

California Water and Infrastructure Report

Formerly, the “California Drought (and Flood) Update”



For April 5, 2018

by Patrick Ruckert

Published weekly since July, 2014

An archive of all these weekly reports can be found at both links below:

<http://www.californiadroughtupdate.org>

<https://www.facebook.com/CaliforniaDroughtUpdate>

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What if U.S. sentiment towards China could be changed now through a policy that settled the score – returned solid middle-class jobs to America...? What if such a policy would also reduce our treasury debt to China, replacing it with longer-term equity, also made a significant dent in our infrastructure deficit?...There is a fairly obvious exchange that aligns China's needs to protect its reserves with America's need to reduce its debt while renovating its infrastructure. China would over time redeem its holdings of U.S. debt into a more protected stake in U.S. infrastructure providing the crucial capital to rebuild its rival.'

William A. Mundell, a leading Republican activist and Trump supporter in California.

A Note To Readers

The quotation above demonstrates at least some of those aligned with President Trump are beginning to get on the right track on how to actually finance the rebuilding of the U.S. infrastructure. And what Mundell is suggesting can also lead the U.S. to join with China in its Belt and Road Initiative. Now that is a Win Win policy. A longer report on Mundel's article can be found on page 11 of this report.

Along similar lines, Treasury Secretary Mnuchin said March 25 that the intention of tariffs on China was to trigger a negotiated agreement to lower China's trade surplus with the United States, currently about \$360 billion/year. As China's Foreign Minister Li Keqiang and Ambassador Cui Tankai both responded, this requires *raising total trade* between the two countries: more American high-technology exports to China, and more production in the United States by Chinese industrial companies.

These in turn, said Mnuchin, could be driven by a high-technology infrastructure-building program on

the part of the United States, in which China could invest. This is part of *EIR* Founding Editor Lyndon LaRouche's "Four Laws" economic proposal.

And again upsetting the swamp he wishes to drain, the President on April 3 reminded everyone that he wants to pull all the U.S. troops out of Syria and stop wasting trillions on regime change wars, and “start rebuilding the nation.”

In this week's report

The drought is back and it will not go away, despite some precipitation last week and coming up tonight and tomorrow.

While the snowpack and the reservoirs are in better shape than they were one month ago, the snowpack especially is still no where near the average for this time of the year. Several reports below give the details.

So, we have more and more forecasts (as you will see below) that the past few years of drought and declining snowpack are harbingers of the future to come. So what? The climate has always changed and will always be changing. The only important point is will we humans allow ourselves and our future be determined by the whims of nature, or will we use our creative power to discover more and more the fundamental principles of our universe and then shape that universe for the benefit of mankind?

To underline the above I include a couple of climate and geological items in this report.

The Oroville Dam update reports on the Department of Water Resources announcement that there is a Potential use of main spillway next week in expectation of the storm about to arrive.

The never ending and always changing story of the Delta tunnels now has the Metropolitan Water District backing away from its recently announced plan to finance both delta tunnels and it will just finance a single tunnel.

Governor Jerry Brown and the environmentalists will never learn, that is true, but they also shall not define the future. So reports a section on California's electricity supply and a breakthrough in fusion research.

A glance at the real state of the U.S. economy features reports on hungry university students and how much of the nation and its people are reflections of what is described as a third world nation.

