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A Return to Being Human

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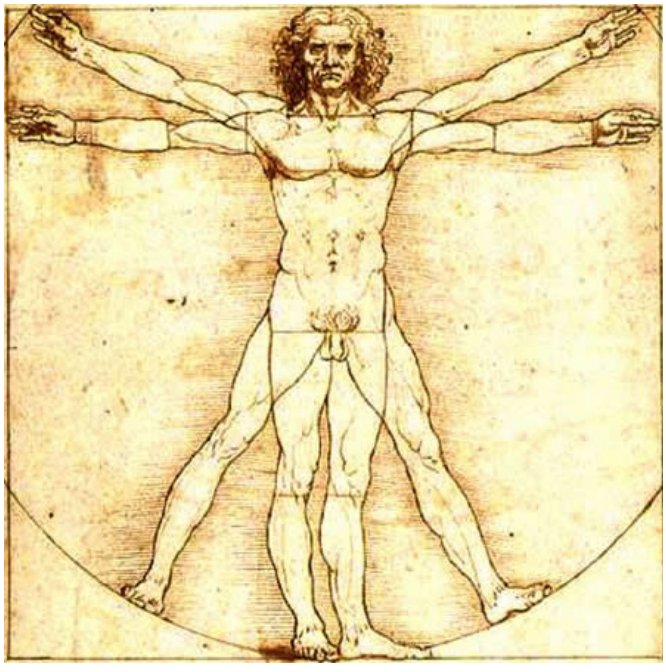

This research paper proposes the concept of the ‘general ecosystem’—a novel pattern of economic and social organization based on a holistic reassessment of human needs and a reintegration of our sense of what it is to be human

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The cover image shows a detail from Leonardo da Vinci's Vitruvian Man.

A Return to Being Human

Seeking Escape

In March 2007, the BBC broadcast in the UK a three-part documentary called *The Trap*[1], by the controversial British film maker, Adam Curtis. Its message was that "a simplistic model of human beings as self-seeking, almost robotic, creatures" plus an overriding belief in human selfishness have created "a cage" for human beings in modern society. The documentary argued that this predicament is in part the result of a long process by which social and personal values have become dominated by reductionist thinking. *The Trap* was pessimistic in tone and did not offer any clear solution. The question it left open, which this paper addresses, is whether it is possible to reverse this process by establishing a basis for values that would not be reductionistic, and that would offer a way out of the present trap.

Reductionism and human identity

The root of the problem is that our picture of human beings has been gradually reshaped by the dominance of one particular mode of thinking – reductionism – as a means of generating knowledge. What this has caused us to believe and value about ourselves in turn shapes how we behave towards each other. If our picture is somehow inadequate or incomplete, our behaviour will also fall short of its natural potential and serious social and other problems may develop. This can easily happen without our noticing it and is not easy to detect or correct.

Reductionism is essentially the procedure of reducing things to their component parts. The idea of taking things apart as a means of finding out more about them has been an extremely powerful way of building scientific knowledge. Early scientists began by looking at easily visible internal structures, and then developed instruments such as microscopes for looking at parts at smaller and smaller size scales. This led to the modern theory of the atom, and beyond that to sub-atomic physics, and to the paradoxes of the quantum realm.

What we lost sight of in the process is that knowing what things are made of does not necessarily help us to value them appropriately.

The basic assumption of reductionism is that a thing really is simply the sum of its parts. Each part is made of something smaller, right down to the basic building blocks of material reality, the sub-atomic particles. In this view, everything is a material construct. The properties of multi-particle things are seen as outcomes of system interactions, and thanks to computer simulations we now know these can be surprising and unpredictable. The features that appear as things get more elaborate are referred to as "emergent" properties of complex systems.

We see everyday objects around us that have internal structure and are built up from smaller parts, and this does apparently explain how their properties arise. This can be seen very clearly with simple machines. If we take a bicycle apart we are left with a collection of mechanical components and we can see exactly how they come together to form the bicycle. The fact that this approach works so well with machines made it easy to think that it could be applied to living organisms without raising any new issues.

