of the major impacts of such population growth is the negative impact it is having on the earth’s life-supporting ecosystem services [66-68]. It has been estimated that about half of the productivity of the earth’s biosystems has been diverted to human use [69,70]. As population continues to increase, competition for these increasingly scarce resources will intensify globally. The disconnect between the "haves" and the "have nots" will also become more visible as living standards drop below survival level [71].

However, if we do succeed in stabilizing, or even decreasing, the global population, other problems become apparent. With a non-growing population, the average age of the population increases, creating a situation where more retirees exist relative to workers. Addressing this problem may require higher taxes, extensions of retirement age, and/or pension reductions [72].

3.2. Protecting Capabilities for Flourishing

3.2.1. Sharing the work

In a zero-growth or contracting economy, working-time policies are essential for two main reasons: to achieve macro-economic stability and to protect people’s jobs and livelihoods. In addition, reduced working hours can increase flourishing by improving the work/life balance. Specific policies should include: reductions in working hours; greater choice for employees about working time; measures to combat discrimination against part-time work as regards grading, promotion, training, security of employment, rate of pay, health insurance, etc.; and better incentives to employees (and flexibility for employers) for family time, parental leave, and sabbatical breaks [72].

However, achieving hourly reductions will require structural changes in the operation of labor markets. Indeed, even the proximate causes of rising hours are complex. In the United States, factors include the movement of women into full-time career jobs, an upward shift in work norms made possible by the growing power of employers relative to employees, and the collapse of hourly wages at the bottom of the wage distribution (which necessitates longer hours to avoid costly declines in household income) [73]. Higher levels of income inequality have also led workers to prefer longer hours [74,75].

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Workers’ preferences for income and consumer goods affect the determination of hours but are mainly endogenous, i.e., they adjust to the level of hours, income, and consumption that the market delivers, rather than exogenous preferences that drive the market. The phenomenon of preference endogeneity, preferences that adapt to market outcomes, rather than being fixed, may be more important than has heretofore been recognized [73]. This endogenous preference view is the reverse of the conventional wisdom, which is that workers’ exogenous preferences determine the level of hours. It is also quite different from historical accounts that emphasize consumer desires and unionizing strategy as the leading variable in determining hours, and hence the level of output and growth [76].

To date, no detailed empirical studies linking environmental degradation and hours of work exist. Yet, in the simplest models, in which hours are correlated with income and hence consumption, a reduction in hours ceteris paribus (other factors being held equal) would reduce impact [73]. The increased presence of Western media and advertising, the expansion of transnational corporations into domestic markets in the global South, and the development in the South of large middle classes with disposable income are part of a process of rapid growth in branded consumer goods worldwide. In addition to cultural products these include apparel, vehicles, consumer electronics, fast food, travel and tourism, and a range of household durables. In general, this shift is associated with much higher levels of environmental impact [77].

However, many of the productivity gains of the past 200 years were driven by a shift from human labor to fossil fuels. There is therefore a distinct possibility that a dramatic reduction in fossil fuel use will lead to a shift from capital to labor. It takes approximately 5,000 hours of human labor to generate the work in a barrel of oil [78]. At US$100 a barrel, labor can only compete with oil at $0.02/hour.

### 3.2.2. Tackling systemic inequality

Social inequality can express itself in many forms besides income inequality, such as life expectancy, poverty, malnourishment, and infant mortality [79]. Inequality can be seen between countries but also within countries and small communities. Inequality can drive other social problems (such as over-consumption), increase anxiety, undermine social capital, and expose lower income households to higher morbidity and lower life satisfaction [72].

In the United States civil service, military, and universities, income inequality ranges within a factor of 15 or 20. Corporate America has a range of 500 or more. Many industrial nations are below 25 [80]. One solution to such inequity is to have people who have reached their weekly or monthly working wage limit either work for nothing at the margin, if they enjoy their work, or devote their extra time to hobbies, public service, or their family. The demand left unmet by those at the top will be filled by those who are below the maximum.

A sense of community, necessary for democracy, is hard to maintain across the vast income differences found in the United States. The main justification for such differences has been that they stimulate growth, which will one day filter down, making everyone rich. This may have had plausibility in an empty world, but in our full world, it is unrealistic.