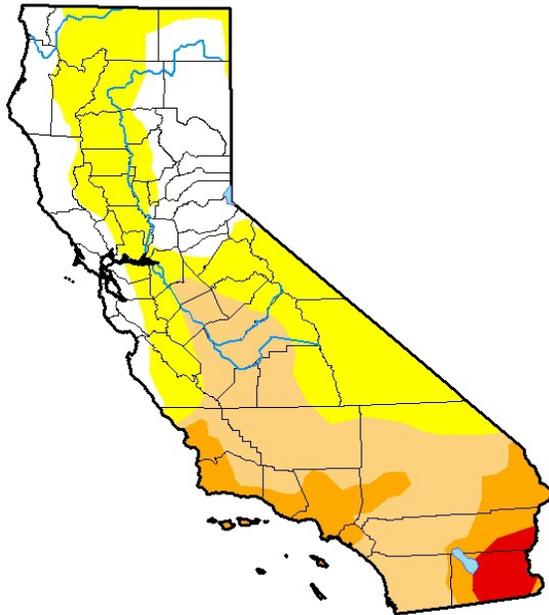
The feature this week, “*Apollo Mission on Earth: Transforming Our Relationship to the Physical World,*” demonstrates how like the building of the Tennessee Valley Authority and the Grand Coulee Dam in the 1930s created a market for the massive amount of electricity produced by those projects, Henry Ford doubling the wages paid to the workers in his new assembly line production of automobiles created a market for those cars produced.

U.S. Drought Monitor and More

This week's *U.S. Drought Monitor* shows no change in the extent and intensity of drought throughout the state. That underlines the point I made last week, that even some drenching rain for a few days does little to alter the direction the drought process goes once that process begins. So, my forecast: More extensive and more intense drought ahead for the next six months, at least.

U.S. Drought Monitor California

April 3, 2018
(Released Thursday, Apr. 5, 2018)
Valid 8 a.m. EDT



Drought Conditions (Percent Area)

	None	D0-D4	D1-D4	D2-D4	D3-D4	D4
Current	22.99	77.01	40.90	12.72	2.50	0.00
Last Week 03-27-2018	22.99	77.01	40.77	12.56	2.50	0.00
3 Months Ago 01-02-2018	55.70	44.30	12.69	0.00	0.00	0.00
Start of Calendar Year 01-02-2018	55.70	44.30	12.69	0.00	0.00	0.00
Start of Water Year 09-26-2017	77.88	22.12	8.24	0.00	0.00	0.00
One Year Ago 04-04-2017	76.54	23.46	8.24	1.06	0.00	0.00

Intensity:

■ D0 Abnormally Dry ■ D3 Extreme Drought
■ D1 Moderate Drought ■ D4 Exceptional Drought
■ D2 Severe Drought

The Drought Monitor focuses on broad-scale conditions. Local conditions may vary. See accompanying text summary for forecast statements.

Author:

David Miskus
NOAA/NWS/NCEP/CPC



<http://droughtmonitor.unl.edu/>

All Kinds of Forecasts For Now, and For the Future-- Some Make Sense; Some Do Not. Some Today; Some for Tomorrow

Heavy rain to enhance flood, mudslide risk in California through Saturday

By [Renee Duff](#), AccuWeather meteorologist

April 05, 2018

<https://www.accuweather.com/en/weather-news/heavy-rain-to-enhance-flood-mudslide-risk-in-california-through-saturday/70004605>

Residents of California are being put on alert for a renewed risk of flooding, mudslides and travel disruptions through the first part of the weekend.

A plume of moisture from the tropical regions of the Pacific Ocean, also known as an atmospheric river, will take aim at Northern and central California through Saturday.

“This atmospheric river will bring periods of heavy rain to Northern and central California through the first half of the weekend,” said AccuWeather Meteorologist Brett Rathbun.

One round of rain will swing through Thursday night into Friday, with another heavier wave of wet weather to follow Friday night into Saturday.

A total of 1-3 inches of rain may pour down on the communities of Redding, San Francisco, Sacramento and Santa Rosa, heightening the risk of urban and flash flooding.

Even higher rainfall totals, on the order of 3-6 inches or more, are expected for the west-facing slopes of the coastal ranges and northern and central Sierra.

Snowfall will be limited to the highest peaks of the Sierra for the duration of the event. However, enough cold air may be pulled in at the tail end of the storm for precipitation to end as snow over Donner Pass.

At intermediate elevations, the combination of rainfall and melting snow may trigger rises on small streams and rivers that can lead to flooding.