Simple reductionism sees the properties of the whole as fully determined by properties observed in the parts when separate. Complex systems theory refines that by saying that although the parts of complex systems determine emergent behaviors, these new properties must be studied at a higher level. In both cases, parts are seen as primal and causal, reflecting a bias that the parts somehow exist first and then come together to form the whole. If we ask how a living system is different from a bicycle, a somewhat deeper answer is that the parts are themselves altered by the dynamic interaction among the parts in a way that does not happen in a bicycle. When the parts are in the living system they are literally different than when they are not – we call the latter state "dead." This answer is still framed in terms of parts, in keeping with the general thrust of scientific explanation. But it suggests a holistic reality in which parts and wholes are interdependent, so that in biological systems the whole can dynamically reshape the parts. An analogy

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would be the creative activity of engineering design, in which the parts are shaped as a means of accomplishing the concept of the whole.

Nevertheless, in reductionist biology the explanatory arrow goes from parts to wholes. Biological organisms clearly have complex internal structure, and do consist of parts, although these parts are bound together in a much more intimate way than the parts of a bicycle, as anyone who has attempted a dissection will know. Dissection – and sometimes vivisection – of living creatures enabled the knowledge base of biology to be built up, leading eventually to molecular biology, in which the operative parts are not bones, muscles and nerves but the far smaller nucleic acids, proteins and enzymes. It was quickly obvious that the internal structure of human beings is very similar to that of animals, so similar that we often talk colloquially about "the human animal."

This similarity, and the effectiveness of reductionism, led to the modernist understanding of a human being. We asked ourselves, what is a human being? And we answered by saying, human beings are advanced animals. And what are animals? They are systems of life processes. And what are these life processes? Well, they are dynamic systems of atoms and molecules. And so, in a few simple steps we reduced our idea of a human being to a set of material, atomic, phenomena.

The largely unseen problem is that when we apply reductionism to living creatures, and most significantly to human beings, we inadvertently perform not one but two reductions. The obvious one is that we reduce the living creature to its material components. The other, overlooked one is that we also reduce our appreciation of its qualities as a living being. In place of an appreciation of distinctive human qualities we are left with a perception of material qualities only. We have reduced our understanding of human beings to the same level as our understanding of material things.

There are several qualities of being human that are devalued or even lost when this happens. As humans, we are self-aware, able to choose, and the holistic experience of being human is our unique existential identity. These qualities cannot be found in the parts that make up a human, or in material constructs such as bicycles, but can only be appreciated from the standpoint of actually being human. To be able to put appropriate value on these qualities, we must use the holistic experience of being human as our frame of reference and basis of analysis.

Instead, our modernist belief in the power of reductionism to develop knowledge led us to think that the successive steps of the reductionist definition are a disclosure of the truth about being human. We consequently came to regard the material aspect of human beings as more real or more fundamental, and therefore more important and more valuable than other qualities. But the more we see ourselves as material constructs, the more we will begin to treat each other as if this is what we value most about each other.

There are many signs that this has happened, and has become one of the distinguishing marks of modernity. We say that nothing other than materiality exists, and that this is self-evidently true. We deny non-material aspects of ourselves, dissociating ourselves from our own nature. We no longer see uniquely human qualities because we do not take them seriously any more. We do not treat them as real in themselves, or as representing primary value; we say that they only exist as a by-product of material processes. And as we become dead to various human qualities in ourselves, and in others, our society begins to be less and less accommodating to certain aspects of being human. This is the predicament described in *The Trap*.

We are living in a predominantly modernist culture that admires material and mechanistic qualities more than human ones. It places great value on the qualities of machines – their speed, precision and efficiency – and we often see these as better than human attributes. In many contexts we aspire to be as much like machines as possible, and sometimes we actually wish to be machines, devising robotic implants and dreaming that we will be able to

Reductionism generates knowledge capable of disrupting the whole, but this knowledge does not work the other way round to help us bring order to the whole.

upload our consciousness to silicon and defy death.

