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TECHNOLOGY AND SUSTAINABILITY: CHANGING OUR PERSPECTIVE

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From the evidence of our senses to the evidence provided by our science, we know our current global society is unsustainable. We also know that technology is at least partly responsible for our predicament, just as it will be part of whatever future we face.

Neither denial nor despair is an appropriate response to the situation. At such a critical juncture, however, we cannot afford to make poor decisions about the technology we develop and use. If we do not understand what has gone wrong and why up to this point, we risk undermining the decisions we make in our attempt to create “the world we want.”

We know a sustainable future requires changes in how we all live, regardless of where we are or in whatever circumstance. To make the necessary changes, wisely and in time, however, first requires us to change our perspective on technology itself.

This paper outlines that change in perspective and how technology, values and civil society are inevitably intertwined in shaping whatever world in which we will live beyond 2015.

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Perspective is the observed, spatial relation between things. If we change our perspective, it is the spatial relationship between those things that changes, not the things themselves.

A different perspective on technology leads to new possibilities for sustainable development because it changes the relationships among our problems, tools and solutions.

That shift in perspective, very simply, comes from understanding that technology is in our heads, not merely in our hands.

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Contrary to popular understanding, technology is the knowledge that lies behind the tools, not just the tools themselves.¹ Technology is instrumental knowledge and its practice – knowledge we use (or could use) to do something.

Technology is therefore always the product of choices. We make choices for reasons and those reasons reflect what we think is important – our values. Technology is never neutral or inevitable. It is always within our control, because it is always the result of the choices that people make. Some have more opportunity to choose than others, but collectively, we are determining our future by the choices we make about the technology we develop and use.

Accept this shift in perspective and it leads to a series of realizations about making choices toward a sustainable future. It makes the world we want into a possibility, not merely a dream, and places responsibility for making better choices squarely upon us both as individuals and as members of society.

This shift in perspective -- realizing that technology is in our heads, not our hands -- also necessarily links technology, ethics and sustainability. If technology is the product of choices, ethics becomes the nexus between technology and sustainability.

Sustainability is not primarily a scientific or technological problem. It is a social and cultural problem as well. We have the necessary tools, we know what must be done -- but we simply don't do it.

There are always good political or economic reasons for continuing on a globally unsustainable course, but such indecision reflects a problem of perspective. We find ourselves, in effect, saying we would like to have sustainable future but we can't afford it. Or that we would like to have a sustainable future, but everyone else except us needs to change how they live.

To paraphrase Shakespeare, the fault is not in our stars, nor in our tools, but in ourselves.² We can have a sustainable future, but only if we choose it – deliberately, intentionally and right away. While we cannot change the physical parameters of the problems we face, the possibilities for their solution change with a shift in our perspective.

There are two facets to the problem of the unsustainable global society in which we now live:

First, too many people make daily decisions without thinking – enough, or at all – about their own choices. Whether they need more information or need to be shown how to understand it, the decisions they make are more by reflex or habit.

Ask a group of people how many of them have made an ethical choice to this point in the day and you will likely be greeted by puzzled silence. That silence explains how even intelligent, educated, thoughtful and compassionate people can consistently make foolish decisions – they are not aware of the choices they are making.

Every day we decide what to eat and drink; what to wear; how to travel; and what to do. For most people there are options in each of these categories and so they make choices, for better or worse, every day. Some people think about their options and so have reasons for the choices they make; far too many do not.

If morality is what people believe is good or bad, then ethics is what they do about it. Good decisions, made intentionally, can be repeated; good decisions, made unconsciously, are only repeated by accident.



We are thus embedded in a cloud of the largely unconscious ethical choices that we make, individually and collectively, every day. These daily choices are necessary and inevitable, but we can no longer afford to make good choices only by accident. We should be able to give reasons for our decisions and thus be responsible for the choices we make.

Second, they are often making those decisions about something they don't really understand: technology.

To say we do not collectively understand the technology we choose and use may seem an extraordinary statement, yet it is nonetheless accurate.

Ask an average person to define or describe "technology," and the response will involve something mechanical or electronic, devices (likely recent) intended to make life or work "easier." It will probably involve science and gives the impression that new is better than old.

What is more, people would say Technology is proliferating in our generation. Simply put, people are under the impression that there is far more technology today than ever before, a symptom of a rapidly changing world.