Around recent burn areas, including the Tubbs Fire, mudslides and debris flows will be a concern.

"Despite the threat for flash flooding and mudslides, this rain will help to further fill area reservoirs prior to the dry season this summer," Rathbun said.

Gusty winds may kick up along the coast and over the ridges during the second wave of moisture on Friday night and Saturday. The risk of fallen trees and power lines will be heightened due to the saturated ground.

The risk of flooding will lessen heading into Southern California, where the heaviest rainfall will miss to the north. At most, Los Angeles and San Diego may be dampened by a few showers on Saturday.

"While rain is not uncommon across California during April, a storm of this magnitude is a bit unusual," Rathbun said.

January and February are typically the wettest months of the year in California, with average rainfall rapidly declining from March to April and May.

Late Winter Storms Bolster Snowpack in Sierra to 52% of historical average

April 2, 2018

From the Department of Water Resources:

Following one of the driest Februaries in California history, late winter storms increased the Sierra Nevada snowpack but were not enough to put the state on track for an average year.

Today's snow survey by the California Cooperative Snow Surveys Program indicates that water content in the statewide mountain snowpack increased from 23 percent of the March 1 average to 52 percent of today's historical average. The early-April snow survey is the most important for water supply forecasting because the snowpack is normally at its peak before it begins to melt with rising spring temperatures.

Sierra snowpack is heftier than it was a month ago, but still less than average

By [Peter Fimrite](#)

April 2, 2018

<https://www.sfgate.com/bayarea/article/California-s-snowpack-is-heftier-than-it-was-a-12799477.php>

The storms of March may not have rained glory on the state, but they dropped enough snow on the Sierra to greatly improve the drought situation and, with another storm rolling in this week, water resources officials believe thirsty California will make it through the year.

The Sierra snowpack, known to water resources officials as the state's frozen water supply, is 52 percent of average for this time of year — not great, but a lot better than it was in January and February, according to the California Department of Water Resources.

Hopes For 'Miracle' Snowpack Recovery Fade; Colorado River Headed For 6th-Driest Year

By [Luke Runyon](#)

April 4, 2018

<http://www.kunc.org/post/hopes-miracle-snowpack-recovery-fade-colorado-river-headed-6th-driest-year>



For years, Lake Mead has hovered close to a level that would trigger a shortage among lower Colorado River Basin states. Luke Runyon / KUNC

The Colorado River Basin is likely to see one of its driest spring runoff seasons on record this year, according to federal forecasters.

Scientists at the Salt Lake City-based Colorado Basin River Forecast Center say current snowpack conditions are set to yield the sixth-lowest recorded runoff into Lake Powell since the lake was filled more than 50 years ago.

[The April forecast](#) projects inflow to Lake Powell, the first major reservoir that impounds the river's water as it flows from the Rocky Mountains to Mexico, to be 43 percent of average.

As the winter progressed, water managers, farmers and cities hoped for a "miracle" month to boost dwindling snowpack. Those storms never quite materialized. Now, a few days into the historic runoff period, forecasts are less of an educated guess about the far off future and more a reflection of the almost present.

“At this point getting close to average is a pretty unlikely scenario,” says Greg Smith, a CBRFC hydrologist.

Climate and weather records give little hope of spring weather robust enough to make a difference, according to Smith. At this point, the Colorado River Basin has less than a 3 percent chance of catching up to an average year.

This pattern will feel familiar to those who watch the Colorado River closely. Of the 15 driest years on record in the river’s Upper Basin, which includes the mountains of Colorado, Wyoming, Utah and a small portion of New Mexico, nine of those years have occurred since 2000. Of the top five driest, three have been since 2002.

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The dry winter has been felt acutely in southwestern Colorado, northern New Mexico, Arizona and central and southern Utah. Measurement sites near the headwaters for the San Juan, Dolores and Gunnison Rivers have reported the lowest precipitation on record since October.