The shift to this outlook has been gradual, and largely without our noticing we have ceased to appreciate fully what it is to be human. So much so that this assertion itself may seem questionable, in spite of our uneasy awareness that it does carry some kind of meaning that we cannot quite pin down. The changes, these reductions in the way we see ourselves, have crept up on us gradually. We did not see them coming and we do not notice how they alter the way we see the world and how we behave towards each other. But we do see that there are social problems we do not know how to fix, and perhaps we sense that the full depth of experiencing life has somehow been diminished.

Reductionism and the problem of the whole

Reductionism has not only had an unintended social impact, but it also limits our ability to find solutions to the problem of technological impact on the natural environment. It also helped create this problem in the first place. The effectiveness of reductionism in generating practical knowledge enabled us to develop advanced technologies, which have been a major force behind the exponential growth of industrialization and the spread of modernity. We used our knowledge almost exclusively to create disrelated instances of applied technology, such as consumer products and infrastructure projects, which we put into the world without any special thought for their impact on the whole context, the larger natural and social environment.

For most of the industrial period the larger environmental context was simply not an issue. When industrialization began, it was a small development in a vast world that was patterned in ways far beyond human influence or understanding. We simply took for granted the pre-existing structures and processes that organized the world. Even as we poured technology into the world, we thought the pattern of the whole would simply take care of itself.

This was true up to a point, while the scale of industrial activity compared to the rest of the world remained small, but from sometime in the 1970s onwards the relentless growth of the industrial economy began to overtake the scale of the biosphere itself. After the 1970s, according to the World Wildlife Fund, we began to consume renewable natural resources faster than the global capacity to regenerate them. Having reached this vast scale, the total collection of technologies that had been deployed began to disrupt the pre-existing pattern of the whole.

The problem with reductionism is that it generates knowledge capable of disrupting the whole, but this knowledge does not work the other way to help us to bring order to the whole. As a way of thinking, it is biased towards the parts rather than the whole. This gives us detailed knowledge of the parts, but little insight into how we might fix the disruption that is caused by the bias in our focus. To address the "problem of the whole" we need find a way of appreciating the value of wholes as wholes. Until we can rebalance the value we put on the whole versus the parts we will not be able to heal the pathology caused by the entire system of human socio-technical organization – the disruption of the whole.

Reductionism and sustainability

These two problems, our picture of human beings as material constructs, and the pathology of the whole, come together as a problem of sustainability. Disruption to the pattern of the whole is a direct threat to the sustainability of present-day human society. This means reductionist thinking is a key underlying source of *un*sustainability in the world today.

This link between reductionism and sustainability should not be surprising. There is a connection between our understanding of what it is to be human and our ability to sustain our lives. If there is a distortion in our picture of ourselves, our sense of our needs will also be distorted, and this will affect our ability to sustain ourselves. This happens through the way we make choices to meet our needs.

One of the attributes of being human is our ability to

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choose. Most of us, most of the time, choose to sustain our lives, to keep them going. If our lives are in danger, we will do our best to save ourselves. On a day-to-day basis we choose to sustain ourselves by making sure our needs are met.

Our ability to do this of course depends on our being able to accurately identify and value our various needs. Because in the modernist worldview we consider the material or physical level of description to be the most real, we value our needs at this level more highly than our needs at other levels. Since we naturally make the most effort to meet the needs we value most, we then tend to neglect or ignore the remaining needs.

If we consistently and systematically fail to meet our full range of needs as human beings we are indirectly threatening our ability to sustain ourselves. This unsustainability may not be obvious immediately, because it mostly involves our non-material needs, whereas a lack of basic material needs causes obvious problems faster. Nevertheless our shift from a holistic appreciation of human needs to a reduced appreciation is an underlying cause of the wider problem of systemic unsustainability.

An antidote to reductionism

Is there an antidote to our bias towards valuing the parts more highly than the whole? How can we restore our sense of the qualities of the whole, and bring ourselves back to a fuller appreciation of what it is to be human? Is there an alternative to reductionist thinking that would achieve this?

Suppose we throw the sequence of reduction into reverse. Instead of working down the sequence of levels of description and ending up with material parts as the answer to our questions about the whole, we could work our way upwards towards the whole, integrating into our understanding of the whole the properties we find at each level, and crucially, giving equal value to each of the levels.

