RESILIENCE THROUGH SIMPLIFICATION: REVISITING TAINTER'S THEORY OF COLLAPSE

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A society or other institution can be destroyed by the cost of sustaining itself. **– Joseph Tainter**

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Samuel Alexander[1]

1. INTRODUCTION

In 1988 Joseph Tainter published his seminal work, *The Collapse of Complex Societies*, in which he presented an original theory of social complexity that he offered as the best explanation for the collapse of civilisations throughout history. Tainter's theory, which I outline in more detail below, essentially holds that human societies become more socially complex as they solve the problems they face, and while this complexity initially provides a net benefit to society, eventually the benefits derived from increasing complexity diminish and the relative costs begin to increase. There comes a point, Tainter argues, when all the energy and resources available to a society are required just to maintain the society, at which point further problems that arise cannot be solved and the society then enters a phase of deterioration or even rapid collapse. Not only is Tainter's theory of historical interest, many believe it has implications for how we understand the world today.

One of the most challenging aspects of Tainter's theory is how it reframes – one might even say revolutionises – sustainability discourse (Tainter, 2011a). Tainter argues that sustainability is about problem solving and that problem solving increases social complexity. But he also argues that social complexity requires energy and resources, and this implies that solving problems, including ecological problems, can actually demand *increases* in energy and resource consumption, not reductions. Indeed, Tainter (2006: 93) maintains that sustainability is 'not a passive consequence of having fewer human beings who consume more limited resources,' as many argue it is; he even goes as far as to suggest that voluntary simplification by way of foregoing consumption may no longer be an option for industrial civilisation, for reasons that will be explained. Instead, Tainter's conception of sustainability involves subsiding increased complexity with more energy and resources in order to solve ongoing problems.

While Tainter's theory of social complexity has much to commend it, in this paper (which is part of a larger work-in-progress) I wish to examine and ultimately challenge Tainter's conclusion that voluntary simplification is not a viable path to sustainability. In fact, I will argue that it is by far our best bet, even if the odds do not provide grounds for much optimism. Moreover, should sustainability prove too ambitious a goal for industrial civilisation, I contend that simplification remains the most effective means of building 'resilience' (i.e. the ability of an individual or community to withstand societal or ecological shocks). While I accept that problem solving generally implies an increase in social complexity, the thesis I present below is that there comes a point when complexity itself becomes a problem, at which point voluntary simplification, not further complexity, is the most appropriate response. Not only does industrial civilisation seem to be at such a point today (Homer-Dixon, 2006), or well beyond it (Gilding, 2011), I hope to show that voluntary simplification presents a viable and desirable option for responding to today's converging social, economic, and ecological

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problems. This goes directly against Tainter's conception of sustainability, while accepting much of his background theoretical framework.[2]

2. OVERVIEW OF TAINTER'S THEORY

This is not the place to review the historical details that serve to underpin Tainter's theory (1988). For present purposes, what is required is simply an outline of the structure of his position, which can be done quite briefly. After doing so, I unpack some of the implications of Tainter's theory, at which point I will be in a position to explore the thesis of 'resilience through simplification.' I conclude by situating my analysis in the context of various contemporary social movements, including those based on permaculture (Holmgren, 2002), eco-villages (Walker, 2005), transition initiatives (Hopkins, 2008), and voluntary simplicity (Trainer, 2010a; Alexander and Ussher, 2012). It is my view that voluntary simplification, understood in the context of Tainter's theory, is the most coherent framework for understanding what these overlapping social movements are attempting to achieve. I hope that by clarifying this framework these social movements might be able to move more effectively toward their goals.

2.1. *The Dynamics of Social Complexity*

The foundation of Tainter's position, as already noted, is that social complexity increases when human beings set out to solve the problems with which they are confronted. Since problems continually arise, there is persistent pressure for growth in complexity (Tainter, 2011b: 91). Both historically and today, such problems might include securing enough food, adjusting to demographic, climatic, or other environmental changes, dealing with aggression within or between societies, organising society, and so on. Indeed, the challenges any society might face are, for practical purposes, 'endless in number and infinite in variety' (Tainter, 2011a: 33). As societies respond to the problems they face, they often develop their technical abilities, establish new institutions, diversify social, economic, and political roles, as well as increase production and information flows, all of which require energy and resources. Social or cultural 'complexity' is the term Tainter uses to describe this development in human organisation and behaviour.

In order to understand the dynamics of social complexity, it can be helpful to begin by focusing on prehistoric times (prior to the uptake of agriculture), when human life was about as simple as can be. During these times, the main problem human beings faced was securing an adequate food supply, and this was solved relatively easily by hunting wild animals and gathering wild plants. Interestingly, anthropologists have concluded that prehistoric hunter-gatherers were the most leisured societies to have ever existed (Sahlins, 1974; Diamond, 1998), which confirms that food supply was generally secure and easily obtained. It seems that once essential biophysical needs were adequately met, hunter-gatherers stopped labouring and took rest rather than work longer hours to create a material surplus for which they did not seem to desire.

This form of life was sustained by a minimal and largely static supply of energy – essentially just food, and eventually fire. This tightly constrained energy supply placed

[2] There is one important terminological issue that needs clarification. The term 'voluntary simplicity' has long been used to refer to a way of life in which people choose to reduce or restrain their material consumption while seeking an increased quality of life (see Alexander, 2009; 2011a). By way of distinction, I use the term 'voluntary simplification' in this essay to refer specifically to a living strategy within the context of Tainter's theory of social complexity. While there is much overlap in the practical implications of these two ideas, conceptually they ought to be kept distinct. 'Voluntary simplicity,' one might say, opposes 'consumerism' or 'materialism,' whereas 'voluntary simplification,' in ways that will be explained, opposes 'social complexity.'

strict bounds on the types of society that could arise, for the reason that more 'complex' social organisations and behaviours require greater supplies of energy. In other words, hunter-gatherer societies had no food (i.e. energy) surplus to feed any non-food specialists – such as soldiers, craftspeople, bureaucrats, aristocrats, and so forth – so there was very little differentiation in social roles. Accordingly, for hundreds of thousands of years, early hunter-gatherer societies did not develop any significant degree of social complexity, in Tainter's sense of the term.

