

## Have We Reached a Planetary Tipping Point? A MAHB Dialogue with Paleobiologists Elizabeth Hadly and Anthony Barnosky

Geoffrey Holland



Sharing our world | Image courtesy of the author

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**Geoffrey Holland - Your book, *Tipping Point for Planet Earth*, concludes that a handful of global scale factors are converging inexorably toward a tipping point in our Earth’s ability to sustain human civilization. What are those factors and realistically, how bad could it get?**

*Elizabeth Hadly and Anthony Barnosky -* The key factors are human population size, unsustainable consumption of resources, climate change, and how those interact to stress social and political systems. We are already seeing the effects in our current migration crisis. Migrants are moving out of areas that cannot sustain them, with the local tipping points that make them leave increasingly brought on by a convergence of decades of higher-than-world-average population growth, climate catastrophes that limit local production of food and water supplies, overlaid on local political and societal systems that have long histories of ethnic or religious rivalries. How bad can it get? We are probably seeing the tip of

the iceberg in terms of the migration crisis. As more and more of the world experiences the conditions that are already causing migrants to flee from their homelands, more and more of the world will experience the conflicts we are beginning to see flare up as people move to try to stay alive.

**GH - Earth's human population is close to 7.8 billion, headed with near certainty to 10 billion or more. A recent study published by the National Academy of Sciences reports that of all the mammalian biomass now on Earth, 60% is domesticated livestock raised for human consumption, 36% is living human, and only 4% is wild animal species. What's wrong with that picture?**

*EH & AB* - The decline of other species at the hands of humans is a huge problem. It affects humanity in very direct ways—some of which can cause us to go hungry, for example, the decline of pollinating (and all other) insects. Overall we've seen the loss of perhaps 40% of insects over the past few decades. With reduced pollination, crop yields reduce. And of course it's not "just" insects. We've killed 50% of the world's wildlife over the past fifty years, and in the seas, ocean acidification and warming waters is projected to wipe out most of the coral reefs on Earth by 2070 or so. Think about that. Loss of coral reefs means loss of 25% of fish in the sea, and some 10% of the world's fisheries. Again, tens of millions of hungry people who now depend on those fisheries as their main source of protein. But it is more than those physical effects on our well-being. We evolved embedded in a network of other species whose presence actually pays us huge emotional rewards. Most everybody feels better after a walk in nature. And there is little that can compare with seeing wild animals such as elephants interacting in ecosystems that are still operating more or less as they have for millions of years. The bottom line is that the decline of species goes right back to how many of us are on the planet—for every one of us, members of other species have to give way to make room for our needs, which include our farmland, pastures, livestock, cities, roads, etc. That's why it's so important to go into the future with a clear picture of how we can design cities, farms, and so on to accommodate non-domestic species, rather than wipe them out.

**GH - You say our Earth is reaching a limit in its ability to feed the humans already here. Can you talk about the emerging factors that could actually diminish the food supply in the coming decades when 3 million more humans will need to be fed?**

*EH & AB* - We've already taken over the majority of arable lands on Earth. There simply is no more highly productive farmland. What's left to take over are only the most biodiverse places on the planet—the few remaining tropical and subtropical forests we have left—which when cut down end up rapidly losing their productivity and soil quality. Climate change may well actually reduce productivity in the lands we now count on, through increasing droughts, floods,

longer hotter summers, etc. So it is going to be important to use technology to make the areas we now produce food even more productive without also increasing the downstream effects of nitrogen pollution and so on. Fortunately this may well be possible by what food security experts are calling the Goldilocks strategy: using technology to give just enough fertilizer, just enough water, and planting crops that are well matched to local environments. Also important will be reducing meat consumption and improving food distribution systems so that less food is wasted.

**GH - You write that the number of people who will be short of water by 2025 could reach three billion, about a third of all humans on Earth, and 'by 2040, the world will reach insurmountable water shortages, if things keep going as they have been.' Is there any remedy for this?**

*EH & AB* - Agriculture is a big water user, so more efficient use that regard will be important. But perhaps the biggest problem is melting glaciers that now provide the water supply for over a billion people, especially in Asia. That can only be stemmed by getting off of fossil fuels to limit global temperature rise, which ultimately is causing the glacier melt. Converting to green energy systems may also make desalination of sea water a viable option—right now the energy cost and larger-term issue of needing vast amounts of fossil-fueled energy to desalinate water are primary limitations.

