A Global Forecast for the Next Forty Years

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types of pollution than CO_2, or for that matter any land area for the other creatures with which we share our beautiful planet.

So the human ecological footprint has overshot the carrying capacity of the earth. How is that possible? How long can it last? The current overshoot is possible because the footprint includes the amount of forestland that would have been needed to absorb all the CO_2 that we emit from energy production. This land does not exist, and the CO_2 is not being absorbed fully in tree growth. The rest is accumulating in the atmosphere. Furthermore, the amount of forest needed to do the trick is roughly twice as much as the remaining forest area on planet Earth. As a consequence, we experience a gradual and unsustainable warming of the planet. So overshoot will last until climate change forces us to pare back emissions until what is emitted can be absorbed sustainably by the remaining forest.

As I have stated before, there are only two ways out of overshoot: managed decline or natural collapse. Currently humanity is seeking the first alternative, a planned and orderly program of reductions of greenhouse gas emissions, in time to keep global warming below plus 2°C. But since I do not believe we will act fast enough to achieve this goal, we will get increasing climate damage throughout this century.

When it finally starts to dawn on people and politicians that the world is in planetary overshoot and headed for trouble, there will begin a race to secure one's own future interests. The most visible moves on that front lately have been the Chinese purchases of agricultural land in Africa, and the attempts of Pacific islanders to buy flood-proof land in Australia and New Zealand. Both actions reflect a way of thinking that will become increasingly prevalent over the decades ahead. "Glimpse 6-3: The Race to Lose Last" explores this aspect of the future.

GLIMPSE 6-3

The Race to Lose Last

Mathis Wackernagel

At a private lunch when I recently asked one of the world's highest-ranking international diplomats what, among all the possible scenarios for Pakistan, was the most positive vision she held, everyone around the table laughed nervously.

This diplomat was surprisingly honest. She admitted that she had not one positive vision for Pakistan. She was candid about a view that leaders widely hold but seldom acknowledge: humanity is on a slippery slope of resource depletion. It is unlikely leaders can do anything about it. Hence, their job is to make sure their people will lose last. This means securing for their people enough resources from the globe's diminishing resource pie to ensure that their nation will float even if others sink.

From this vantage point, money shields a population from losing first. Leaders beholden to this view therefore embrace even more vigorously GDP growth as their key objective; the financial advantage will allow their constituency to stay just a bit further ahead of the others in the resource race to 2052.

From a resource perspective, the projections for Pakistan do not look rosy. Their tiny bio-capacity of less than 0.6 global hectares per person (or about one-third of the global average) is facing a rapidly increasing demand.[5] Pakistan's demand already exceeds the country's bio-capacity by 80%. It does not take a mathematical genius to draw the conclusion that with current trends of growing populations and increasing material expectations—in a context of a limited bio-capacity and rising fossil fuel costs—Pakistan will run out of resources well before 2052. Most likely, the lack of bio-capacity will manifest itself through heightened levels of internal conflict. The conflict will come with a high price tag, including a significant drop in the population's longevity. Of course, such decay could have disastrous global ramifications, not least due to Pakistan's nuclear arsenal. By 2052, Pakistan could well be a devolved, failed state, with hundreds of fiefdoms, medieval levels of child mortality, and very low literacy.

Pakistan could of course try to import the needed resources. But in a world of global overshoot—where global demand for bio-capacity exceeds the available biological space—it is unlikely that a financially weak Pakistan could successfully outcompete the economic demands of other countries for those same resources.

But Pakistan could take a different turn. It could publicly recognize the significance of lacking resources for its residents' current and future well-being. It could seek a societal consensus among Pakistanis on how to handle the social implications of tightening physical

constraints. This would be tough—particularly since it would require a totally new vision of development, including a central role for women. But if well done, it would ensure much better and more prosperous living conditions for Pakistanis within the existing ecological and financial limitations.

Unfortunately, Pakistan, like most countries in the world, is unlikely to act in this manner because it is blinded by two misconceptions: first, nothing can be done about the slow but cumulative ecological trends, neither on the demand side nor on the supply side; and second, if anything could be done, it would be too costly, and achievable only through global consensus.

Both misconceptions are paralyzing, and deeply misinformed. Yes, resource trends have an enormous inertia. But they are built on past and present societal choices. Resource consumption is largely driven by population size and the infrastructure already in place—cities, power stations, roads, and airports. By reversing population trends and reshaping infrastructure, the dependence on imported resources can be turned around. But how? Pakistan, or any country, could start to manage its ecological assets as one would run a good family farm.

A good family farm produces more, in net terms, than the farm family consumes. The good farmer has secured enough land to grow crops and support his or her livestock. The extra production beyond the farm family's own consumption can be sold and traded for other goods and services—TVs, clothes, books. Some countries are like good family farms, with more bio-capacity than what it takes, in net terms, to provide for their inhabitants.

Compare this with a weekend hobby farm, with honeybees, a rabbit, and an apple tree, where most resources have to be bought from elsewhere. Presently 80% of the world population lives in countries that are like hobby farms. They consume more, in net terms, than what the ecosystems of their country can regenerate. The rest is imported or derives from unsustainable overuse of local fields and forests.

In fact the world as a whole has become a hobby farm, using 1.4 times what the biosphere can regenerate.[6] The difference between what nature provides and what humanity takes comes from liquidation of natural capital. It is grabbed from future generations, at a very cheap price.