Without aggregate growth, poverty reduction requires redistribution. Complete equality is unfair; unlimited inequality is unfair. Fair limits to the range of inequality need to be
determined, i.e., a minimum income and a maximum income [80]. Studies have also shown that the majority of adults would be willing to give up personal gain in return for reducing inequality they see as unfair [81,82].

Other redistributive mechanisms and policies have also been well-established and could include revised income tax structures as discussed above, improved access to high-quality education, anti-discrimination legislation, implementing anti-crime measures and improving the local environment in deprived areas, and addressing the impact of immigration on urban and rural poverty [72]. New forms of cooperative ownership (as in the Mondragón model), or of public ownership, as is common in many European nations, can also help constrain internal pay ratios.

### 3.2.3. Strengthening human and social capital

Satisfaction of basic human needs requires a balance between social, built, human, and natural capital (and time). Policy and culture help to allocate the four types of capital defined earlier as a means for providing these opportunities.

One institution that helps build social capital is a strong democracy. A strong democracy is most easily understood at the level of community governance, where all citizens are free (and expected) to participate in all political decisions affecting the community. Interactive discussion plays an important role. Broad participation requires the removal of distorting influences like special interest lobbying and funding of political campaigns [83]. In fact, the process itself helps to satisfy myriad human needs, such as enhancing the citizenry’s understanding of relevant issues, affirming their sense of belonging and commitment to the community, offering opportunity for expression and cooperation, strengthening the sense of rights and responsibilities, and so on. Historical examples include the town meetings of New England or the system of the ancient Athenians (with the exception that all citizens must be represented, not simply the elite) [34,83].

Participating in society demands that attention be paid to the underlying human and social resources required for this task. Creating resilient social communities is particularly important in the face of economic shocks. Specific policies are needed to create and protect shared public spaces; strengthen community-based sustainability initiatives; reduce geographical labor mobility; provide training for jobs in sustainability; offer better access to lifelong learning and skills; place more responsibility for planning in the hands of local communities; and protect public service broadcasting, museum funding, public libraries, parks and green spaces [72].

### 3.2.4. Expanding the “commons sector”

Most resource allocation done today is through markets, which are based on private property rights. Private property rights are established when resources can be made “excludable,” i.e., one person or group can use a resource while denying access to others. However, many resources essential to human welfare are “non-excludable,” meaning that they are difficult or impossible to exclude others from benefiting from these resources. Examples include oceanic fisheries (particularly those beyond the economic exclusion zone), timber from unprotected forests, and numerous ecosystem services, including the waste absorption capacity for unregulated pollutants.

In the absence of property rights, open access to resources exists—anyone who wants to may use them, whether or not they pay. However, individual property rights owners
are likely to overexploit or under-provide the resource, imposing costs on others, which is unsustainable, unjust, and inefficient. Private property rights also favor the conversion of ecosystem structure into market products regardless of the difference in contributions that ecosystems and market products have on human welfare. Hence, the incentives are to privatize benefits and socialize costs.

All scarce resources are rival, meaning that use by one person leaves less of the resource (in quality or quantity) for others to use. Many resources, however, are non-rival, which means that use by one person does not leave less for others to use. When this is true there is no competition for use and the resource is not scarce in an economic sense, even if total supply is inadequate. Examples include streetlights, many different ecosystem services (e.g., climate stability, flood regulation, scenic beauty), and information. Price rationing in this case reduces use and hence value to society without affecting quantity, which is inefficient. For example, if someone develops a cheap, clean solar energy technology and then patents it (which makes it excludable), it can be sold at a price. A positive price will reduce use, leading to less substitution away from competing energy sources, such as coal, and society as a whole suffers. Markets will only provide non-rival resources if they are made excludable and can be sold at a price, but this creates artificial scarcity. Paradoxically, the value of non-rival resources to society is maximized at a price of zero, but at that price markets will not provide it [84].

The solution to these problems lies with common or public ownership. Public ownership can be problematic due to the influence of money in government, which frequently results in the government rewarding the private sector with property rights to natural and social assets. An alternative is to create a commons sector, separate from the public or private sector, with common property rights to resources created by nature or society as whole, and a legally binding mandate to manage them for the equal benefit of all citizens, present and future. The misleadingly labeled “tragedy of the commons” [85] results from no ownership or open access to resources, not common ownership. Abundant research shows that resources owned in common can be effectively managed through collective institutions that assure cooperative compliance with established rules [86-88].