To demonstrate this approach we could take the human being as the paradigm, not least because it has more levels of qualitative reduction than any other whole system we know. We would first set out and describe each of the levels of reduction. We would then see various human qualities revealed at each level. Our aim would be to achieve the sustainability of the whole, and to heal the pathology of the whole, and we have seen how that depends on valuing all our needs equally. We would therefore look for the needs we have at each level when our reality or our identity is considered at that level. This procedure would result in several groups of needs that are qualitatively distinct. We would then bring these sets of needs together into an integrated whole picture, giving equal value to each set.

This process would put all the steps of the reduction back together and build back up to a much more fully described sense of what it means to be human. The result would be a holistic sense of being human, with a balanced sense of all the needs we as humans value being able to meet. This integrated picture would provide a holistic sense of human value.

Human needs and the levels of reduction

Here is how this process would look in practice. We start by setting out the steps of the reductionist description of a human being:

(Level 0)	The starting point: we experience ourselves as human beings. We ask: what is a human being?
(Level -1)	We answer by saying: human beings are advanced animals. We ask next: what are animals?
(Level -2)	We answer by saying: animals are systems of life processes. We ask next: what are life processes?

At the non-reduced or whole level....the highest meaning of things arises from their relation to our uniquely human needs, what might be called our "cultural" or "civilizational" needs.

(Level -3) We answer by saying: they are dynamic systems of atoms and molecules.

This gives us four levels of description, starting at the top level with the whole human being, and ending at the bottom level with material components.

Next, we build back up from the lowest level, observing the human qualities and needs that exist at each level in turn.

At the third most reduced level (-3 above), we see the human being as an assembly of atoms. At this level our corresponding needs are defined as ones met at this level, by assemblies of atoms and material constructs. These include basic material requirements such as tools, clothes, and infrastructure for functions such as transport and shelter. At this level of human identity the highest meaning of things arises from their relation to our physical needs.

At the second most reduced level (-2 above), we see the human being as a set of systems of life processes. At this level our corresponding needs are defined as ones met at this level, by systems of life processes. These include a viable biosphere to provide ongoing life support, and food composed of complex organic compounds. At this level of human identity the highest meaning of things arises from their relation to our biological needs.

At the first most reduced level (-1 above), we see the human as being essentially an advanced animal. At this level our corresponding needs are defined as ones met at this level, as common to animals. These include social contact, social organization, social reciprocity, membership of family groups, and emotional relationships. At this level of human identity the highest meaning of things arises from their relation to our social needs.

At the non-reduced or whole level, (0) above, we see the human being as uniquely itself, unlike anything else we can compare it with. At this level our corresponding needs are defined as ones met at this level, and unique to humans. Our uniquely human qualities and attributes include reflexive awareness, abstract knowledge, and the potential for impartial judgment. Our needs include education and justice, intellectual development, and aesthetic satisfaction. At this level of human identity the highest meaning of things arises from their relation to our uniquely human needs, what might be called our "cultural" or "civilizational" needs.

We can go further and add one level beyond or "above" our experience as human beings. We could call this level (+1). This level relates to a question about our ultimate identity, about the meaning of being human. We are not able to answer this question definitively, since we cannot fathom the source of our own identity. But perhaps the best answer available to us is that we appear to be creative beings who develop an innate and open-ended individual potentiality and who therefore need to be free or unconstrained in this by other human beings. Our needs at this level are therefore for freedom of self-realization and self-actualization, in free response to the mystery of creation. At this level we might say, although it is hard to pin down an exact definition of the word, that the highest meaning of everything in human experience arises from its relation to our "spiritual" needs.

This (+1) is not a level of reduction, since it cannot be found when reducing the system we are dealing with to a description of its parts. Rather than being a reduction, it is at a level of integration higher than the whole we are examining, which is why it is referred to as "plus 1." However paradoxical this may be, it is important to include it because it acknowledges something further about human beings. We are not only aware of ourselves as wholes with unique attributes, but we are also (at least from time to time) aware that there is something about us that goes beyond our everyday experience of life. At the very least we are reminded of this because we are repeatedly haunted by questions about our own identity. This (+1) level provides a way to accommodate the idea of the "spiritual" and allow for religious needs, without attempting to precisely define it.