Low soil moisture throughout the watershed has the possibility of lessening spring runoff even further. Dry soil sucks up melted snowpack before it can reach a major stream, meaning the parched landscape saps even more of the river’s normal flow.

The low runoff means the possibility of [a shortage on the Colorado River](#) could be declared sooner than later. That declaration would be triggered if Lake Mead, another major reservoir outside Las Vegas, dips below 1,075 feet in elevation. The latest operational plan from the Bureau of Reclamation projects the lake to be below that threshold in 2019.

California’s Nearly Dismal Snow Year a Harbinger of Things to Come

By Tara Lohan

April 4, 2018

<https://www.newsdeeply.com/water/articles/2018/04/04/californias-nearly-dismal-snow-year-a-harbinger-of-things-to-come>

Californians may collectively be breathing a sigh of relief, but not elation, this week, after the state’s latest snowpack reading. A wet and cold March saved California from a near record-low snowpack, but it proved too little too late to bring a full recovery. And worse, climate scientists say we should start getting used to these low snowpack years.

How much water content the snow holds in the Sierra Nevada mountains is crucial to the state’s water supply, and snowpack readings at the start of April – usually the peak accumulation of the season – are a key indicator of the winter’s bounty (or lack of).

As of April 3, the [snow-water equivalent](#) (how much water content is in the snow), was 52 percent of the long-term average statewide. And in the northern part of the Sierra Nevada, which drains into the state’s two biggest reservoirs, it was only 41 percent of average.

It’s not great, but it’s a vast improvement from the outlook just over a month ago when the snowpack was near the lowest recorded. “At the end of February things were not looking so great, things were extremely dry throughout the state,” said [Daniel Swain](#), a climate scientist at University of California,

Los Angeles' [Center for Climate Science](#). "The whole winter had been very warm, in some place the warmest on record."

Sierra Nevada snowpack nearly tripled during March.

The other good piece of news is that 2017 was a huge water year for California, and the state's major reservoirs are at 107 percent of average for this time of year, according to the Department of Water Resources. But this also means that California will be working its way through some of its reserves this year as it taps the "bank account" of water supply in reservoirs. And so far, contractors that receive water via the State Water Project are projected to receive only 20 percent of their allocation, although that figure may be amended.

In recent years, Swain said the overall trend has been a lagging snowpack, even in years when there's adequate precipitation. And higher temperatures are to blame there. "That's sort of the warming signal that's buried in everything now," he said.

California will still experience wet years and occasional big snow years, he said, but they will become less frequent and less big. A [report](#) just published by the UCLA Center for Climate Science found that if nothing is done to curb climate change, Sierra Nevada average spring snowpack is likely to drop by 64 percent by the end of the century and by 30 percent if some efforts are made at reducing greenhouse gas emissions.

"There has been an expectation for a long time that we would see Sierra Nevada snow lines, the elevation of where the mean snow is falling, creeping up the mountain and we'd see less snow at lower and middle elevations, and then eventually the overall snowpack would start to decrease," Swain said. "And based on a couple of studies that have come out in the last six months – we're there. It's no longer 'we expect to see,' it's 'we are starting to see this in the real world.'"

Maybe (Actually Not Maybe, but For Sure) the Hysteria About Climate Change is Off the Wall

11,000 years ago, our ancestors survived abrupt climate change

By [Ashley Strickland](#), CNN

March 30, 2018

<https://www.cnn.com/2018/03/26/health/climate-change-hunter-gatherers/index.html>

Story highlights

- Hunter-gatherers survived abrupt climate change events
- Data combined human activity and climate record analysis
- Climate change would impact modern lives in different ways, expert says

(CNN)Imagine if, instead of heat this summer, we were faced with a sudden, dramatic cold front that lasted the next 100 years. That is what our hunter-gatherer ancestors lived through 11,000 years ago.

Findings from a Middle Stone Age site named Star Carr in North Yorkshire, England, show that our ancestors resiliently survived the century-long drop in temperature, according to a new study in the journal [Nature Ecology & Evolution](#) on Monday.