Resources that are rival but non-excludable would need to be “propertized” (made excludable) to prevent over-use [89]. Governments—or in the case of global resources such as atmospheric waste absorption capacity or oceanic fisheries, a global coalition of governments—are generally required to create and enforce property rights, but could turn these rights over to the commons sector as a common assets trust (CAT) [89]. The trust would cap resource use at rates less than or equal to renewal rates, which is compatible with inalienable property rights for future generations. Since the resources under discussion were created by nature, and enforcement of property rights requires the cooperative efforts of society as a whole, rights to the resource should also belong to society as a whole. Individuals who wish to use the resource for private gain must compensate society for the right to do so. This could be achieved through a cap-and-auction scheme, in which the revenue is shared equally among all members of society, or else invested for the common good [90]. Preventing the re-sale of the temporary use-rights would reduce the potential for speculation and private capture of rent. Under common ownership, both costs and benefits accrue to society as whole, and the two are likely to be brought into balance. Taxes on waste emissions and resource extraction can serve the same purpose as a cap-and-auction system.

When a resource is non-rival, excludable property rights are inappropriate, but lack of property rights eliminates private sector incentives to provide the resource. The solution is common investment and common use. The commons sector must invest in the provision of non-rival ecosystem services and in green technologies that help provide and protect
such services. Everyone would be free to use the non-rival ecosystem services, but not to degrade the ecosystem structure that sustains them. For the means to invest in non-rival resources can be obtained from auctioning off access to rival resources. For example, the CAT could auction off the right to greenhouse gas absorption capacity, then invest the revenue in carbon-free energy technologies.

When a resource is privately owned but generates economic rent, or is used in a manner that socializes costs and privatizes benefits, taxation can achieve the same goals as common ownership, as discussed in section 4. Table 2 summarizes appropriate property rights for different categories of resources.

### Table 2. Rivalry, excludability, and suitable institutions for allocation [84-90].

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<thead>
<tr>
<th>Rival and scarce (rationing is desirable)</th>
<th>Excludable (rationing is possible)</th>
<th>Non-excludable (rationing is not possible)</th>
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<tbody>
<tr>
<td><strong>Potential market resources:</strong></td>
<td>Price rationing may be appropriate, rent should be captured for commons sector by taxes or royalties.</td>
<td><strong>Open access resources:</strong> “Propertization” via collective action is required. Private use rights can be auctioned off by commons sector.</td>
</tr>
<tr>
<td>Examples: land, timber, oil, absorption capacity for regulated wastes, use of airwaves</td>
<td><strong>Examples:</strong> many aquifers, oceanic fisheries, absorption capacity for unregulated wastes</td>
<td></td>
</tr>
</tbody>
</table>

| Rival and abundant (rationing is not desirable, except to prevent scarcity) | Club or toll good: Price rationing may be appropriate to prevent scarcity; rent should be captured by commons sector. | Public good: Economic growth and ecological degradation are likely to increase scarcity over time. Common sector management is appropriate to prevent scarcity. |
| Examples: toll roads, golf courses, ski resorts, private beaches, parks with entrance fees, etc. | **Examples:** oxygen, public beaches |

| Non-rival (rationing is not desirable; value maximized at a price of zero) | Inefficient market good: Price rationing causes artificial scarcity. Common sector provision and ownership would be more efficient. | Public good: Commons sector must ensure adequate provision by preventing degradation or investing in provision. |
| Example: patented information | **Examples:** open source information, many ecosystem services |

If the public sector shirks its duties to manage our shared social and natural inheritance for the common good, we require a commons sector to ensure sustainability and a just distribution of resources. Once these two goals have been achieved, the market will
be far more effective in its role of allocating scarce resources towards the products of highest value, then allocating those products towards the individuals that value them the most.

### 3.2.5. Removing communication barriers and improving democracy

With the invention of television, political advertisements became a critical outlet for candidates to broadcast their message and to sway voters. However, the decentralized nature of the Internet “allows citizens to gain knowledge about what is done in their name, just as politicians can find out more about those they claim to represent” [91]. As a means of two-way communication, the Internet provides voters the ability to speak out about their government’s behavior without leaving their homes. For the Internet to transform the idea of electronic democracy, universal access is critical, but technological, financial, and social barriers currently prevent such universal accessibility [91]. Removal of these and other barriers to engagement and deliberation thus becomes a major goal for replacement of the current plutocracy with real democracy.