The listing of needs at each level given here is intended

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to be indicative or illustrative, not exhaustive. Further exploration and questioning will no doubt clarify the general or common human needs at each level, and in addition there will be many specific needs existing in particular situations, locations and times.

Reintegrating a holistic valuation of human needs

If we now take all these groups of needs and bring them together, we can approximate a holistic[2] picture of human needs. Putting together just the needs listed above, the picture looks like this: As human beings our needs include: material requirements such as tools, clothes, and infrastructure for functions such as transport and shelter; a viable biosphere to provide ongoing life support, and food composed of complex organic compounds; social contact, social organization, social reciprocity, membership of family groups, and emotional relationships; education and justice, intellectual development, and aesthetic satisfaction; and freedom of self-realization and self-actualization, in free response to the mystery of creation.

In bringing together this holistic picture we are no longer trying to define or value these needs in terms of each other. In particular we are not trying to explain the higher ones in terms of the lower ones. Our aim is not to explain, but to harmonize functioning wholes, which requires appreciation of the qualities of the functioning whole and the needs related to them. This means developing the ability to perceive and value all the attributes. The quality of being fully human will only be possible if all the qualities of being human are recognized, and the needs related to them are valued equally and fully met.

We now have the necessary starting point for achieving whole system sustainability, a procedure for identifying and valuing our full range of needs as human beings. The next step is to consider how we might make use of this to meet those needs in the practical context of the world, bearing in mind that the existing pattern of the whole is increasingly disrupted, as described earlier. A more precise definition of the disruption would be that the world as a whole is no longer able to self-regulate in a manner that will meet human needs indefinitely. We are overshooting planetary limits, and the risk for us is that if we push the overshoot too far, the biospheric system may crash or instead self-regulate by sweeping us out of the picture – this is the "revenge of Gaia" scenario[3]. What we are looking for therefore is a process that enables human beings to relate to the whole system of the world in such a way that it can self-regulate and indefinitely meet (or allow us to provide for) human needs as it does so.

Towards a comprehensive design process for sustainability

As individual human beings, we look to our surroundings to meet many of our needs. Our need for clean air is met by the functioning of the biosphere, while our need for human contact is met through our association with other human beings. At an earlier stage of human history our needs were directly met through the natural functioning of the larger ecosystem in which we live, just as with animals living in their natural habitat. As human societies developed, we created increasingly specialised economic and technological systems for meeting our needs – and the needs of some at the expense of others – and these operated inside and depended on the global set of natural ecosystems.

These human technology-based sub-systems, which could be classed as "ecostructures," along with beavers' dams and spiders' webs[4], were developed without special thought about the functioning of the natural global ecosystem, because, as already discussed, in the early stages of industrial growth this kind of thinking simply wasn't necessary. At our current stage, however, industry has grown to span the planet, and involves physical flows of material that are as large as the flows of material within the natural global ecosystem. It is now essential that we do address the impact we have on the whole context within which we operate – the natural global ecosystem or what is technically termed the planetary biogeochemical system.

To keep the planet habitable we must now aim not only for our own human well-being but also the well-being of the whole system of which we are a part.

The "pathology of the whole" is a disturbance of the entire biosphere, as well as being the social issue described in *The Trap*. Life of some kind will no doubt survive the present period despite our environmental depredations, but we as a species are far more fragile than life in general. Our practical concern as human beings is that the planet remains habitable for us, and for the highly developed ecosystems that support us, and that something close to our current civilization can continue. It is certainly not in our interest for the planetary eco-climatic conditions to break down. If Gaia "strikes back" by moving beyond the range we can tolerate, we will be in serious trouble.

In principle continuity should be possible, for several reasons. One is that we can now make adequate material provision for everyone because our technological capability allows us to overcome the material scarcity that existed before. Basic resources are still unequally accessible only because social belief and politics are lagging behind our actual capability. The social and psychological work of overcoming our outdated and now dangerous belief in fundamental scarcity is one of the most important tasks of the present century. The brunt of this task is now to master collectively the emotions of fear and greed that are fed by the belief in scarcity and that drive much dysfunctional political and corporate decision-making.

