

## Built Infrastructure and Climate Change in the American Southwest

The Glen Canyon Dam was “a magnificent mass of concrete . . . cost \$750 million and the lives of sixteen (16) workmen . . . , sponsored by the U.S. Bureau of Reclamation, courtesy of U.S. taxpayers. . . . ‘Pray’ said [Seldom Seen] Smith. ‘Let’s pray for a little *pre*-cision earthquake right here.’ And Smith went down on his knees, there on the cement walkway of the bridge, bowed his head . . . and prayed.”

Where neither Edward Abbey’s fictional prayer, nor environmental advocacy and litigation, have been able to remove the Glen Canyon Dam, 400 parts per million atmospheric carbon dioxide, like termites munching on a house, bit by little bit, is rendering it nonfunctional. Lake Powell is now about half full. Never again will we see it full. It is fast becoming stranded infrastructure.

It is not just carbon dioxide and other greenhouse gases. The last century was a time of abnormally high rainfall in the American Southwest. The ongoing reversion of rainfall to past averages would be a huge problem, even were it not exacerbated by increasing atmospheric carbon dioxide. We built a great civilization — and its physical infrastructure — in a desert, when the desert was getting abnormally high rainfall.

This impact of climate change on the Southwest is summarized in Chapter 20 of the 2014 National Climate Assessment’s report “Climate Change Impacts in the United States” and the more detailed book *Assessment of Climate Change in the Southwest United States*. Looking at their predictions for the future, we don’t have a whole lot to look forward to. If current carbon emissions continue, as seems almost in-

evitable, by the end of this century the American Southwest faces not only continuing water shortages, but a stunning increase in average temperature of some 8 degrees Fahrenheit.

Our wealthy society could easily work around loss of the water and power from the Glen Canyon Dam. But our problem is not just one lone dam. The changing climate (from both natural and anthropogenic causes) is rendering obsolete the entire infrastructure of the Southwest: dams, buildings, cities, bridges, roads, ports, systems for waste disposal. Every piece of the built portfolio that supports civilization is, in one way or another, to some extent threatened.

Infrastructure lost to climate change needs to be repaired, retrofitted, or rebuilt somewhere more hospitable. If we lose infrastructure in the Southwest because of temperature increases and in coastal regions (where most of the human population and even more wealth is concentrated) because of sea-level rise, then further north and more inland, we will have to rebuild that infrastructure.

How much will this cost? I know of no estimate, even to within an order of magnitude. But it is certainly an almost incomprehensibly immense sum. The American Society of Civil Engineers’ “Infrastructure Report Card” concludes that it would take a cool \$3.6 trillion (roughly equivalent to the annual U.S. federal budget), just to fix the *backlog* of existing deficiencies in U.S. infrastructure, let alone replace significant portions of it because of population migration driven by climate change.

The problem is not just money. Ul-

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timately money is just a token for real, physical resources.

Herein lies what I see as an insurmountable problem. My sense is that climate change is and will harm our built infrastructure much too fast for us to be able to replace it. Ponder the difficulties the United States faced in responding to Hurricane Katrina. Then envision a world where we lose infrastructure much more frequently, in countries much less wealthy, and with much worse damage.

At what point will the stresses on society from climate change overwhelm our ability to respond, even if we have the political will? Science is but a rigorous set of methodologies for answering a fairly narrow set of questions. And this question is beyond the ken of science.

But it is not beyond the ken of history. The literature on why past human civilizations have collapsed, as summarized by Peter Turchin, Michael Grant, Jared Diamond and many others, demonstrates that societies typically just kept doing what they had always done, even when faced with clear threats to their very existence.

We are making absolutely no progress in stabilizing, much less reducing, levels of atmospheric carbon dioxide. Perhaps we will. We certainly could. But if our civilization follows the path of past civilizations that faced existential threats, we will simply keep burning fossil fuels, as our infrastructure collapses, taking our civilization with it.