Unlike television, very low technological and financial barriers exist to establishing a presence on the Internet. This has the effect of decentralizing information production, and returns control of the distribution of information to the audience, providing a venue for dialogue instead of monologue [92]. Opinions and services previously controlled by small groups or corporations are now shaped by the entire population. Television news networks, sitcoms, and Hollywood productions are being replaced by e-mail, Wikipedia, YouTube, and millions of blogs and forums, all created by the same billions of people who are the audience for the content.

In 2008, the United States presidential election marked the first election year in which more than half of the nation’s adult population became involved in the political process by using the Internet as a source of news and information. Rather than simply receiving uni-directional news, approximately one-fifth of the people using the Internet used websites, blogs, social networking sites, and other forums to discuss, comment, and question issues related to the election [93].

### 3.3. Building a Sustainable Macro-Economy

The central focus of macroeconomic policies is typically to maximize economic growth. This is evident in the definition of a recession as two consecutive quarters with no economic growth. Lesser goals include price stabilization and ensuring full employment. Meadows argues that changing goals is the second most powerful lever for changing complex systems [38]. If society instead adopts the central economic goal of sustainable human well-being, macroeconomic policy will change radically. The goal will be to create an economy that offers meaningful employment to all, that balances investments across the four types of capital to maximize well-being. Recession would be redefined as unacceptable or increasing rates of poverty, misery, inequality, and unemployment, or unsustainable levels of throughput. Such goals would lead to fundamentally different macroeconomic policies and rules. Changing the rules is the third most effective of Meadow’s places to intervene in a system.
3.3.1. Changing the institutions: Monetary reform for sustainability and justice

The current monetary system is inherently unsustainable. The base of the money supply in almost all countries is coins and bills printed by governments, and money that governments create when they provide credit to banks during purchases. Government money spent into existence is then destroyed by taxes. Taxes in fact are what give the government the power to create money: everyone accepts government currency because they require it to pay taxes. In the modern era, national currencies are backed by the taxation power of the government. However, this government money (also known as vertical money) is now only a small fraction of the money supply in most economies.

Most of our money supply is now a result of fractional reserve banking. Banks are required by law to retain a percentage of every deposit they receive; the rest they loan at interest. However, loans are then deposited in other banks, which in turn can lend out all but the reserve requirement. The net result is that the new money issued by banks, plus the initial deposit, will be equal to the initial deposit divided by the fractional reserve. For example, if a government credits $1 million to a bank and the fractional reserve requirement is 10 percent, banks can create $9 million in new money, for a total money supply of $10 million. Fractional reserve requirements may not even limit the amount of money created. Banks will typically loan money to any investor who they believe offers a high probability of repayment. If the amount they lend exceeds their reserves, they can borrow money from other banks or the Federal Reserve Bank to make up the deficit. If there is too much borrowing of this type, it threatens to drive up the interest rate. If the Federal Reserve Bank is trying to target interest rates, it will be forced to buy securities from banks to increase bank reserves and the money supply. Regardless of whether the fractional reserve or investor demand determines total money supply, most money is today created as interest-bearing debt. Total debt in the United States, adding together consumers, businesses, and the government, is about $50 trillion dollars. This is the source of the national money supply.

When the loans are repaid, the new money is destroyed. However, the borrowers must repay the loans plus interest and the banks initially loaned out enough to repay only the principal. Either new government expenditures or new loans are required to pay back the interest.