Usually there is also a cautionary note, an underlying feeling that Technology has become autonomous, with a mind of its own, and that it could just as easily harm us as it could help us in the longer term.

However common these ideas might be – and you should check them against your own – they are incomplete. They are the result of a perspective on technology that has been generated in Western culture since the Scientific Revolution of the seventeenth century and which has gained particular power since the Industrial Revolutions of the eighteenth and nineteenth centuries.³

In the Age of Steam, the idea that "Knowledge is Power" rapidly became "knowledge of Technology is Power," as everywhere steam-powered industry and transportation transformed the globe. Technology became understood primarily as mechanism, as the metaphor of the Machine in Civilization morphed into "the Machine Civilization" by the 1920s and 1930s.

By extension from the models of industrial production, society and culture have increasingly been perceived in mechanical terms over the past 150 years. So we discuss inputs, outputs, efficiencies of operation, costs of production and distribution; we have valued the metrics of quantity over any qualitative assessments (like "happiness," for example). We have also been able to attach economic markers to these metrical assessments, as a means of establishing a common measure for measuring things the same way around the globe. A key criterion for determining the success of the Millennium Development Goals (MDGs), for example, was our ability to measure the progress made toward them.

As critics have point out in recent years, however, our economic cost accounting of the technologies we develop and use is inadequate unless it also includes the use of "natural capital" in the cost of production. Nor is there any life-cycle accounting that measures not only the cost of production but also the cost of use and disposal. Even worse, organic and ecological systems are far too complex and dynamic to be reduced to any set of calculations we can manipulate. In a world swirling with the complexities of climate change, we cannot even accurately predict what the weather will be like tomorrow.

In the context of sustainability, therefore, we are either not measuring what matters or we are measuring things that paralyze our ability to change the unsustainable direction in which we are travelling. Sustainable development thus becomes an oxymoron, not a set of goals, and



“the world we want” turns into fantasy. Even where claims of “progress” are made, it seems too often to be the result of selective metrics, choosing to see only what supports the conclusion and not the larger, unsustainable system over which we fear we have little or no control.

Realizing that Technology is in our heads, not in our hands, however, and that all of our systems – technological, economic and political – are the product of the choices we make and not some necessity of nature, changes everything.

This shift in our perspective on Technology allows us to take seemingly insoluble problems and intransigent situations and instead to create new opportunities for their resolution.

For example, if our civilization is not the pinnacle of some evolutionary process⁴ but the result of specific developments in society and culture, then we have a much narrower historical focus for discovering where and how inappropriate or unsustainable choices have been made – and by whom. We can also replace the language of inevitable “Progress” (over which we have little personal control) with more helpful conversation about difference and change and how these may be managed toward a sustainable future.

If all technological systems are the product of choices made by people, then whatever problems might arise are problems in system design that may be corrected.

A shift in perspective thus leads to the realization that problems are urgent, but not insoluble; delays make it harder to solve problems, but not impossible. It also enables a pragmatic approach to sustainable development that allows for the creativity of new solutions, provided those in charge of making social decisions about sustainability are willing to search these solutions out, wherever they might to be found.

I suggest there are at least five main implications for sustainability of this shift in our perspective on technology:

1. Technology is not new. It is as old as thinking humans.

Consider a rock, picked up by some prehistoric human ancestor and thrown in self-defense at a carnivore. Though helpless victims at first, realizing that a rock could be many things was at the heart of the origins and development of human culture. Grind one rock against another, and grain could be turned into flour and then cooked on another rock, heated for the purpose – and so agriculture became a good idea.

Tie the rock to a stick, and it became a hammer, a weapon, a tool – for making things as well as for hunting large prehistoric animals to extinction. Stacked together, it became a building, a chimney, a wall, a bridge. Bang two rocks together to create music; grind up some other rocks into powder and then paint on a rock wall -- and create art.

The rock is all of these things and more – the only limit to what purpose it may be put is the inventiveness of the human brain that uses that rock in a particular way at any point in time.

We can never live in a world without technology. It is what makes us human. The only choice we have, therefore, is not *whether* we use Technology, but *what kinds* of Technology we should use. This turns sustainable development from an oxymoron into a problem in system design, requiring us to use our most important tool – the one between our ears – to solve it. Humans have thrived by being creative and inventive – we need to apply these abilities more effectively in designing with nature rather than against it.