If we looked at the world like good farmers, we would recognize that it is in our interest to look after our farm. We would see the danger in becoming increasingly a hobby farm when there are ever fewer good farms available to provide us with what we need. Countries would know to look after their farms and curb their resource demand in order to be strong and independent—and this would stabilize the global situation as well.

In such a world, we would maximize not the throughput (as suggested by growth in GDP) but our per capita wealth, and we would use the sustainable returns from this wealth to maintain well-being into the future.

Perhaps the wisdom will come once resource prices start creeping up more rapidly than economies expand. Once that happens, it is going to feel like climbing up a downward-moving escalator. But will this feeling generate more insight among decision makers, and quicker and more decisive action?

I fear not. As incomes tighten, governments may rather cease to invest, even in education and infrastructure maintenance, leaving their populations fending for themselves as they face ever-higher food and energy bills. National bankruptcies may become more frequent.

In other words, resource constraints will produce social upsets way before producing ecological collapse—the menu includes currency decay, runaway debts, insolvency, social unrest, civil wars. All these events will obfuscate the underlying resource drama, as it did in the "Arab Spring" of 2011. While the uprising against repressive leaders was largely seen as a positive development toward democracy, the underlying circumstance was that rapidly expanding populations in the region were meeting rising food and energy prices. Such potent social dynamite cannot be contained even by cynical dictators.

Now consider China. China's leaders have understood the resource race for decades—far better than any large nation. They have actively prepared themselves in order to access resources from abroad. They have limited their population growth, reforested devastated areas, and carefully managed urbanization pressures. They have begun to secure access to resources abroad, although their ultimate goal is a self-sufficient China—a continuation of the age-old Middle Kingdom.

China is not a democracy, but it features a governing system in which the population expects its leaders to deliver. Delivery has been the government's continued license to operate. China's leaders have successfully used economic growth as a way to lift millions out of poverty, and to keep a vast portion of its population excited and loyal. The growth has created opportunities for many and generated a sense of progress for a large majority.

Expanding budgets and economies simplify politics. Rather than having to tackle challenging redistribution conflicts, growth provides more all around, allowing Chinese decision makers to please one constituency without having to take from another one. More *is* better.

But how long will it be physically possible for China to extend this growth? If its energy consumption was half that of the United States in 2000, and exceeded that of the United States by 2009, how can this trajectory be sustained? Already today, China has the largest bio-capacity deficit of all nations—it would take the equivalent bio-capacity of 2.2 Chinas to support the country's current domestic demand.[7]

The big difference between China and other nations is that China is fully aware of the problem. The "farmer's view" is present even in the highest places. China has for millennia striven to be independent of the outside world. It is wary of its growing dependence on outside resources and is putting considerable efforts into building a national resource base and an economy based on domestic consumption rather than on resource-intensive exports to the rich world.

The "farmers" in Beijing are seeking to uphold their present growth rate, but their goal is to decouple it from its ecological footprint. Without economic growth, economic disappointment will rattle Chinese society, and thereby the world economy. Without massive decoupling, China will not make it to 2052. Is it physically possible to decouple their economy? Yes. But we have not yet seen the physical evidence that China is acting fast enough. But I hope they will, because China, like our big banks, is "too big to fail." If China coughs, we will all get a severe flu.

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I believe that "The Race to Lose Last" makes a valid point about national policy. But the advice is not easy to follow in practical politics. This is bad for the affected nations' future, but it makes it much simpler for me to forecast what will actually happen. namely, little deviation from recent trends.

Unused Bio-capacity Will Plunge

In order to study the consequences of overshoot, it is clarifying to split the ecological footprint in two parts: the energy footprint and the nonenergy footprint. The energy footprint consists of the CO_2 emissions that we discussed at length in chapter 5. These emissions are so high that they lead to accumulation of CO_2 in the atmosphere and higher temperatures. The nonenergy footprint, on the other hand, takes the form of human use of physical land: it is the number of hectares used to raise food, graze animals, grow trees, and rear fish. So how has this area developed since 1970? And how does it compare with the available land—with the available biological capacity of the planet?[8]

The nonenergy footprint has grown slowly from 1970 to 2010, from 60% of the carrying capacity in 1970 to 70% in 2010. So if we disregard the energy footprint, humanity is still operating in a sustainable fashion, inside the land area available on the planet. But disregarding the energy footprint is, of course, a totally unsustainable assumption: even if we do so, climate gases will continue to accumulate in the atmosphere. The point I am trying to make is that we are currently using less land for food, meat, wood, fish, and cities than is available on the planet. That is the good, although myopic, news.

The bad news is that the growth in the nonenergy footprint has led to a significant reduction in the amount of unused bio-capacity (defined as total bio-capacity less the nonenergy footprint), as shown in figure 6-2. The unused bio-capacity is the amount of land that we have not yet occupied for food, meat, wood, fish, and cities. The unused part of the world has declined significantly, from 40% to 30% of the total availability in the last forty years. If we divide by the population, we see that the spare capacity per person has fallen even more dramatically, from 1.2 to 0.3 global hectares per person. There is now only a tiny reserve of unused, biologically productive nature behind each of us.

The nonenergy footprint has been growing much slower than world population over the last forty years. This means that we need less land today to support a global citizen than we did in 1970. The reason is improved technology: we have increased dramatically the annual output from each hectare of land, for example, through the use of fertilizer, genetic improvement, and fish