Things began to change, however, around 10,000 years ago as a consequence of the agricultural revolution (Diamond, 1998: Ch 6). The greater productivity of agriculture for the first time gave human societies a significant boost in their food (i.e. energy) supply, and this set in motion the development of social complexity that continues to this day. Being so much more productive than foraging, agriculture meant that not everyone had to spend their time producing food, and this gave rise to an array of non-food specialists, including those noted above and many more. Furthermore, the sedentary nature of agricultural societies made it practical to begin producing and accumulating new material artefacts (e.g. houses, furniture, collections of tools, etc), all of which would have been too cumbersome for nomadic peoples to justify creating, or too energy-intensive.

Eventually wind energy (boats, windmills, etc) and hydro energy (waterwheels) further enhanced humankind's energy surplus (Smil, 2004), paving the way for further increases in social complexity. The greatest energy revolution, however, was of course initiated early in the 18th century, when humankind first began harnessing on a large scale the extraordinary potential of fossil fuels. This provided the vast energy foundations required to establish and maintain a form of life as complex as industrial civilisation. While it is believed that hunter-gatherers had no more than a dozen distinct social personalities, modern European censuses recognise as many as 20,000 unique occupational roles, and industrial societies may contain more than 1,000,000 different kinds of social personalities (Tainter, 2011a: 25). If nothing else, this is evidence of unprecedented social complexity.

At this stage it is important to note that social complexity does not always follow an energy surplus, but often precedes a surplus. In fact, Tainter argues that complexity *typically* precedes an energy surplus (Tainter, 1988; Tainter, 2000). While he accepts that historically there were a few isolated 'revolutions' in energy supply that certainly made further complexity possible, he argues that normally complexity arises when new problems present themselves, and in solving those problems societies are forced to find a way to produce more energy, if that is possible. This contrasts with the isolated situations (following an energy revolution) when societies voluntarily become more complex due to an availability of surplus energy. As Tainter puts it, 'Complexity often compels the production of energy, rather than following its abundance.' (Tainter, 2006: 92). This is significant because it means that increasing complexity often is not voluntary, in that it is typically a response to the emergence of unwanted problems, rather than being a creative luxury chosen in response to the availability of surplus energy. This is a point to which we will return.

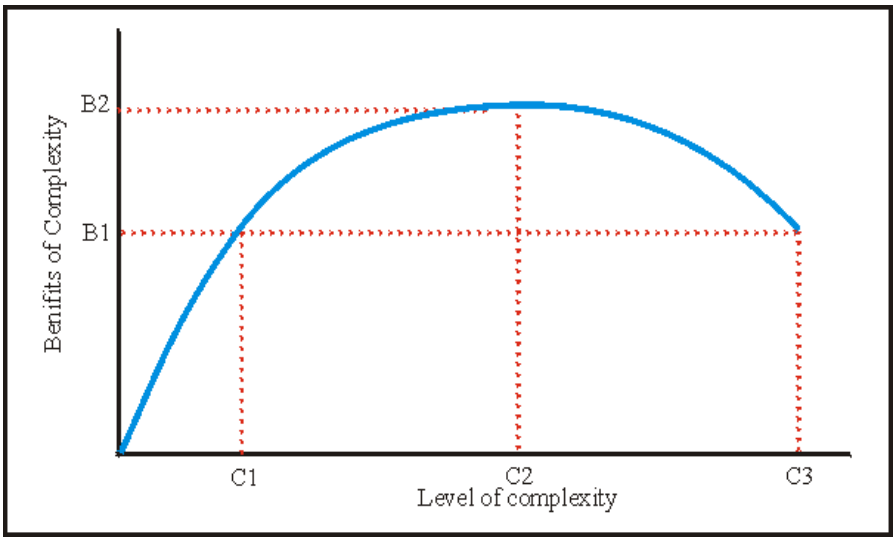
2.2. *Diminishing Marginal Returns of Complexity*

At the centre of Tainter's theory lies his idea that social complexity is an economic function that has diminishing marginal returns. Complexity is an economic function in the sense that it involves a balancing of costs and benefits. That is, when a society solves a problem by becoming more complex it will receive the benefits of solving the problem, but it will also incur the costs of doing so. These costs will include, most importantly, energy and resources, but also costs like time and annoyance. For example, when hunter-gatherer societies discovered agriculture and became aware that its methods could produce more food than foraging, they had to balance the benefits of transitioning

to an agricultural society with the costs. The costs were that early farming techniques were more labour-intensive than foraging; the benefits were that agriculture was much more productive per acre, and this extra productivity might have provided a welcome opportunity to support non-food specialists or solved a society's food crisis (perhaps brought on by overpopulation or overhunting depleting available resources).

This same balancing exercise takes place every time a society considers responding to a problem by creating a new institution, adding new bureaucrats, developing some new technology, or establishing some new social system, etc. Societies choose complexity – that is, choose to solve the problems they face – when it seems that the benefits of doing so will outweigh the costs. Critically, there must also be the energy and resources available to actually subsidise the problem-solving activity (or at least the potential to acquire more energy and resources, if current supplies are already exhausted in simply maintaining existing complexity).

Tainter's central thesis, however, is that complexity is subject to diminishing returns, which is to say, over time the benefits of complexity diminish and the ongoing costs of maintaining or increasing complexity augment. He explains that this is because 'humans always tend to pick the lowest hanging fruit first, going on to higher branches only when those lower no longer hold fruit. In problem-solving systems, inexpensive solutions are adopted before more complex and expensive ones' (Tainter, 2011a: 26). In other words, over time increments of investment in complexity begin to yield smaller and smaller increments of return, which is another way of saying that the marginal return on complexity starts to decline (see Figure 1 below).



<u>Figure 1:</u> The marginal productivity of increasing complexity. At a point such as B1, C3, the costs of complexity exceed the benefits, and complexity is a disadvantageous approach to problem solving (Tainter, 2011a: 27).

Eventually, Tainter argues, the costs of solving a problem will actually be higher than the benefits gained. At this point further problems will not or cannot be solved, and societies become vulnerable to deterioration or even rapid collapse. Another way of expressing this is to say that there comes a point in the evolution of societies when all the energy available to that society are exhausted in simply maintaining the existing level of complexity. When further problems arise, as history tells us they inevitably will do, the lack of an energy surplus means that new problems cannot be solved and thus societies become liable to collapse.

This highlights the point explained above about how complexity is not always, and not even normally, a voluntary response to surplus energy, but instead is usually

required for a society to sustain itself as new problems emerge. Societies can be destroyed, however, when the costs of sustaining their complexity become unaffordable. This is the essential dynamic that Tainter argues 'can explain collapse as no other theory has been able to do' (Tainter, 1995: 400).