How they responded to such abrupt climate change could hold key insights for us as we face a different kind of climate change, the researchers said.

A Megaflood-Powered Mile-High Waterfall Refilled the Mediterranean [Video]

- By [Katherine Kornei](#) on March 26, 2018

https://www.scientificamerican.com/article/a-megaflood-powered-mile-high-waterfall-refilled-the-mediterranean-video/?WT.mc_id=send-to-friend

Buried sediments near Sicily suggest water rushed into the sea's partially dried-out eastern basin at speeds reaching 100 miles per hour

The Inland sea on Gozo island in Malta. Credit: [John Crux Photography Getty Images](#)

Six million years ago the Mediterranean Sea was a very different place than it is today. Plate tectonics had closed the Strait of Gibraltar separating modern-day Spain and Morocco, leaving the Mediterranean cut off from the Atlantic Ocean. The newly enclosed sea succumbed to evaporation, its water level falling by thousands of meters, turning it into a desertlike environment pockmarked with shallow pools as salty as today's Dead Sea.

One hypothesis suggests a megaflood rapidly refilled the Mediterranean. Now, a study of buried ocean sediments near Sicily shows this flood may have washed all the way into the sea's partially filled eastern basin via a waterfall about 1,500 meters high.

Oroville Dam Update

Update on Lake Oroville operations: Potential use of main spillway next week

Published: Apr 03, 2018

<https://www.water.ca.gov/News/News-Releases/All-News-Articles/Lake-Oroville-Operations-April-3>



Lake Oroville main spillway March 19, 2018 (DWR)

SACRAMENTO – Forecasted storms expected in the Feather River basin this weekend may require using Lake Oroville's flood control outlet spillway (also known as the main spillway) this week or next.

After last year's spillway incident, the Department created the [2017/18 Lake Oroville Winter Operations Plan](#) to ensure public safety in the event of major storm events. This plan triggers more aggressive outflow from Hyatt Powerplant and potential use of the main spillway should the reservoir's elevation reach 830 feet during the month of April. The current forecasts show the potential for inflows to raise the reservoir to near the 830-foot trigger elevation by the middle of next week. Currently, the

lake elevation is 794 feet.

In anticipation of the incoming weather, DWR began increasing outflows today, April 3, from Hyatt Powerplant to approximately 10,000 cfs. The total capacity of outflows from Hyatt Powerplant is currently 12,500 cfs. If necessary, DWR also has use of the River Valve Outlet System which has an additional maximum outflow capacity of 4,000 cfs.

DWR's objective for the year has been to minimize use of the main spillway while it is still under construction. However, because forecasts are uncertain, DWR is taking proactive steps such as early notification to downstream communities, regulatory agencies and construction crews to prepare for possible use of the main spillway next week in the event the lake level reaches an elevation of 830 feet, even after increasing outflows through Hyatt Powerplant.

Now the Story On the Tunnels Changes Once Again

Metropolitan Water District backs away from plan to finance both delta tunnels

By [Bettina Boxall](#)

Apr 02, 2018

<http://www.latimes.com/local/lanow/la-me-mwd-delta-tunnels-20180402-story.html>

The Metropolitan Water District of Southern California is dropping plans to push ahead with a two-tunnel proposal to revamp the state's water delivery system, opting to pursue a scaled-back version instead.

In a memo to the agency's board on Monday, MWD officials said the decision followed discussions with major agricultural districts that remain unwilling to make any financing commitments for the project, known as California WaterFix.

Rather than fund much of the full project on its own, the staff will ask the board to vote next week to approve \$5.3 billion in funding for a smaller capacity, one-tunnel version.

Money has been a major sticking point for the much-debated project, which is intended to sustain water deliveries to San Joaquin Valley agribusiness and urban Southern California.