There are several serious problems with this system. First, it is highly destabilizing. When the economy is booming, banks will be eager to loan money and investors will be eager to borrow, which leads to a rapid increase in money supply. This stimulates further growth, encouraging more lending and borrowing, in a positive feedback loop. A booming economy will stimulate firms and households to take on more debt relative to the income flows they use to repay the loans. This means that any slowdown in the economy will make it very difficult for borrowers to meet their debt obligations. Borrowers can sell assets to meet their obligations, but this will drive down the price of assets, for example, home values. Eventually some borrowers will be forced to default. Banks are likely to lose the confidence of other borrowers and will be unwilling to make new loans, which the borrowers require to pay back interest, leading to more defaults. Repayment of loans will exceed creation of loans, leading to a shrinking money supply. Outstanding loans will continue to grow exponentially, even as output diminishes as a result of less money available for investment. Widespread default on the debt becomes inevitable. The result is a self-reinforcing downward economic spiral, leading to recession or worse. The poor usually bear the brunt of the resulting suffering.
Second, the current system systematically transfers resources to the financial sector. Borrowers must always pay back more than they borrowed. At 5.5 percent interest, homeowners will be forced to pay back twice what they borrowed on a 30-year mortgage. Conservatively speaking, interest on the $50 trillion total debt of the United States must be at least $2.5 trillion a year, one-sixth of our national output. Currently, banks can borrow money from the Federal Reserve Bank at almost zero percent, then charge 20 percent or more on credit card debt.

Third, the banking system will only create money to finance market activities that can generate the revenue required to repay the debt plus interest. Since the banking system currently creates far more money than the government, this system prioritizes investments in market goods over public goods, regardless of the relative rates of return to human well-being. Studies find that government investments in public goods regularly generate 25–60 percent non-diminishing annual rates of return, in monetary measures [94]. There is no reason to believe that returns would be any less when the investments are targeted towards the new macroeconomic goals.

Fourth, and most important, the system is ecologically unsustainable. Debt is a lien on future production. Debt grows exponentially, obeying the abstract laws of mathematics. Future production, in contrast, confronts ecological limits and cannot possibly keep pace. Interest rates exceed economic growth rates even in good times. Eventually, the exponentially increasing debt must exceed the value of current real wealth and potential future wealth, and the system collapses. However, in the effort to stave off an economic crisis and the unacceptable misery, poverty, and unemployment it will cause, policy makers will pursue endless economic growth, unsustainable on a finite planet. The system forces us to choose between unsustainable growth and misery.

In order to address this problem, the public sector must reclaim the power to create money, a constitutional right in the United States and most other countries, and take away from the banks the right to do so by gradually moving towards 100-percent fractional reserve requirements. This would allow banks only to loan money on time deposits, in which case the owner of the money forgoes the right to use it while it is loaned to someone else. Banks would be restricted to the role that most people believe they play anyway—serving as an intermediary between those who want to save their money and those who want to borrow it. The current recession is an ideal time to implement this change, since banks are currently loaning far less than allowed by fractional reserves. Reserve deposits in the United States are currently about $1.4 trillion greater than required by law.

The public sector could create money in several different ways. First, the government could simply spend money into existence to provide the public goods that the private sector will not supply, to invest in social and human capital, to create jobs, to rebuild the national infrastructure, and to restore the natural systems that sustain us all. Such spending would end the recession (as previously defined) without increasing the national debt and without systematically transferring interest to the already wealthy. Second, the government could loan money into existence interest-free. Money could be loaned directly to the private sector to finance critical economic activities, such as food production and alternative energy, or it could be loaned to state and local governments (SLGs) to meet their needs. SLGs would also have the option of loaning money interest free or spending it on public goods.
Third, in order to minimize disruption as we change from the current system, the government could make time deposits in banks that serve the common good, allowing them to carry on with business as usual. The public, however, would have control over the money supply.

Ironically, many economists argue that the public sector cannot be trusted to print and spend money—that it will create too much and spend it irresponsibly. The United States government, however, printed $1.6 trillion in government bonds in a single year to finance its deficit, which must be paid back with interest. Issuing interest-free currency is much less risky; it would be difficult for the government to under-perform the private sector when measured by the new goals for macroeconomic policy. At the very least, voters have some control over governments, and none over the banking sector.