3. IMPLICATIONS OF TAINTER'S THEORY ON SUSTAINABILITY DISCOURSE

Tainter's theory of social complexity and collapse has profound implications on sustainability discourse. There are of course many strains of sustainability discourse, but Tainter argues that all the dominant varieties look inadequate once the implications of his theory are grasped. His main target is the argument that sustainability can be achieved through industrial societies voluntarily consuming less energy and resources (what I will call the 'consumption argument'). But he also levels his critique against sustainability arguments based on pricing commodities correctly and market exchange; rationing resources; reducing population; or producing commodities more efficiently through technological advance. While acknowledging that these approaches are not always mutually exclusive, Tainter (2011b: 93-4) concisely dismisses them in the following terms:

> 1. *Voluntarily reduce resource consumption*. This strategy is constrained by the fact that societies increase in complexity to solve problems. Resource production must grow to fund the increased complexity. To implement voluntary conservation long term would require that a society be either uniquely lucky in not encountering problems, or that it not addresses the problems that confront it.
>
> 2. *Employ the price mechanism to control resource consumption*. This is currently the laissez-faire strategy of industrialized nations. Economists consider it more effective than voluntary conservation. Both approaches, however, lead eventually to the same outcome: As problems arise, resource consumption must increase at the societal level even if consumers as individuals purchase less. Still, the price mechanism has more ability to curtail complexity than does voluntary conservation.
>
> 3. *Ration resources*. Because of its unpopularity, rationing is possible in democracies only for clear, short-term emergencies, as in World War II. Moreover, rationed resources may become needed to solve societal problems, belying any attempt to conserve through rationing.
>
> 4. *Reduce population*. While this would reduce aggregate resource consumption temporarily, as a long-term strategy it has the same fatal flaw: Problems will emerge that require solutions, and those solutions will compel resource production to grow.
>
> 5. *Hope for technological solutions*. Members of industrialized societies are socialized to believe that we can always find a technological solution to resource problems. Technology, within the framework of this belief, will presumably allow us continually to reduce our resource consumption per unit of material well-being. Unfortunately, recent research shows that innovation in industrialized nations is becoming more expensive and less productive (Strumsky et al., 2010), and its long-term prospects for solving resource concerns are in doubt. Moreover, experience shows that improvements in technical efficiency paradoxically cause resource consumption to increase through the Rebound Effect (Jevons, 1866; Boulding, 1959; Polimeni et al., 2008).

There are many points here that deserve further exploration, but since Tainter's critique of the consumption argument (point 1, above) is the most important and by far the most original, it will be the focus of attention for the remainder of this essay.

3.1 *Tainter's Critique of the Consumption Argument*

Tainter maintains that the argument for sustainability based on consuming less follows logically from the assumption that resources and energy precede and facilitate innovations that increase complexity. 'Complexity, in this view, is a voluntary matter. Human societies became more complex by choice rather than necessity. By this reasoning, we should be able to choose to forgo complexity and the resource consumption that it entails (Tainter, 2011a: 31). But we have seen that Tainter rejects that reasoning. In his view, complexity is generally forced upon societies as they respond to new problems, not voluntarily embraced due to an energy surplus, and this leads Tainter to reject the consumption argument:

> Contrary to what is typically advocated as the route to sustainability, *it is usually not possible for a society to reduce its consumption of resources voluntarily over the long term*. To the contrary, as problems great and small inevitably arise, addressing these problems requires complexity and resource consumption to increase (Tainter, 2011a: 31, emphasis in original).

Elsewhere, Tainter (2006: 99) arrives at the same conclusion: 'Sustainability is an active condition of problem solving, not a passive consequence of consuming less.' More directly still, he insists that 'sustainability may require greater consumption of resources rather than less. One must be able to afford sustainability' (2006: 99).

This conception of sustainability is derived from the following assumptions: (1) that human societies will constantly face new problems; (2) that problem solving increases social complexity; and (3) that increasing social complexity requires energy and resources. On the basis of these assumptions, each of which is very plausible, Tainter contends that achieving sustainability will require increased social complexity and thus increased consumption of energy and resources. He even concludes a recent essay with the following statement: 'Developing new energy is therefore the most fundamental thing we can do to become sustainable' (Tainter, 2011a: 33). His essential argument, therefore, is that if we have enough energy to solve the problems we face, civilisation will not deteriorate or collapse. The flip side of that argument, of course, is that if we cannot secure the necessary energy, our future looks much bleaker – that is, we will be destined to repeat the history of all previous civilisations that have collapsed according to the same logic of diminishing returns on complexity (Tainter, 1988).

Despite Tainter's approach to sustainability being coherently and rigorously defended (if one accepts his assumptions), his theory directly contradicts the widely held belief that sustainability requires reducing overall energy and resource consumption. For reasons already outlined, Tainter rejects that position as nice in theory but naïve in practice, perhaps even impossible. Given that Tainter is equally dismissive of the other approaches to sustainability, one can understand why he resigns himself to the fact that 'the study of social complexity does not yield optimistic results' (Tainter, 2006: 99). In fact, there is something deeply tragic in Tainter's view, because it suggests that civilisation, by its very nature, gets locked into a process of mandatory growth in complexity that eventually becomes unsupportable. Furthermore, history provides a disturbingly consistent empirical basis for this tragic view (Tainter, 1988), leading Tainter (2006: 100) to conclude that 'all solutions to the problem of complexity are temporary.' This seemingly innocuous statement is actually extremely dark, for it implies that ultimately and inevitably social complexity will outgrow its available energy supply. Despite this situation, or rather, because of it, Tainter (2006: 100) argues that '"success" consists substantially of staying in the game,' and he believes that sustainability in this sense depends on developing new energy sources to subsidise ongoing problem-solving activity.

3.2. *Problems with Tainter's Conception of Sustainability*

Before offering a different response to the problem of complexity, it may be worth spending a moment further considering Tainter's proposed solution, for even if we were to accept the underlying logic of his analysis, his thesis that sustainability should be pursued by increasing energy supply is highly problematic, to say the least.