A second reason is that we now have a great deal of scientific knowledge about how the world works and how our own technological activities have an impact. If we design ingeniously it is entirely within our ability to configure our applied technologies to coexist respectfully with the natural processes of the biosphere.

To keep the planet habitable we must now aim not only for our own human well-being but also the well-being of the whole system of which we are a part. This aim will mean finding ways of meeting our needs that are in line with three principles: first, that the meeting of any one need does not compromise the meeting of any other need; second, that the meeting of any one person's needs does not compromise the meeting of any other person's needs; and third (implied by the first) that the meeting of human needs in general does not compromise any of the attributes of the world – such as a functioning biosphere – that enable our needs to be met.

A further reason is that the world actually or potentially contains everything we need. The reason we are able to meet our needs at all is because there are matching attributes in the world around us. If we recognize our needs fully and place an equal value on meeting them all, we will be obliged to look after all the corresponding aspects of the world as a whole. If we can avoid putting all our stress on one set of needs – as we have been doing – we should be able to develop processes for meeting our needs that will also bring the world into balance.

The steps in doing this are first that we develop a holistic sense of our own needs, and second that we design integrated systems that meet our needs and at the same time form part of the balance and functioning of the whole. This is essentially how the natural ecosystem as a whole is already organized, so we could say that we are looking for an ecosystemic form of organization for human life within the planetary ecosystem. By analogy with computer operating systems, we could think of this as an "ecosystemic operating system."

Ecosystems in general are systems that meet the needs of their participants (of whatever species) through mutual interaction and reciprocity. The first part of the word "ecosystem" is derived from the Greek word for household, *oikos*. The idea behind the word is of a system whereby the household runs. So, without going too far from its biological sense, we could think of the word "ecosystem" as representing a "home-locality needs-meeting system." The various human needs-meeting subsystems could then be thought of as subsidiary ecosystems within the natural global ecosystem. Using the word "ecosystem" signifies that these systems can meet needs and also interact cooperatively with the overall global ecosystem.

The process of designing these ecosystems would start with an appraisal of human needs in a given location. The

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same basic needs exist everywhere, but the specifics differ in each locality and community, and for each organization in meeting the needs of its members and those it serves. Every group, community or organization applying this approach would need to carry out its own detailed needs inventory at its own scale of operation and at each need level (as described earlier). The process would consist of a subjective appraisal of needs by a group of participating co-designers. It would need to be open and participatory, to ensure the input of everyone involved, both in terms of perspective and local knowledge. Examples of comparable protocols would be participatory rural appraisal (PRA), "consensus design" in architecture as developed by Christopher Day[5], and the emerging "science of qualities" being pioneered by the biologist Brian Goodwin[6].

A locally-relevant needs-meeting system – a local ecosystem – would then be designed and developed for meeting each group of needs (the rationale for a local focus is discussed below). Material-level needs (level -3) would be met by an industrial ecosystem[7]; life-support needs (level -2) by a bio-agricultural ecosystem; social needs (level -1) by a social reciprocity ecosystem; and human-level needs (level 0) by a human development ecosystem. (The ability to pursue needs at the more elusive +1 level would be assured by constitutional freedom of individual religious and spiritual inquiry and practice, always operating within the criteria of non-interference with the meeting of other human needs.)

The design of each ecosystem would require expertise relevant to that need area. Because of the diversity of knowledge required – including economics, engineering, ecology, agriculture, social science, governance and law – there would have to be a specialized ecosystem design team working at each need level.

The design of these ecosystems would use and synthesize the existing range of human knowledge. They would mesh with each other so that the functioning of one ecosystem would not compromise the functioning of any other (through an emphasis on design ingenuity rather than trade-off). They would also mesh with the larger surrounding or adjacent ecosystems of each type. And they would mesh with the local and larger-scale natural ecosystems by having features that would sustain and restore natural ecosystems rather than merely exploiting or degrading them. Protocols such as *The Natural Step*, a Swedish sustainability method, would provide the design criteria for eco-compatibility.