2. Technology does not exist by itself. Every object of technology is part of a technological system.

There is no such thing as an independent piece of technology. It is always embedded in a system or systems, not just mechanical ones, but also systems of use. Those systems of use involve knowledge gained, usually by trial and error, back to the start of human culture. Basic systems relating to agriculture, cooking, medicine, conflict, and religion, for example, are rooted in local, communal knowledge that was passed down through generations long before anything was ever written down.

Every community therefore has its own “traditional knowledge” – it just depends on how long that “tradition” has been embedded in a community and for what reasons. The usefulness of any particular knowledge within our systems of technology becomes our standard for judging whether it belongs or not – and whether it should continue.

Understanding the nature of technological systems allows us to leverage the effects of any change we make and to recognize why other unsustainable effects have happened so that they may be avoided in the future. Excusing poor outcomes by talking about “unintended consequences” is an unacceptable response to failures in predicting the effects of technological decisions on natural or human systems.

If sustainability is effectively a system design problem, then we need to design technological systems that meet “the needs of the present without compromising the ability of future generations to meet their own needs.”⁵ This will not be an easy task, but it is far from impossible, judging from what humans have accomplished to date.

3. Every civilization has the technology it needs to survive. Otherwise, it doesn't.

The more we learn about past civilizations, the more incredible they become – full of achievements in technology that would be difficult or impossible for us to match today.

For all the speculations about why civilizations fail, there is a simpler answer: they failed because they stopped making the right choices about the technology they developed and used. Societies survive as long as the individuals within them, on balance, continue to make smart choices. When they stop, the civilization collapses.

The sobering realization here is that we are not exempt from this same scenario. On balance, as long as we make smart choices, we will survive. When we stop making smart choices, as individuals and as groups, then we will not survive. Nor will our civilization.

We need to set the outcomes of our technological choices against the lessons we can learn from history, which is full of stark illustrations that survival is not so much about having the right tools, but making the right decisions about what to do with them. We are not as special as we sometimes seem to think.



4. Technology must be appropriate to the situation or context in which it is being used and for the purpose intended. New is not better than old; recent is not better than traditional; Western is not better than Eastern – technology must be appropriate to the task, in the time and place where it is used.

In a global society, we have many choices. Wisdom lies in knowing which tools to use, where, how, when – and why.

Sometimes this may mean using the newest example of high tech gadgets; other times, it may mean using a rock the same way as it has been used for thousands of years.

What guides the choice is the purpose for which the technology is being used, what is accomplished by using it to do something. Some of the most powerful tools in working toward sustainable development will be the ones that combine practical knowledge gained by indigenous people over thousands of years with the latest research in science. This can only happen in an environment of respect for all the technological knowledge that is contributed, from all sides, where people are focused on achieving a common goal.

One of the unfortunate consequences of globalization is the presumption that technologies have equivalent effects regardless of where they are used. If technologies are considered to be systems, not items, then it is obvious that the interactions of technological with ecological, social and cultural systems will not be the same in every location. Appropriate technology is local and contextual. What may be the right tool to use in one place may be the wrong one to use somewhere else. One size NEVER fits all.

Just because the necessary technology exists, moreover, it may not be available at the time and place where it is needed. As well, other system limitations (social, economic, political, cultural) may mean that different solutions to problems in sustainable development need to be adapted to local circumstances to accomplish equivalent results.

5. Technology is not only expressed in systems, but those systems are inextricably related to ecological, social and cultural systems. These systems are dynamic, not static; they embody a complex web of relationships, not simple, linear and mechanical connections.

In the 21st century, all ecology is social ecology; it is impossible to consider environmental issues or ecological systems independent of human affairs. Efforts to understand earth systems from a purely scientific perspective that do not include human-ecological interactions are inherently flawed and will lead nowhere.

This is the most important implication of a shift in our perspective on technology. Sustainability is a systems problem, but especially a problem of interrelated systems. While most people involved in sustainable development would accept this intellectually, at a practical level our tools too often seem to be drawn from an inventory of simple, linear and mechanical options.



Constructing simple causal chains of events, understanding decisions largely from a consequentialist perspective, or predicting on the basis of inadequate data, may do more harm in the longer term than doing nothing at all. There are too many variables and even more unknowns in any local situation. This makes our interventions successful only by accident, not by design, and impossible to extrapolate to larger contexts, much less a global one.