First of all, production of the world's most important source of energy – crude oil – seems to have 'peaked' or reached an undulating plateau, and production is widely expected to enter terminal decline in the foreseeable future (see Hirsch et al, 2010; Alexander, 2011b). This has led to increased development of non-conventional oil, but this is notoriously more expensive to produce and has a far lower energy return on investment (Hall and Murphy, 2011). What this means is that the world is almost certainly facing a future with less energy derived from oil supplies, not more. Furthermore, a similar, roughly bell-curve pattern of production levels will eventually apply to other fossil fuel sources too (coal and gas), as well as fuels for nuclear energy. This is the so-called 'peak everything' argument (Heinberg, 2007), and it presents Tainter's approach to sustainability with what is probably an unsurmountable obstacle. That is, just as we need more energy to subside further complexity and respond to new societal or ecological problems, overall supplies look poised to plateau and diminish (Heinberg, 2011).

Secondly, the science of climate change (e.g. IPCC, 2007; Hansen et al, 2008) suggests very strongly that if we maintain or increase existing levels of fossil fuel consumption, we are likely to face increasingly dire consequences over the course of this century and beyond (Gilding, 2011). Again, this casts grave doubt on Tainter's energy-based solution to sustainability problems. He argues that we must secure increased energy supplies to solve new and ongoing problems, but if increasing social complexity in that way requires the burning of more fossil fuels, then it seems clear that the world's problems are going to get considerably worse, not better (Hansen, 2011). At the same time, if the world chooses to stop consuming fossil fuels – which currently make up more than 80% of global energy supply (IEA, 2010: 6) – then obviously Tainter's approach fares no better, because he argues quite rightly that we need energy to solve problems. From his perspective, then, it seems that 'we're damned if we do, and we're damned if we don't,' as the saying goes.

Given the problems of 'peak everything' and climate change, Tainter naturally highlights the importance of transitioning to cleaner, renewable sources of energy (2011b). Such a transition is certainly to be desired, but unfortunately it is very unlikely to provide a timely supply of energy at the level Tainter's path to sustainability would require. Leaving to one side the fact that the transition to renewables is taking place at a disturbingly slow rate while emissions continue to rise (Jackson, 2009: 72), the more fundamental problem seems to be the inherent limitations to renewable energy sources. Ted Trainer (2012a; 2012b; 2010b) has spent the best part of a decade examining the best available evidence on varieties of solar, wind, biomass, hydrogen, etc., as well as energy storage systems, and he concludes that the figures do not support the widely held assumption that renewable energy can sustain the global economy, in anything like its current form. This is because the enormous quantities of electricity and oil required today simply cannot be converted to any mixture of renewable energy sources, each of which suffers from various limitations arising out of such things as intermittency of supply, storage problems, resource limitations (e.g. rare metals, land for biomass competing with food production, etc.), and inefficiency issues. Ultimately, however, the cost is the fundamental issue at play here. Trainer provides evidence showing that existing attempts to price the transition to systems of renewable energy are wildly understated, especially if future growth in energy production is taken into consideration. The challenges are exacerbated further by the existence of the 'rebound effect,' a phenomenon that can negate some of the energy use reductions expected from

efficiency improvements (Holm and Englund; 2009). At times efficiency improvements can even be the catalyst for *increased* energy consumption, a phenomenon known as the 'Jevons' paradox (Polimeni et al, 2008). All this firmly suggests that renewable energy will never be able to sustain growth-based economies, primarily because it would be quite unaffordable to do so. This is not a message most 'green' people want to hear.

It is of the utmost importance to emphasise that this is not an argument against renewable energy; nor is it an argument more broadly against the use of appropriate technologies to achieve efficiency improvements. It seems clear enough that the world must transition to full dependence on systems of renewable energy without delay and exploit appropriate technology wherever possible. We cannot afford not to! But given the limitations and expense of renewable energy systems, it seems highly unlikely that Tainter's approach to sustainability – the approach that argues that we need to increase energy supply to solve ongoing problems – can be subsided by renewable energy sources. Furthermore, as outlined above, maintaining or increasing consumption of fossil fuels will be either compromised by peak oil or rendered uneconomic due to the enormous costs of adapting to a changing climate. Tainter's approach to sustainability, therefore, cannot be accepted.

At this stage one may be tempted to reach for the nearest bottle of whisky. I would like to resist that temptation, however, or at least advise moderation. It certainly appears that Tainter's approach to sustainability faces various insurmountable obstacles, and if we were to accept his assumptions, then perhaps the bottle is indeed our only salvation. But in the next section I wish to examine more closely Tainter's critique of the consumption argument, and in doing so I hope to show that the strategy of voluntary simplification has far more potential than he is willing to give it. Indeed, I will argue that it is our best and perhaps our only hope to avoid civilisational collapse.

4. THE STRATEGY OF VOLUNTARY SIMPLIFICATION

As we have seen, Tainter argues that sustainability is about problem solving and that problem solving increases social complexity. But he also argues that social complexity requires energy and resources, and this implies that solving problems, including ecological problems, requires *increases* in energy and resource consumption, not reductions. On essentially that basis, Tainter concludes that sustainability cannot be achieved by voluntarily reducing energy and resource consumption, because societies are required to meet the ongoing and indeed increasing demands of social complexity, or else suffer deterioration or collapse. Accordingly, sustainability for Tainter involves securing enough energy and resources to subside ongoing problem solving activity.

The first point to note is that Tainter's conception of sustainability is not really about sustainability, if sustainability is meant to refer (as it normally is) to something being sustained *over the long term*. In Tainter's view, the tendency of all societies to become more complex, coupled with the diminishing marginal returns on complexity, means that eventually all societies get locked into a process of mandatory growth in complexity that eventually becomes unsupportable. This theory of social complexity implies that all societies have an inbuilt tendency to collapse, and this is why Tainter's conception of sustainability is necessarily compromised. After all, if one were to accept his assumptions, the idea of sustainability as meaning 'a civilisation being sustained over the long term' is actually a contradiction in terms. Civilisation is *inherently* unsustainable according to Tainter's logic, and this is why he is required to weaken his conception of sustainability to mean merely 'staying in the game' (2006: 100). But he also insists that all solutions to complexity are only temporary, and that is why I refer to Tainter's view as 'tragic.' Not only is it tragic, it is disconcertingly plausible (Tainter, 1988).

While I accept Tainter's view that problem solving generally implies an increase in social complexity, and that social complexity has diminishing marginal returns, the thesis I outline below is that there comes a point when complexity itself becomes a problem – that is, there comes a point when the costs of further complexity exceed the benefits – at which point voluntary simplification, not further complexity, is the most appropriate response. Tainter believes this is not an available response, but I hope to show that on this point, at least, he is in error.