The combination or meshing of the four types of ecosystem would be achieved by a design synthesis of industrial ecosystems, bio-agricultural ecosystems, social reciprocity ecosystems and human development ecosystems, coming together into a general socio-economic and governance system that is itself nested in and compatible with local and global natural ecosystems. These combined ecosystems could then be called "general ecosystems." General ecosystems would be defined as integrated systems that provide the essential needs of a human group, community or organization in a locally comprehensive, autonomously-directed, and ecologically sound way.

The focus on localness does not imply that everything would be restricted to local scale, merely that locally-scaled general ecosystems would be the basic building bricks or "cells" of the larger system. The economy and society as a whole would be structured as a mosaic of these cellular sub-systems, which would be the primary units of organization. These cells would be communities organized to meet the full range of human needs locally, not in a quest for self-sufficiency, but simply to ensure that all the needs are indeed met, an important distinction. An element of self-sufficiency would be needed for this, but most cells would also specialize in activities or production that could be exported to other cells, while importing other specialized offerings – somewhat like the role of organs in the body.

Successful general ecosystem cells would not simply grow in size by "scaling" like growing businesses. As cellular sub-systems they would spread by replication, not by gigantism, through independent re-creation of the entire ecosystemic cell. If a particular general ecosystem design proved successful, other communities could reproduce

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it. Expansion by whole system replication while keeping the cell size small would be vital to preserve the essential feature of the general ecosystem – its ability to meet the full range of human needs by organizing locally. At larger size scales – eco-regional, national and supra-national – the society and economy would be a patchwork of similar and dissimilar but complementary ecosystemic cells linked by mutual trade.

Part of the rationale for the primacy of local scale is that a variety of factors and trends indicate that future economic and social relocalization might be both desirable and feasible. This can be seen on a variety of fronts. Socially, relatively small groups form the primary unit of structure. For example, cross-cultural studies in sociology and anthropology indicate that the maximum size of a genuine social network such as a village is about 150 members, and is known as the "Rule of 150" or Dunbar's Number. This number may be related to the average human ability to recognize people and keep track of emotional information about all members of a group. Agriculturally, if basic foods are grown locally they are fresh and seasonal, with corresponding ecological and health benefits. Industrially, in spite of the well-known economy of scale concept, recent thinking about flexible demand-led "lean" manufacturing leads to smaller plants close to consumers, rather than huge centralized plants at a distance. Technological developments are also leaning in this direction, as production equipment becomes smaller and more flexible. Various economies of scale still exist, but the viable scale of manufacturing is progressively reducing in size as technology advances. In economics, the success of industrial clusters also emphasizes the value of local scale. Politically too, the smooth functioning of democratic systems depends on the vitality of local political engagement.

The exact size or scale implied by "local" is suggested by these factors but not precisely defined. A balance would need to be struck between a scale small enough for certain kinds of human interrelatedness, and large enough for certain activities to have a minimum viable size. A working definition of local could be expressed in, say, numbers of people, geographic area, or travel time, but these factors all interrelate and change over time. Historical analysis of human settlements shows that their average radius has been roughly equal to the distance that could be traveled in half an hour by the prevailing transport technology. As transport speed has increased, so has the population size of towns and cities, so they no longer offer a good social definition of local. Their ecological footprint has also vastly expanded. This scale problem inspired the "new urbanism movement," an urban planning initiative that designs village-like urban layouts clustered round rapid transit stations. The concept of general ecosystems goes beyond this, potentially being something like a localized integration of village-like urban form, economically independent production clusters, closed-loop recycling, ecologically balanced food production, intimate social scale, and civic self-governance.

The ultimate benchmark for the scale of locally-focused socio-economic organization is the individual's experience of how human needs are met. Imagine a child growing up in a community organized as a general ecosystem. Because the system would meet all the fundamental needs of the people in the community, the child would experience a high quality of life. He or she would be able to see directly, as part of everyday experience, how the entire system worked and was operated by people belonging to the community. Much of the child's education would involve witnessing how all the important parts of the system were designed, created, interrelated and maintained. This would be much more likely to foster a feeling of personal involvement and responsibility, ecological awareness, economic autonomy, local political self-determination, and give a comprehensive insight into the way the world works. In these terms, local might be both justified and defined as whatever scale of general ecosystem allowed a child to have this kind of experience growing up.

