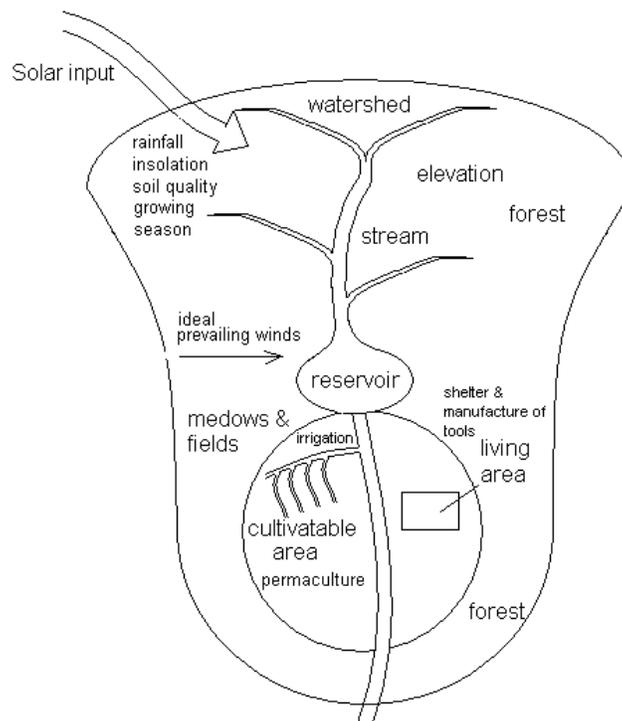


What is a Sustainable Living Situation for Future Humans? Part 2

Two days ago, I put up [Part 1](#) of this post by George Mobus, and this is Part 2. You will remember that George is looking forward to some time in the future. At that time, there seem to be a much smaller number of people on earth. In Part 1, George tells us how generally he sees a sustainable living pattern—in communities of about 500 people, located in areas where the climate is favorable, and that soils are favorable, and there is a diversity of plant and animal life. His base case is a low tech society. In this segment, he tells us more about how he would envision such a new society to be organized. His original post on [Question Everything](#) can be found [here](#).

The Layout

This figure summarizes some of the above considerations for the conditions needed to support a small society sustainably. It represents what amounts to necessary and sufficient conditions for life that provides opportunities for all members of the community to achieve self-actualization (and meet all of the lower needs) and is sustainable for an indefinite period (until the environment shifts so badly as to make life difficult or invaders arrive).



That is, life will be sustainable as long as the population is maintained at the relatively constant average of, say, 500 individuals. This is the most difficult condition. We humans, as constituted, are not very good at exercising controls over our sexual and, hence, reproductive urges. And unless we were to learn to do so, this potential for long-term sustainability will remain elusive.

Primitive (but more “advanced”) Technologies

By primitive I mean that the principles come from very ancient times. That does not mean that the technologies have to be primitive in form, they may be updated in realization based on our more advanced knowledge. For example, I indicate in the figure that there is a built reservoir of water by assuming that a dam structure has been built downstream from a more elevated watershed. We know a lot about effective dam building these days. We also know how to use materials more effectively. I suspect that a very effective dam could be built to contain a reservoir of water for many purposes, including running water in the homes and “factories”, perhaps even flushing toilets!

One of the earliest technologies of agriculture was water management, not just the irrigation canals themselves, but the organization of how they should be laid out, constructed, and maintained. Management is a form of technology, *knowledge* as technology. We know a lot about what needs to be done and how to do it, even without fossil fuels. Much of this knowledge is currently being implemented in developing countries to boost agricultural output.

Similarly we know a huge amount today about how to design a village of living quarters, shops, factories, and schools — a village. We can borrow a lot from many European and Asian villages. But we know a great deal today about sanitation and public health that could help develop livable communities near enough to all resources that transportation could be accomplished with animal and human resources alone. We know a tremendous amount about building construction and thermodynamics to produce optimal structures from local building materials as long as we are modest in our desires.

Regarding factories, the models are the early 19th century blacksmith shops and weaving factories (with a potter’s wheel thrown in for good measure). It is altogether likely that most of our material goods will need to be manufactured locally from locally obtained raw materials. The situation for blacksmithing is problematic. Where will the metals come from?

Metal is a problem. It is highly unlikely that every tribe will have access to metal ores. It is even unlikely that any tribe will! Therefore, I assume that a certain quantity of metal has been imported at the start from scavenges of metal products left over from our current metal-rich civilization. Metal is not verboten in the base case. But it must be recognized that whatever metal is available to a tribe at the outset pretty much constitutes its total allotment and must be recycled assiduously (more on this later).

The picture I am trying to develop here is one of a civilization not unlike some of our ancestral ones, before fossil fuels, but with the advantage of knowledge (both scientific and practical) that we have developed since those societies existed. We (in the US) may live like our pre-Columbian predecessors (I claim a 1/100 ancestry of Native American blood!) but with a lot of advantages of hard-won scientific knowledge. For example we know about climate shifts and their consequences. We know about soil health and how to maintain it. We know about metals and the principle of leverage in machines. Take the best of the Native American cultures, the pre-Industrial Revolution European cultures, the Asian cultures of wisdom, the ancient civilizations of the Mid-East, etc. and combine them along with modern scientific understanding and you have a formula for good living, in my opinion.