There is, however, no free lunch. The government cannot and should not endlessly spend money into existence. The goal must be to achieve a steady state with sustainable levels of throughput, which will likely require a significant reduction in market activity in the wealthy nations, and thus a reduction in the total money supply required to support the economy. When money is loaned into existence, it will be destroyed when it is repaid. State and municipal governments would need to use tax revenue to repay the federal government, but would not need to pay fees to investment banks to issue municipal bonds, nor interest to bond holders. When money is spent into existence, it can be destroyed through taxes, which would play a critical role in regulating the money supply. To ensure that too much money does not flood the economy, any new expenditure could be matched by future taxes, imposed at the same time the expenditure takes place. Rather than a tax, borrow, and spend policy, the government would explicitly pursue a policy of spend, then tax (which, many argue, is actually the way the system currently works anyway). There will no doubt be errors as we shift towards a steady state economy, resulting in occasional recessions or booms. The government however could spend extra money into existence to alleviate misery, poverty, and unemployment during times of recession, and raise taxes if throughput becomes excessive. The monetary system would be counter-cyclical, not pro-cyclical. Government would never need to borrow money and pay it back with interest. There would be no debt. With no exponentially growing debt and no interest payments, there would be no pressure to choose between unacceptable misery or endless growth. The feedback signal of a rising price index would government when to stop creating money.

Fiscal reform is also required to meet the goals of macroeconomic policy. This section is limited to a discussion of taxes, which are a powerful tool for changing economic behavior. The other half of fiscal policy is expenditure, which would be subsumed under monetary policy as described above.

Conventional economists generally look at taxes as a drag on the economy, albeit necessary to finance government expenditures. The reasoning is that taxes increase costs, leading to a reduction in output, and disequilibrium between marginal costs and marginal benefits, resulting in a deadweight loss of economic surplus. They are seen as a significant drag on economic growth. From a more holistic perspective, however, taxes are an effective tool for internalizing negative externalities into market prices, therefore reducing deadweight loss, and for improving income distribution.
3.3.2. Tax bads, not goods

A perennial conflict in tax policy is taxing to raise revenue versus taxing to change behavior. Induced behavioral change aims at avoiding the tax, and this naturally reduces revenue. The policy of shifting the tax base from value added to throughput (that to which value is added) encounters this conflict in a different way. Taxing value added (labor and capital) tends to reduce incentives to enterprise and work, and to use untaxed resources lavishly. Taxing the resource flow would lead to emphasizing resource efficiency, and using less resources (more untaxed recycled resources and more labor and capital) to the extent possible, which is a desired behavioral change, but would reduce revenue. Yet depletion and pollution remain “bads” even if reduced, so there is a good case for further raising the tax on them if revenue needs require it, while value added remains something we want to increase, so we would still want to avoid taxing it.

A shift in the burden of taxation from value added (economic goods, such as income earned by labor and capital) to throughput flow (ecological bads, such as resource extraction and pollution), is critical in shifting towards sustainability [80]. Such a reform would internalize external costs, thus increasing efficiency [95]. It is possible to impose throughput taxes on resource depletion or on waste emissions. Taxing the origin and narrowest point in the throughput flow induces more efficient resource use in production as well as consumption, and facilitates monitoring and collection. For example, there are far fewer oil wells than there are sources of CO$_2$ emissions. In either case, taxes will increase prices and induce efficiency in resource use. One disadvantage of green taxes is that the level of pollution is determined by price, rather than the ecosystem’s capacity to absorb waste. Prices can adjust to ecological constraints more rapidly than ecosystems can respond to the price signals [96]. We discuss below quantitative limits as an alternative.

Many people call for a gradual revenue-neutral tax shift, rather than a set of new taxes. This approach would begin by forgoing a certain dollar amount of revenue from the most regressive taxes, for example, payroll or sales taxes, which currently take a larger percentage of income from the poor than from the rich, while simultaneously collecting the same amount from the best resource severance tax. Then, as the next step, get rid of the second worst tax and substitute the second best resource tax, and so on. As discussed below, however, increasing tax revenue may be desirable.

The logic of ecological tax reform has been broadly accepted for at least a decade and has been implemented in varying degrees across Europe. But progress towards this goal has been painfully slow. In the United Kingdom, the proportion of taxation from green taxes is now lower than it was in 1997. There’s an urgent need to achieve an order of magnitude step-change in the structure of taxation. A sustained effort by government is now required to design appropriate mechanisms for shifting the burden of taxation from incomes onto resources and emissions [72].

3.3.3. Tax what we take, not what we make

Taxes should also be used to capture unearned income, or rent, in economic parlance. Green taxes are a form of rent capture, since they charge for the private use of resources created by nature. However, there are many other sources of unearned income in society.