In pre-industrial times, most children grew up on farms or in small towns and villages, where they would

Building on a way of revalidating the full range of human needs, the general ecosystem concept is a possible framework for organizing society to meet human needs in full.

directly witness how things were made, how food was grown, how social order emerges among animals, and what distinguishes humans. However, they may not have experienced a high level of social justice and mobility, or the freedom to develop themselves. The modern era has made great headway towards these things, but at the cost for most people of any comprehensive sense of how the world as a whole works, and with a loss of any real sense of participation and responsibility. Some form of general ecosystemic organization might therefore be the key characteristic of a future "trans-modern era" that would combine the benefits of modernity with a restored sense of direct personal participation and the security of belonging to a coherent community.

These speculative thoughts about general ecosystems are intended as an exploration of future possibilities rather than a prediction of the future. Building on a way of revalidating the full range of human needs, the general ecosystem concept is a possible framework for organizing society to meet human needs in full.

In conclusion

We live in a world in which most needs of most people in most places are not fully met. The forces of modernity that shaped our world have given us unrivalled power to meet human needs, yet the shortfall persists and the general situation becomes steadily more chaotic.

We try to solve our increasingly complex problems by throwing more money at them to deploy more physical resources. Our over-emphasis on the physical often actually crowds out and reduces our ability to meet other needs. Ever more money is soaked up and the problems remain. Despite our vastly increased technological capabilities we have a growing "problem of the whole" that we do not know how to address.

Before the industrial era we did not have to worry about this. The "pattern of the whole" was simply inherited from the historical past. Social and economic relationships, and the relationship of humans to their natural environment, were not things that anyone consciously thought out. The roots of these things had arisen in the immemorial past, and most people regarded them as God-given, along with nature itself.

In the modern period scientific knowledge and technology expanded into the old unconsciously shaped world and progressively cut away its moorings. We now urgently need to respond to the growing chaos of the whole with a consciously determined repatterning, but we have no obvious pattern to follow. We have a greatly expanded view of human agency, and a repertoire of sophisticated and powerful tools. But we lack an organizing pattern that combines our scientific knowledge with wisdom about our place in the whole.

In order to resolve this impasse, it is useful to heed the admonition attributed to Albert Einstein: "We cannot solve our problems with the same thinking we used when we created them." The mode of thinking primarily responsible for creating our current predicament is the application of reductionism as a means of generating knowledge. Although successful in many ways, it has had the unwanted effect of gradually reducing our picture of human beings, changing how we value ourselves and others.

The corrective response suggested here centers on a revaluation of human beings and a corresponding reintegration of human needs. It builds on this to propose a simple but comprehensive pattern of organization that has the potential to provide a new fundamental framework for achieving socio-economic continuity and ecological sustainability.

The pattern of the whole for which we search is the same as the pattern of ourselves. Once we recognize our needs fully and place an equal value on meeting them all, we will be obliged to look after all the corresponding aspects of the world as a whole, which actually or potentially contains everything we need.

The message of *The Trap* was that our reductionist model of human beings has created a cage for human beings in modern society. Our release now depends on rediscovering

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a way to value the wholeness of being human and learning to apply it in our relationship with the world.

Notes

1 http://video.google.com/videoplay?docid=8372545413887273321

2 It would be more appropriate to refer to this as "holonocentric," a word coined by systems theorist Richard Bawden, after Arthur Koestler's concept of the "holon." Holons are systems nested within larger systems. Each holon is both a whole and a part of a whole. Holistic implies "whole centred" whereas "holonocentric" implies "centred on wholes that are part of larger wholes," which is more apt.

3 James Lovelock, *The Revenge of Gaia*. Allen Lane, 2006.

4 Hardin Tibbs, "Humane Ecostructure" *Whole Earth Review* 1998.

5 Christopher Day, *Consensus Design*. Architectural Press, 2003.

6 Brian Goodwin, *Nature's Due*. Floris Books, 2007.

7 Hardin Tibbs, *Industrial Ecology: A New Agenda for Industry*. ADL 1991.

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