Those people were not unhappy! They may have been unsatisfied in some regards. They were constantly challenged by all sorts of factors from invaders to climate changes. But they lived. They were productive. Were it otherwise we would not be here. We need to learn from their experiences and shape our future based on their successes along with the reality of energy flow declines in our world.

The real trick is to find a satisfying existence with knowledge of what is possible, what is feasible, and what is good for us in the long run. That, unfortunately is a real trick because the majority of humans today are incompetent when it comes to good judgements (see my series on sapience, [Series Index](#), to get my thoughts on why this is so). Ergo, the kind of living situation I have been describing is not necessarily available to the average human today. Ah well, that is perhaps left to a future blog post.

In Harmony With the Ecos

The key will be understanding the Ecos as a system and our place in it. This is not easy. We have a heritage of belief that we humans have somehow transcended ordinary physics and biology. This is deeply engrained within our psyches and so it won't be easy to expunge. But it is essential to do so for there to be any future for something we would recognize as humanity.

How should we think about so-called “advanced technology” and its role in our societies in post-fossil fuel powering of our future? Consider the village described above. What would it take to support something like hydroelectric power? Clearly, if the society in this scenario has built a dam they have the potential to include hydroelectric generation. Say, for example, that such a community, before the rest of civilization broke down, had the presence of mind to install a small hydro-driven turbine and generator. Then after civilization collapsed how would they maintain the generator and replace it when it finally gave up the ghost? They would have to have some capacity for metallurgy, for shaping and forming metals, for constructing other electric components, etc. A blacksmith shop is not going to fill the bill.

This raises the main problem with keeping an extrasomatic technology going after fossil fuels are no longer available. Rebuilding a hydro-turbine and generator (not to mention the general infrastructure for distribution) at some future time is not a trivial problem. We might be able to preserve the knowledge of how to do it, but keeping the capabilities for doing so is another thing. Such capabilities will require maintaining metallurgics that are, themselves, complex and need dedicated skills and facilities. What are the possibilities for having more advanced technologies?

Technology

Here we meet the real conundrum for humanity. We have defined ourselves in terms of our capacity to solve problems with ever increasing technologies. For the majority of our existence this has been our experience and has come to represent our deepest beliefs about ourselves. Unfortunately, this belief is based on something entirely different from our cleverness at the root. We have been the unsuspecting recipients of the benefits of the increasing flow of high powered energy from fossil fuels. We are beneficiaries of expanding energy flow, not from some magical ability to conquer the universe with cleverness. But being basically self-indulgent beings, we told ourselves the story of progress based on our own superior intelligence. We were kind of dumb as it turns out.

What technology is possible with no real extrasomatic energies than water power and solar energy? That is a real problem for us. Suppose we were to introduce wind power into our model community. Suppose that we install wind turbines that can take advantage of the prevailing winds (see figure). Suppose we install electricity distribution infrastructure (based on DC current to be very efficient). How will our community produce the needed materials for repairs of those generators (and

turbines)? More importantly, how will they provide for replacements? That is the crux of technological capabilities. It requires energy flux to support maintenance and replacement. If our model society were to install a hydroelectric generator how would it maintain and replace it when the time came, as it would? The support for technology requires high powered energy flows. That is what we have enjoyed for most of humanity's experience. But that is not what we are going to have in the near future.

Preserving Knowledge

The fact that it might be impossible for future societies as conceived above to actually take advantage of technology as it has been developed by modern high-energy society doesn't mean that such technological knowledge is worthless for all time. In fact, one of the critical purposes of society after the decline and loss of fossil fuels will be to preserve knowledge of what is possible with high through-put energy fluxes. We have fought hard to acquire this knowledge and I don't want to believe it was in vain.

The world of humanity is a history of advancement and decline. Golden ages followed by Dark Ages in which some seed of enlightenment was preserved by diligence. I hope the future will have that same characteristic. Those of us who see what needs to be done in terms of preserving some kind of civilized culture (even if not high tech in nature) have a duty to future generations of what I think will be a more sapient form of humanity. We need to transmit knowledge that was gained by our kind. Even if life seemingly devolves to more primitive social forms we need to fulfill the role of the monks in the Dark Ages, faithfully copying the understanding of this age to some future eusapient generation able to pick up where we left off, but without the weaknesses that we have displayed. Let's prepare and hope.

More Complex Societies and the Future of Mankind

It is nearly certain that the time of complex societies is at an end, at least for a long time into the future. Until there is some form of energy flux that can replace fossil fuels in such a way as to replace the high power and support a technologically advanced civilization again, I think we should have the wisdom to accept simpler and more sustainable societies along the lines described above. It is possible that if humans can achieve a more eusapient future and survive the coming challenges, then we might yet produce a high technology civilization, complete with travel to space and the stars and all the dreams that we have given voice to over the last milenium. There is nothing wrong with those dreams. The only problem is with our eagerness to achieve them and the consequent loss of understanding of what it takes to do so. There are energies that

we, as a species, have yet to tap into. The universe is still full of promise. But all things in their own time and ways. It is not yet our genus' time. We have lessons yet to learn. If we succeed the future species evolved from our seed may yet reach the stars.

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