**GH - You talk about the massive number of toxins produced by humans that have been introduced to the environment. How do these pesticides, herbicides, and toxic pharmaceuticals, and hazardous industrial chemicals impact our environment?**

*EH & AB* - It's amazing to me that the milk of nursing mothers in the high Arctic—far from any primary pollution—contain such high levels of pollutants that our own EPA would classify it as toxic waste. The problem is, toxic substances don't just stay where we put them. The pharmaceuticals we flush down the toilet, the harmful chemicals found in many kinds of plastics, excess nitrogen from the fertilizers we spread, and much more gets re-distributed by flowing water, winds, and living things themselves so that they are found worldwide. Among the harmful effects are not-so-subtle signs like chemical castration and feminization in males of far-flung species of fish and amphibians, from a class of chemicals called endocrine disruptors that are found in certain pesticides. And of course air pollution from any number of industrial processes remains a huge problem in most cities, making the very air we breathe unhealthy and stealing years from our lives.

**GH - How does human population growth and the increasing human intrusion and takeover of wild habitat exacerbate the impact of communicable diseases like Ebola and Zika?**

*EH & AB* - Basically, as people encroach into areas they weren't previously, they come into contact with disease organisms found only in wild populations. In some cases, like Ebola, the organisms mutate so that they can infect humans as well and there you have it, the spread of a previously unknown disease.

**GH - Can you reflect on the Rwandan Genocide as an example of what can happen when land and resource shortages lead to violent, ethnic-based conflict? Are there resource wars today, that are real, and deadly, but not getting any attention?**

*EH & AB* - As we say in our book, the underlying pressures in Rwanda were the same as those we are seeing in many parts of the world that are trouble spots today, and from which people are fleeing to find a better life - Rapid population growth that leads to a local depletion of life basics like food, water, and a place to live, a history of cultural or religious differences among people living side-by-side; and the inability of the existing government to make the situation any better. Under those conditions, all that is needed is a spark to set off the powder keg. We saw that in the Middle East with the rise of ISIS, when a prolonged drought decimated the region, leading to shortages that triggered uprisings against the established order that had previously been adequate to hold fragile societies together.

**GH - In so many ways, you show that humanity is failing to acknowledge and address the anthropocentric, planetary scale challenges that threaten life on Earth. How much of this can be attributed to the long-standing, market-based economic system that allows bankers, billionaires, and the corporate elite to shape public policy to favor their personal profit over the common good?**

*EH & AB* - That's a big problem that will have to be solved before we can move forward. Basically, the concept of ever-increasing economic growth cannot hold in a world where there are more people wanting resources than there are resources to provide what they want. What we need to be striving for is economic stability at sustainable levels. That probably cannot happen without policies from the top down that encourage the right kind of market forces through incentives and discourages societally counterproductive behaviors through taxes or other kinds of penalties. How likely is that? Not very, unless a large enough sector of humanity buys into the plan.

**GH - Can you talk about the interdependence of the world's nations, and what it means if we fail to come together in support of a common, sustainable vision for our planet.**

*EH & AB* - Now, despite what many would like to think, there is no nation on Earth that can support its populations in the manner to which they are accustomed solely through what they produce within their borders. It is truly a global economy, in which we depend upon other nations for the everyday things we take for granted, like the food we eat, the clothes on our backs, and the labor needed to produce what people want. If we fail to realize that as a global society, and nations retreat behind their borders, the whole system we depend upon eventually falls apart. One of the outcomes of that of course is increased conflict not only between nations, but also between people with different perspectives within nations. We're beginning to see an increase in both kinds of conflicts these days.

**GH - So, how do we find the route of reason that leads to a good kind of tipping point, with billions of humans clamoring for a positive, life-affirming future that is worthy of our species? What are some actions individuals can take immediately to address this? What can groups of people focus on?**

*EH & AB* - In our book we talk about two actions that are critically important. One is embracing the issues of unsustainable growth of the human population, overconsumption of natural resources, climate change, and environmental degradation as very real problems that already are lessening the quality of billions of lives and emerging as societal conflict, leave alone what is coming down the pike if we do nothing differently. The second is to work within your peer groups to spread the word about both the seriousness of these problems, and how we can solve them, starting now. The messages that need to be conveyed are that we have the technological wherewithal—examples are given in the book—and that all that is standing in our way are cultural and political boundaries that keeps us from working together across the political aisle and across the world. Communicating within your peer group is essential because your peers are probably not going to believe information that comes in from outside. And of course you need to communicate these things to our world leaders at the local, state, national, and international levels by who you decide to put in government and where you decide to spend your money. World leaders, both in government and business, have no choice but to respond to what their constituents demand of them, when the demands get loud enough.

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Professor Anthony D. Barnosky is Emeritus of Integrative Biology at UC Berkeley. Professor Elizabeth A. Hadly is a paleoecologist and Professor of Biology at Stanford University. They have

been married for more than twenty five years and have collaborated on a range of academic studies. Most recently they co-authored *Tipping Point for Planet Earth* – Thomas Dunne Books, 2016.

*The MAHB Dialogues are a monthly Q&A blog series focused on the need to embrace our common planetary citizenship. Each of these Q&As will feature a distinguished author, scientist, or leader offering perspective on how to take care of the only planetary home we have.*

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