Most obviously, the word "rent" is associated with land. Land is available in a fixed supply which cannot respond to market signals, and is an essential input into all economic activities—even the least tangible economic activities must take place on some physical substrate. The value of land is created by nature and society as a whole, not by individual
Building a Sustainable and Desirable Economy-in-Society-in-Nature

effort. For example, if a government builds a light rail or subway system—more sustainable alternatives to private cars—adjacent land values typically skyrocket, providing a windfall profit for landowners. New technologies also increase the value of land, due to its role as an essential input into all production [97]. Because the supply of land is fixed, any increase in demand results in an increase in price. Landowners therefore automatically grow wealthier independent from any investments in the land. Furthermore, speculative demand creates a positive feedback loop, in which rising prices increase demand, leading to bubbles and busts in land markets, which can trigger national and even global recessions. High taxes on land values (but not on improvements to land, such as buildings) allow the public sector to capture this unearned income. Similarly, public ownership through land trusts and other means, as is increasingly common, allows for public capture of the unearned income. This removes any reward from land speculation, thus stabilizing the economy. It also drives down land prices. Mortgage payments will be replaced by tax payments, so there will be no negative impact on new landowners. If land values fall, so do payments, dramatically decreasing the likelihood of default and foreclosure. Fixed stocks of land means that it exhibits perfectly inelastic supply, so landowners cannot pass tax increases on to renters.

Growing demand and increasing scarcity of natural resources also drive up their price, generating windfall profits for resource owners. The depletion taxes discussed above should increase in tandem with price increases, capturing the rent for the public sector.

3.3.4. Taxation to reduce inequality

Income inequality can have very pernicious effects on human well-being. Figure 6 below shows the relationship between inequality and an index of health and social problems across OECD countries.

Figure 6. Relationship between income inequality and social problems score in OECD countries [32].
Inequality is also closely related to taxation policies. Figure 7 shows the highest marginal income tax bracket in the United States, along with the share of income captured by the wealthiest 0.1 percent. However, taxes on capital gains, which account for a significant share of the income of the top 0.1 percent, are not included in this figure. The top capital gains tax dropped from 28 percent to 20 percent in 1997, which accounts for the dramatic increase in income inequality beginning that year.

There is also a strong correlation between tax rates and social justice, as evident from Figure 8. High tax rates that contribute to income equality appear to be closely related to human well-being. This suggests that tax rates should be highly progressive, perhaps asymptotically approaching 100 percent on marginal income. The measure of tax justice should not be how much is taxed away, but rather how much income remains after taxes. For example, hedge fund manager John Paulson earned $4.9 billion in 2010. If Paulson had to pay a flat tax of 99 percent, he would still retain nearly $1 million per week in income. Presumably, most of this income was taxed at the current capital gains tax rate of 15 percent, which also applies to a large share of hedge fund manager income.

Increasing his tax rate to 99 percent (which might entail a marginal tax rate of 99.99 percent, depending on the tax schedule) would allow the government to hire 84,000 teachers at $49,000 per year.
3.3.5. Increasing financial and fiscal prudence

The monetary reform proposed above requires significant political will, which may be slow in coming. Other policies for achieving financial and fiscal prudence may be required in the meantime.

For over the past decade, debt-driven consumption has pushed economic growth globally. However, our relentless pursuit of that growth as the end goal has contributed to the global economic crisis. A new era of financial and fiscal prudence needs to: increase the regulation of national and international financial markets; incentivize domestic savings, for example through secure (green) national or community-based bonds; outlaw unscrupulous and destabilizing market practices (such as short selling); and provide greater protection against consumer debt [72]. Governments must pass laws that restrict the size of financial sector institutions, eliminating any that impose systemic risks for the economy. “Too big to fail” is “too big to exist.”

Certain governmental policies have promoted the financial turmoil of the past few years. Reforming these policies would reduce the distortions within the financial markets, eliminate the too-big-to-fail problem, and prevent the government from manipulating housing credit. These reforms would include: (1) smarter micro-prudential regulation of banks, (2) macro-prudential regulation of bank capital and liquidity standards, (3) creation of credible plans for reforming large, complex banks, (4) elimination of leverage subsidies as a means of promoting homeownership, (5) removal of barriers to stockholder discipline of bank management, (6) policies that promote improvement in counter-party risk management [100], and (7) encouraging sustainable local development through new and existing community, municipal, and state development banking institutions.