Furthermore, I will argue that given the tendency of societies to become more complex than they can afford to be, true sustainability, in the sense of being sustained over the long term, requires that societies embrace voluntary simplification when the costs of complexity exceed the benefits. If they do not, they collapse. Another way of expressing this argument is to say that as the benefits of social complexity diminish and become outweighed by the costs, the benefits of voluntary simplification increase. Since industrial civilisation today is arguably at the point where the costs of complexity have begun to outweigh the benefits – or, at least, at the point when maintaining existing complexity is going to get increasingly difficult due to the anticipated descent in overall energy supply – it follows that we are at a critical point in history. We are at the point where we must embrace voluntary simplification, if that is possible (see Alexander, 2012a), or suffer the consequences.

4.1. *Situating Voluntary Simplification within Tainter's Theory*

In order to assess the viability of voluntary simplification as a strategy for achieving sustainability, a clearer view of what it might mean is required. The short answer is that voluntary simplification means *choosing a form of life in which the overall consumption of energy and resources is progressively reduced and eventually stabilised at a level that can be sustained over the long term; and because social complexity requires energy and resources, voluntarily reducing energy and resource consumption would generally imply a reduction in social complexity*. This definition of voluntary simplification, of course, raises many questions, which I will now endeavour to answer, or begin answering.

First of all, the definition must be situated in the context of Tainter's theory of social complexity, for in that context the notion of voluntarily reducing energy and resources seems like an incoherent strategy to achieve sustainability. This demands an immediate explanation, because if one were to accept that solving problems requires energy and resources – and I do accept that – it would seem to follow that voluntary simplification means choosing to solve fewer problems. I will now try to explain that the apparent incoherency here disappears when we take a closer look at what Tainter means when he uses the term 'problem,' which is a central concept in his theory. It seems that Tainter oversimplifies here what is a complex term, and that misunderstanding or misuse locks him into the tragic worldview outlined above. I believe that clearing up this misunderstanding provides the key to escaping Tainter's tragedy.

4.2. *The Indeterminacy of 'Problems' and its Implications*

Societies increase their social complexity in Tainter's view when they solve the problems with which they are presented. However, Tainter employs the term 'problem' as if it were self-defining and unambiguous. He assumes that a society just knows what is and what is not a problem, which of course is not an unreasonable assumption. On closer inspection, however, it can be seen that a 'problem' in Tainter's sense is actually a radically indeterminate notion, requiring various value judgments in order to give it content. There are at least three causes of this indeterminacy.

First of all, indeterminacy can arise over the very question of what constitutes a problem. For example, if a nation seeks security, it may wage war on a threateningly powerful neighbouring state, rather than risk being attacked by surprise. Solving the

'problem' of security, therefore, might require (a) creating an army; and (2) if the war was successful, defending a larger territory, perhaps requiring a larger army still. This solution to the problem of security is a classic example of how increasing social complexity can require increased energy and resources. However, the 'problem' here is by no means something independent of human values or perspectives. That is, the problem is not just imposed on the society for it to deal with as best it can. There are choices involved about what to focus on. For example, rather than seeing the problem as being one of security, a different society might have seen a problem of 'economic growth,' and rather than waging war, this alternative society might have tried to solve its problem by seeing if it could create a relationship of mutual benefit with its neighbours, perhaps through trade. Even through these simple examples it can be seen that the 'problems' that exist for any given society are often a value-laden function of their perspective or goals, not externally imposed challenges that arise independently.

A second cause of indeterminacy lies in the fact that there is rarely only one means of solving a particular problem. In the first example above, the problem of security could have been solved by waging war, building a defensive wall, trying to negotiate a treaty, some mixture of these strategies, or through some other strategy entirely. Likewise, in the second example, the problem of 'economic growth' could have been solved by creating new trade relationships, developing new technologies, marketing goods more effectively, or perhaps realising growth was not actually so important. Just as different perspectives might produce or dissolve certain problems, different perspectives also provide different ways of dealing with the problems that do exist (or are perceived to exist). Significantly, this means that shifts in perspective, values, or desires can affect the level of energy or resources that are needed to deal with social problems.

Finally, indeterminacy can also arise over the question of 'whose' problems have to be solved, for society is not a harmonious entity with a single set of goals and desires. Accordingly, when a society invests energy and resources to solve certain 'problems,' we are entitled to ask questions about whose interests are being served by addressing those particular problems as opposed to other problems. It may be, after all, that some people in a society do not see such and such a problem as being a legitimate problem, or perhaps they see other issues that are not being addressed as more urgent problems. Tainter, it should be noted, is not wholly unaware of this issue. He writes: 'In a hierarchical institution [or society], the benefits of complexity often accrue at the top, while the costs are paid primarily by those at the bottom' (Tainter, 2006: 100). But he does not seem to appreciate that this is evidence of indeterminacy over what constitutes a problem; nor does he seem to appreciate how all these causes of indeterminacy impact on his theory.

My point in exposing these three indeterminacies is to show that 'problems' are not objective phenomena that exist independently of humankind and which we must simply deal with the best we can. Rather, problems are often the product of a particular worldview, in the sense that they only exist as problems because society (or a particular subset of society) desire a certain state of affairs. This is not always the case, of course. Some problems will not disappear merely because human beings decide to think differently about the world. But many perceived problems and perceived solutions are in fact dependent on the way human beings view the world, or dependent on whose particular perspective is adopted. What this means is that if the world came to be looked at through a different worldview, a society might well find that it was faced with different problems, and perhaps different solutions would present themselves. Again, this is significant because it means that changing perspectives or values can affect the level of energy or resources that are needed for a society to deal with its problems.

The implications of this analysis are potentially profound. Most importantly, the analysis opens up space within Tainter's theory for voluntary reductions in energy and resources. The key point is this: *the energy intensity of industrial civilisation is primarily a function of the values that produce or shape the perception of its problems*. Those values

also produce and shape the perception of what constitutes a solution to perceived problems. Change those values, however, and many of the energy intensive problems industrial civilisation currently feels the need to solve may well disappear. And if energy intensive problems can be solved or rather dissolved by changing one's values or perspective, this will reduce the overall energy requirements for 'problem solving,' thus opening up space for voluntary simplification. When this is understood, the apparent incoherency of voluntary simplification (i.e. the perceived implication that it would require choosing 'to solve fewer problems') disappears. Simplification might simply involve solving different problems, or perhaps solve the same problems in different, less energy-intensive ways. Tainter does not seem to appreciate this, for otherwise he would not dismiss simplification so readily. He argues that voluntarily reducing consumption would require that a society be either uniquely lucky in not encountering problems, or that it not address the problems that confront it (Tainter, 2011b: 93). But the analysis above shows that there is a third option: rethinking what constitutes a problem. It maybe that many problems that industrial civilisation currently invests in are not actually problems that need to be solved, or not solved in such energy intensive ways.