This reality forces us to apply principles, not merely to make decisions based on weighing the potential consequences of one action off against another. Those principles are reflections of the values we hold as individuals and as a society, what we consider to be important. Decisions about the development and use of any aspect of technology entail the effective ranking of our values and priorities – what matters most is what leads the list of values embedded in the technological systems we choose.

For example, to stabilize global climate requires a major reduction in greenhouse gas emissions, most of which are generated in the developed world. Turning off the machines might be the obvious answer, but in view of the social and cultural systems involved, it is neither practical nor helpful to suggest it.

Rather than merely saying “stop,” however, which is bound to generate resistance, we need to think collectively about the values behind the choices that have led to current technologies. Re-rank those values and you change both the reasons for making certain choices and then the choices themselves. Humanity is smarter than we tend to think – there are answers, but only if wisdom from all corners is encouraged and collected.

From a design standpoint, our cities are inefficiently arranged, our transportation systems are inadequate and both our living and working conditions waste rather than conserve energy. Consider this a local design problem, not just of energy efficiency but of how people could live together, and allow the principles based on the shared values in a particular community to shape in a pragmatic way the changes that need to be made to create their own bright green city of the future.

Change that is not driven by reasons and by the realization of shared values behind those reasons simply will not be successful in the long run.

That discussion of values, reflecting the collection of wisdom from all corners of the planet, brings civil society into the decision-making process toward a sustainable future. Civil society is one way of identifying all those affected by the decisions that governments make, whether they are part of the official decision-making process or not. It is not enough to focus on expert opinions as to what should be done, because, in the end, expert opinion will always be swamped by what the general population is able to understand of the story they are told.

Governments may make the right decisions, but unless the general population not only trusts their government but understands why these decisions are the right ones, the implementation process will fail. Good governance, moreover, realizes that given the complexity of the social and cultural systems involved, local wisdom should be part of the process that determines what needs to be done.

After all, we are dealing with a web of relations, each of which will have an effect on all of the others. None of us is alone, nor are any of us independent of the needs of others, no matter who we are or where we live.



Our technological choices are either our tools for creating change toward a sustainable future or obstacles intending to prevent it. Appropriate technology is the kind that will enable us to build “the world we want,” not the kind that merely continues the world we have.

But does what we choose, every day, as individuals make any difference, one way or another?

I would argue that it does. The problems of a globally unsustainable society were created one plastic bottle at a time, for example, by the actions of individuals whose personal values were unsustainable. Multiply these unsustainable choices by billions of people over the past 150 years or more and you create the world we have.

For “the world we want,” sustainable choices need to be made, every day – and they need to be multiplied, deliberately and intentionally, by the billions of people whose future is otherwise at risk.

One of the lessons of history is that no significant event, for good or ill, has ever begun as the result of the actions of a group. It has always the result of one person, making a choice for reasons that reflect the values he or she believes to be important.

If we believe a sustainable future to be important for ourselves, for our children, and for all the children of earth, then the values needed to create that future must be reflected in the reasons for the things – and the technologies – we choose.

We share a common heritage and a common challenge, wherever we live and in whatever circumstance – to live intentionally, deliberately and thoughtfully, respecting all our relations with other people and with the Earth.

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- 1 This argument is developed at length in *Technology and Sustainability: Choosing the Future* (Rocky Mountain Books, 2014). Academic efforts to define and explain the nature of technology are often at odds with the popular attitude toward it – and it is unfortunately that attitude which drives unsustainable decisions.
- 2 “Men at some times are masters of their fate: The fault, dear Brutus, is not in our stars but in ourselves, that we are underlings.” *Julius Caesar*, 1.2
- 3 While this conclusion is generally accepted by scholars in science and technology studies (STS), the implications of the mechanical metaphor in the historical trajectory of the development of industrial society, beginning in the West and then spreading around the world, are developed at length in *Gift Ecology: Reimagining a Sustainable World* (Rocky Mountain Books, 2012).
- 4 Kevin Kelly, *What Technology Wants* (Penguin, 2010)
- 5 World Commission on Environment and Development (WCED). *Our Common Future* (Oxford: Oxford University Press, 1987), 43.