Figure 8. Relationship between tax revenue as a percent of GDP and index of social justice in OECD countries [99].
3. A Redesign of “the Economy” Recognizing Its Embeddedness in Society and Nature

3.3.6. Improving macro-economic accounting

Unlimited economic growth is not only impossible, it is undesirable. GDP measures costs, not benefits, as illustrated by recent declines in energy and food supply, increasing both their prices and share in GDP even as the benefits they generate decline. An indicator of welfare should measure years of satisfying life, encompassing both quality and quantity.

A large body of literature exists critiquing the value of GDP as a wellbeing measure [101]. Its primary limitations include the following:

1. Failure to account for externalities, both positive (household labor, volunteering, ecosystem services) and negative (pollution, crime, or cancer) [28].
2. Counting the depletion of natural capital as income.
3. Ignoring thresholds beyond which increasing GDP no longer contributes to quality of life. As GDP increases, overall quality of life often increases up to a point. Beyond this point, increases in GDP are offset by the costs associated with increasing income inequality, loss of leisure time, and natural capital depletion [30,102].
4. Failure to account for inequality.
5. Failure to account properly for changes in the asset base, which affect our future consumption possibilities [72].
6. Concentration on flows, when capital stocks may be a better measure of quality of life. Society should seek to minimize the flows required to sustain these stocks [103].

GDP does, however, belong as an indicator of economic efficiency. The more efficient we are, the less economic activity, raw materials, energy, and work it requires to provide satisfying lives. Real efficiency reduces environmental impacts and increases leisure time. As a major cost of providing satisfying lives, GDP does frequently move in parallel with welfare. In the same way, countries that spend more on medical care tend to have better indicators of health. However, concluding that we should therefore maximize medical expenditures, a cost, is absurd. When GDP rises faster than life satisfaction, efficiency declines. Our goal should be to minimize GDP, subject to maintaining a high and sustainable quality of life. The real problem with recession is not that it decreases GDP but that it undermines quality of life by increasing unemployment, poverty, and suffering [42].

In 1969, the United States came to the end of a four-decade decline in income inequality and poverty. People then consumed about half as much per capita as they do today. The genuine progress indicator (GPI), a measure of welfare designed to adjust for the inadequacies of GDP, reached a plateau around this time, and has since declined [30]. Subjective measures of well-being, such as the percentage of people who consider themselves “very happy,” have steadily declined since then as well [15]. Empirical evidence therefore suggests that a return to 1969 per-capita consumption levels would not make us worse off. On the contrary, returning to 1969 consumption levels would presumably lower our resource depletion, energy use, and ecological impacts by half, so there is every reason to believe that dramatically lowering our per-capita consumption could actually make us better off [104].

A number of ways of measuring national-level progress has been proposed, developed, and used to address this growing realization that GDP is a measure of economic quantity, not economic quality or welfare, let alone social or environmental well-being.
The measures also address the concern that GDP’s emphasis on quantity encourages depletion of social and natural capital and other policies that undermine quality of life for future generations.

In general, these new measures can be categorized as (1) indexes that address the issues described above by making “corrections” to existing GDP accounts, (2) indexes that measure aspects of well-being directly, (3) composite indexes that combine approaches, and (4) indicator suites. Like GDP, all these measures are abstracted indicators, not comprehensive reports on the heart and soul of individual communities. However, some can and are being used to inform local and regional decisions. This is an improvement on the misuse of GDP and economic growth as a proxy for well-being [28].

National accounts should focus on well-being and societal progress as we defined above. Such accounts will provide policy-makers a better chance to react appropriately to financial crises, climate change, and oil price shocks [105]. By utilizing national accounts focused on well-being, a well-being screen will be applied to every policy proposal, allowing a shift away from narrow, income-driven costs/benefits analysis to a wider range of potential impacts on personal and social well-being [106].

3.3.7. Improving macro-economic and regional coordination

Unless planned with care, moving towards a reduced-growth and reduced-time economy could cause many disruptions at the level of firms, communities, and individuals. Current coordination and planning strategies are limited in general, and are focused largely on growth in particular. A new infrastructure capable of generating specific sectoral, geographic, and time allocating alternatives will be required so that choices between alternative paths can become policies rather than scenarios. Developing ways in which larger-order coordination and planning choices can be presented to publics for democratic consideration and decision-making is an essential requirement of the new direction proposed [107].