For example, the vast amounts of energy and resources that are currently expended on military forces around the globe are an example of societies trying to solve the problem of national security. This investment obviously increases social complexity (and therefore increases the costs of maintaining a society), but military expenditure is a perfect example of problem solving activity that has diminishing returns (Tainter, 2006: 98). Indeed, an 'arms race,' so-called, is typically a zero-sum game: military forces increase, but since everyone's military forces can increase at a similar rate, relative positions often remain unchanged, despite vast expenditure. But since one nation invests, so must the others. At a non-governmental level, the 'marketing' of products provides another example of vast amounts of energy and resources being directed towards what is often a zero-sum game: the more one corporation spends on marketing its products, the greater incentive a different corporation has to spend on marketing its competing products, but one corporation's success is another's loss.

In both these examples, expenditure is easily wasted, that is, invested without providing any net benefit to society. Furthermore, such expenditure takes energy and resources away from solving other problems (e.g. food security, poverty, climate change, health, maintaining infrastructure, or whatever). Worst of all, it can even create new problems (e.g. war can create incentives for more war; marketing can create energy-intensive consumerist cultures, etc.). The critical point to appreciate is that this type of analysis could be reproduced through essentially limitless examples. There is always room for a society to rethink its problems; rethink its solutions; and, importantly, rethink how it prioritises the energy and resources it has available for problem solving. If a society does this effectively it may find that it can solve all of its most important problems while reducing its consumption of energy and resources. In doing so, of course, it may produce a very different type of society.

4.3. *How might Tainter respond?*

One way Tainter might respond to this analysis is to argue that it seems to ignore the tendency of all societies to increase in complexity. Even if Tainter accepted, as he might well do, that there is room to reduce the energy intensity of industrial civilisation in the short term, he might nevertheless reiterate that societies are constantly faced with new problems, such that any attempts at voluntary simplification will eventually be rendered unsuccessful by the inexorable pressure to increase social complexity in response to new problems. For that reason, the costs of maintaining society will still tend to increase over the long term. Tainter might insist, therefore, that my analysis has not been able to provide any escape from the inherent tendency of civilisations to grow in social complexity until they cannot afford the costs of their own existence.

While I accept that societies will constantly be faced with new problems and that solving them will tend to increase social complexity, this is not fatal to the position I am defending. It would only be fatal if it were assumed that voluntary simplification was somehow a 'passive' activity, and we have seen that Tainter does actually make that assumption. Sustainability, he maintains, is 'not a passive consequence of having fewer human beings who consume more limited resources' (2006: 93). But I would argue that voluntary simplification, far from being a passive activity, must be a strategy that is self-reflective and constantly in flux. The thought processes and behaviours which voluntary simplification represent cannot be static or unchanging, but must constantly respond to new circumstances and opportunities in new ways. Granted, if voluntary simplification meant reducing consumption and then returning to old ways of living, one can understand why social complexity would tend to increase over time, negating any initial benefits of voluntary simplification. But if voluntary simplification is considered an ongoing process, in which people and societies continually seek to reduce and restrain consumption, while also rethinking how best to invest the energy and resources at their disposal, then there is no reason to think that a society cannot be sustained, *over the long term*, on a sustainable level of energy and resource consumption, while still solving its most important problems (including new problems). Voluntary simplification, therefore, is not about achieving a stasis; it is about actively working on reaching and then maintaining some form of dynamic equilibrium within sustainable limits. This will not be easy, of course; but it is possible.

A second way Tainter might respond to my analysis is to say that there is already room for it within his own theory. Although this would require a degree of self-contradiction, the response would seem to have some initial justification. After all, in his historical analysis, Tainter states that the Byzantine Empire (which survived the collapse of the Roman Empire in the fifth century) is an example, albeit the only one, where 'a large, complex, society systematically simplified, and reduced thereby its consumption of resources' (2011a: 31). At first instance, this seems to be the strategy I am defending. But after acknowledging Byzantine simplification, Tainter immediately adds that '[w]hile this case shows that societies can reduce consumption and thrive, it offers no hope that this can be commonly done' (Tainter, 2011a: 31). More importantly, however, Tainter points out that simplification by the Byzantine Empire was both forced – that is, made necessary by a gross insufficiency of resources – and temporary (Tainter, 2011a: 31). Since I am defending a strategy of simplification that is both voluntary and practiced over the long term, the Byzantine example is not evidence that voluntary simplification already fits within Tainter's theory. Rather, establishing the viability of voluntary simplification extends Tainter's theory in a way that avoids his tragic conclusions.

A third way Tainter might respond to my analysis is by stating that, even if simplification is an available strategy, it will never be voluntarily embraced on the grounds that people will perceive that it is against their own interests. In fact, when considering whether voluntary simplification is possible, he states: 'I am confident that usually it is not, that humans will not ordinarily forgo affordable consumption of things they desire on the basis of abstract projections about the future' (Tainter, 2011a: 31). Although Tainter's position here has some intuitive force, it is far from being self-evident. It assumes that reducing consumption is against one's self interest, but that assumption, despite being culturally entrenched, is empirically debatable, and in consumer societies it is most probably false. Indeed, there is now a vast body of social and psychological research (see Alexander, 2012b) indicating that many if not most Western-style consumers are actually mis-consuming to some extent, in the sense that they could increase their wellbeing while reducing their consumption. The intricacies of that research cannot be explored here, but if it can indeed be shown, as I believe it can, that large portions of high-consumption societies would benefit from exchanging superfluous material consumption for more time to pursue non-materialist forms of

wellbeing, this would provide further support for the argument that voluntary simplification is not only possible, but desirable. If more people came to see this, one would expect voluntary simplification to be eagerly embraced.

Nevertheless, while that might be so at the individual or community level, the question of whether *governments* will ever voluntarily initiate overall reductions in societal production and consumption is more challenging. After all, governments depend on taxes, and a larger economy means more taxable income, so a process of voluntary simplification is almost certainly not going to be initiated from the 'top down.' The overriding objective of governments around the world is to grow their economies without apparent limit (Hamilton, 2003; Purdey, 2010), and continued growth requires (among other things) a citizenry that seeks ever-higher material standards of living. This growth model of progress is arguably a reflection of an underlying belief that social progress requires more energy and resources in order to increase existing standards of living and solve ongoing problems. But if the global economy has now reached a stage where the growth model is now causing the very problems it was supposed to solve, as many argue it has (Meadows et al, 2004; Jackson, 2009; Trainer, 2010a; Heinberg, 2011; Barry, 2012), then voluntary simplification provides the most coherent path forward, especially for the most highly developed regions of the world (Alexander, 2011c; 2012c). Again, however, the prospects of governments embracing some 'top down' policy of voluntary simplification, which would require planned economic contraction, seem slim to non-existent.

5. Escaping Tainter's Tragedy 'from Below'

If we proceed on the reasonable assumption that governments will never embrace voluntary simplification as a response to today's social, economic, and ecological problems, then it follows that the only hope for voluntary simplification is that it emerges and is driven 'from below,' at the grassroots level (Alexander, 2012d). While still marginal, there are several overlapping social movements that suggest that the seeds of voluntary simplification have already been sown. The most long-standing of these social movements or subcultures is based on the idea of 'voluntary simplicity,'[3] which can be understood as a way of life in which people choose to reduce or restrain their material standard of living while seeking a higher quality of life (Alexander and Ussher, 2012). This counter-cultural attitude towards material wealth seems to be as old as civilisation itself (Vanenbroeck, 1991), with philosophers, prophets, and poets throughout history highlighting that 'the good life' lies not in the accumulation of material possessions but in various non-materialistic sources of wellbeing, such as social relations, connection with nature, and peaceful, creative activity. In the 1960s and '70s as modern environmentalism took hold, the eco-village movement emerged (Walker, 2005), which involved creating intentional communities, often on the fringe or beyond urban centres, in the hope of showing that sustainable, post-industrial forms of life were possible. Toward the end of the 1970s the notion of 'permaculture' also emerged (Holmgren and Mollison, 1978), which is a complex term that essentially refers to the ideal of designing social and economic systems that work with nature, rather than against it. In more recent years the 'transition towns' movement has burst onto the global scene as a positive, community based-response to the dual crises of peak oil and climate change, through which people come together in an attempt to build resilient communities and local economies in the face of government inaction (Hopkins, 2008).

Space does not presently permit a detailed examination of these movements. The purpose of mentioning them is merely to suggest that they exemplify, in various ways and to various degrees of success, the process of voluntarily simplification 'from below.'

[3] See footnote 2 above where I distinguish between 'voluntary simplicity' and 'voluntary simplification.'

The low consumption lifestyles of voluntary simplicity can be understood to be freeing up energy and resources to solve more important problems; eco-villages can be understood to be attempting to build communities that can be sustained over the long term within the carrying capacity of the local environment; permaculture can be understood to be a design system that seeks to achieve sustainability by minimising the waste of energy and resources; transition towns in many ways can be understood to be a mixture of all three previous movements, with the added virtue of emphasising the importance of building a post-carbon world within the existing society through committed grassroots, community-based activity. These are all gross oversimplifications of rich and diverse social movements, but if we were to take the best insights from each of them and began shaping our societies on that basis (see Trainer, 2010a), that might just be enough to realise the concept of voluntary simplification outlined above and thereby escape Tainter's tragedy – the tragedy of a civilisation increasing in complexity until it collapses. As I argued above, the energy intensity of industrial civilisation is primarily a function of the values that produce or shape the perception of its problems. But the social movements just outlined embody values that contrast with the pro-growth, materialistic values upon which industrial civilisation is built, and this means that if those alternative values were ever mainstreamed they would tend to produce a different perception of what problems needed to be solved and in what ways. This shift in values would open up space for voluntary simplification. It would require a much longer work to provide details on what the process of voluntary simplification would look like in practice, but in closing this paper one brief example will be offered to clarify the essential idea.

5.1. *What would Voluntary Simplification look like in practice?*

Let us focus on food, given that it is an essential need for all societies. Currently, in the developed world at least, food production relies on extraordinarily complex economic systems. A single product in one's cupboard could well have had several dozen people in some way work on its production and distribution. Each of the substances within the product (e.g. salt, sugar, spices, vegetables, fruit, minerals, oils, etc.) could have been sourced from different parts of the world, come together at different times in the process of manufacture, and shipped, driven and/or flown by people other than the producers. Furthermore, the glass jar or packaging could have been produced in one place, the paper for the label produced in another place, the inks for the label produced yet somewhere else, and the logo designed and printed somewhere else again. Once the product is finally complete, it would be shipped, driven and/or flown to a retailer who then stocks the shelves with hundreds or thousands of items all made in similarly complex ways. One recent study (Salleh, 2007) in Australia concluded that the items in a single basket food from a supermarket typically travel 70,000 kilometres to the table (aggregating the distance each item travels).

Moreover, this complex process relies in less obvious ways on the entire system – i.e. a system of energy production that powers the manufacturers and supermarkets, factories that make nuts and bolts required to make the trucks that transport the food, universities that educate the engineers who make the factories and trucks – and so on, ad infinitum. Not only is this system of food production and distribution exceedingly energy intensive (mainly due to the fossil fuels needed for fertilizers, pesticides, irrigation, electricity, plastics, and transport), but in many ways it is also very insecure, because each step in the process is critical, meaning that if one step gets interfered with the whole process can break down. Such insecurity is exemplified by the trucker's strike in the UK in 2000. The nation realised very quickly how dependent it was on the globalised food system, because when the truckers were not trucking, food was not getting to the supermarkets. Before long supermarket officials were calling members of parliament advising them that without the lines of transport open to restock the shelves,

supermarkets had about three days of food. In the words of one commentator, the nation was only 'nine meals from anarchy' (Simms, 2008). Industrial food production, we see, is hugely complex, but partly for that reason it is not very resilient in the face of systemic disturbances.

Compare industrial food production with the far simpler methods in hunter-gatherer societies. Everyone is involved in sourcing food, all food is locally sourced, and no fossil fuels are required. People, that is, were self-sufficient. The argument of this paper is certainly not that we return to the extreme simplicity of hunter-gatherer societies (and even if those methods were desired, they would not be productive enough to feed anywhere near 7 billion people). Rather, the argument is that less complex and less energy-intensive ways of providing food for ourselves can be achieved without compromising quality of life and perhaps contributing positively to quality of life. It is very doubtful whether strict self-sufficiency is the most desirable form of food production, and often it would not be possible. But industrial societies could become far more self-reliant, and benefit from this, if only they made a commitment to source much of their own food locally, grow it organically, exchange surpluses at local markets, and eat it in season. This is one concrete example of voluntary simplification.

Governments could certainly help in this process, but presuming they will not do much, there is still much room for individuals, households, and communities to take considerable steps. Cuba in the 1990s provides an instructive example here (Percy et al, 2010; Friedrichs, 2010). When their oil supply was drastically cut after the fall of the Soviet Union, their industrialised food production and distribution essentially came to an end, replaced almost overnight with local and organic systems. Certainly the state played a significant role here, and this shows that governments can facilitate simplification in positive ways. But individuals and communities were the primary agents of change here; they just did what needed to be done. Voluntary simplification of food production might involve embracing something resembling the Cuban response throughout the industrialised world, both in rural and urban centres, *but prior to it becoming a necessity*. Voluntary simplification, after all, will be a very different experience than involuntary simplification, even if the actions are largely the same. This process of re-establishing local and organic food production would make the system less complex, which in turn would lessen the energy demands of industrial societies. We see this process already underway, albeit in small subcultures, in the eco-village, permaculture, transition towns, and voluntary simplicity movements outlined above.

The same type of analysis could be applied to all aspects of industrial civilisation, including: the way energy is produced and used; the way we transport ourselves; the way we organise ourselves and our economies; the way we attend to our health or educational needs; the way we clothe ourselves; the way entertain ourselves; and so on (see Trainer, 2010a). Rather than solving the problem of water security by creating expensive and energy intensive desalination plants, for example, people could all have rainwater tanks; rather than addressing obesity with expensive diet pills or liposuction, people could choose to eat better; rather than buying a clothes dryer, people could dry their clothes on a string outside; etc., etc; Voluntary simplification, as we have seen, involves rethinking problems; rethinking solutions; and rethinking how we prioritise the limited energy and resources we has available for problem solving. If a society does this effectively it may find that it can solve all of its most important problems while reducing its consumption of energy and resources. But this process is not about achieving some passive social or ecological stasis; it is about constantly working on reaching and then maintaining some form of dynamic equilibrium within sustainable limits. Given that presently the global economy is far exceeding the sustainable carrying

capacity of the planet (Global Footprint Network, 2012), it follows that voluntary simplification implies creating very different social and economic systems.[4]

As I have argued elsewhere (Alexander, 2012e), a truly sustainable society would probably end up looking something like Ted Trainer's (2010a) vision of The Simpler Way, which is a vision of highly self-sufficient, post-carbon economies that use mostly local resources to meet local needs. These would be zero-growth economies (Trainer, 2011) that were sustained on much lower levels of resource consumption and ecological impact. This implies that material living standards would be far lower than what are common in consumer societies today, but basic needs for all would be met and high living standards would be maintained because people would be living and working cooperatively in enjoyable and spiritually rewarding communities. Embracing lifestyles of voluntary simplicity, therefore, does not mean hardship or deprivation (Alexander, 2012b; Alexander and Ussher, 2012). It just means focusing on what is *sufficient* to live well, rather than constantly seeking increased consumption and greater affluence. If, however, industrial civilisation continues to pursue that latter path of growth without limits, it is destined to meet the fate of all previous civilisations, with all the suffering that implies. To avoid this what is required, first and foremost, is voluntary simplification, but this depends on a revolution in consciousness.

6. CONCLUSION:

Industrial civilisation is at a point in history when it is faced with the pressing issue of whether it can afford the problem of its own existence. Like a growing number of others, I do not believe that it can afford this, at least, not for much longer. The financial crisis currently plaguing the Eurozone (and elsewhere) is a barely disguised metaphor for this question of affordability, and it presents all of us living in industrial civilisation with the question of how best to respond to this problem – the problem of whether civilisation can afford the costs of its own complexity.

We are hardly the first to be faced with this problem; indeed, all previous civilisations have faced it. But perhaps we can be first, thanks to Joseph Tainter, to understand the dynamics at play. Perhaps we can even respond in such a way as to avoid the collapse scenario that has marked the end of all other civilisations. Prior civilisations attempted to sustain themselves and avoid collapse by continuing to increase complexity in response to new problems, but always this strategy has resulted in collapse, because eventually the energy and resources needed to subsidise increased complexity becomes unavailable. Nevertheless, this seems to be the very response industrial civilisation is taking presently, and indeed it is the one which Tainter himself recommends as the best course of action. As he puts it, 'modern societies will continue to need high-quality energy, and securing this should be the first priority of every nation with a research capability' (Tainter, 2011b: 94). This advice from Tainter is very problematic, given that energy-intensive problem solving led to collapse on all other occasions in history, of which he is very aware. The advice appears more problematic still if one accepts that the world is facing a future of 'energy descent.' But Tainter's advice follows the logic of his own assumptions, which includes the assumption that voluntary simplification is not an available path to sustainability. While I accept that complexity generally has diminishing marginal returns, in this paper I have tried to show, albeit in a preliminary and incomplete way, that voluntary simplification is actually a viable and desirable response to this challenging dynamic. In doing so, I have

[4] On another occasion it would be worthwhile reframing this defence of voluntary simplification within John Michael Greer's theory of catabolic collapse (Greer, 2008), which he offers as a refined, alternative to Tainter's theory. It is my view that the strategy of voluntary simplification remains equally valid within Greer's theory, or outside collapse theory altogether, although such defences would require different papers.

turned Tainter's solution on its head: where he sees the solution to civilisation's problems in further complexity, I maintain the best, and probably the only, solution lies in voluntary simplification.

However, since voluntary simplification is unlikely to be widely embraced as a response to the problem of complexity, one hesitates before claiming that voluntary simplification will produce sustainability. While this sustainability scenario is still an option available for us, the odds of it being selected do not look promising at all. Nevertheless, for those who agree with the analysis outlined above, voluntary simplification still remains the best strategy to adopt even if industrial civilisation continues to marginalise it. This is because if voluntary simplification is not embraced on a sufficiently wide scale to avoid social, economic, or ecological collapse, it nevertheless remains the most effective way for individuals and communities to build resilience, and in the current milieu, perhaps the ability to withstand forthcoming shocks is the best we can hope for.

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