As originally proposed, the urban and farm districts that rely on deliveries from the southern portion of the Sacramento-San Joaquin Delta were supposed to pick up the \$17-billion bill to construct two massive water tunnels under the delta.

MWD and most of the urban districts voted last year to contribute their share. But agricultural districts that had long supported the project said the tunnel water would be too expensive and voted against joining WaterFix.

That prompted Gov. Jerry Brown's administration to downsize the initial construction to a less expensive, one-tunnel project that would be used and financed by the largely urban districts supplied by the State Water Project.

Jerry and the Environmentalists Will Never Learn

California Does Not Have the Power for Its ‘Environmentally Friendly’ Electric Vehicles

April 3 (EIRNS)—The United States as a whole, and California most definitely, does not have enough electric generating capacity to meet the demand from the projected number of electric vehicles, the U.S. Energy Information Administration reported in a recent study. A March 29 article on Grid News calculates that each new vehicle adds a demand equivalent to that of three new homes. This also translates to a doubling of a household’s annual electric demand if it has two electric vehicles. Carbon-conscious California, as one would expect, has the most aggressive goals for electric cars, and also restrictions for building new power plants.

The state’s goal of 5 million electric vehicles on the road by 2030, would require 300,000 charging stations by 2025. Because there is not the generating capacity to power such a number of vehicles, the state is coming up with all kinds of schemes, such as “dynamic pricing.” This, and “time of use” pricing, which means higher rates for peak times, and other gimmicks that “align driver travel and charging behaviors with the grid’s peak capacity,” are supposed to “smooth out” demand so shortages can be avoided while building a minimum of new capacity. This approach has been used for years for households, where lower rates are offered for doing laundry after midnight.

A study years ago determined that the TVA was the only utility in the country with the electric generating capacity to meet the future demand from electric vehicles.

They May Never Learn, But They Shall Not Define the Future

Compact Fusion Reactor Would Revolutionize Earth and Space Transportation

April 1 (EIRNS)—Aerospace/defense giant, Lockheed-Martin’s famous “Skunk Works,” known for its groundbreaking advances in aeronautics technology, has been working since 2014 on an alternative, non-tokamak compact concept for producing fusion energy. The company’s fusion research made it into the media recently as it was granted a patent in February for the compact fusion design.

The goal is a fusion reactor that can produce 100 MW of electricity, and that is small enough to be mounted on a truck, an aircraft, a ship, train, submarine, or spacecraft. A reactor of this size could power a city of between 50-100,000 people, and would be especially well suited to remote locations and for developing countries. Such a power source could also be crucial for desalination to provide fresh water. The advantages of cheap, universally available, and inexhaustible fuel are discussed, since 55 pounds of fuel is sufficient to run the reactor for a year.

Aspects of the challenging required scientific and technical developments have been undergoing testing in a progression of designs. In an interview with Aviation Week & Space Technology on 2014, Thomas McGuire, who was leading the fusion team, explained that it was possible with such a small reactor, to test new designs in less than a year. “We would like to have a prototype in five generations,” he said. The fusion team now hopes to have a prototype next year.

McGuire, who is an aeronautical engineer, explained in the interview that he began looking at fusion designs while in graduate school, under a NASA grant, “charged with how we could get to Mars quickly.” Being disappointed at what he found in the literature on fusion propulsion concepts, he set out to develop something new. Lockheed-Martin describes the compact fusion reactor as potentially creating a technology revolution.

A Glance at the Real State of the U.S. Economy

Hidden crisis on college campuses: 36 percent of students don't have enough to eat

Bill O'Leary, The Washington Post

April 3, 2018 at 8:54 pm

<https://www.denverpost.com/2018/04/03/college-students-hunger/>

According to a first-of-its-kind [survey](#) released Tuesday by researchers at Temple University and the Wisconsin HOPE Lab, 36 percent of students on U.S. college campuses do not get enough to eat, and a similar number lack a secure place to live. The report, which is the first to include students from two-year, four-year, private and public universities, including GWU, found that nearly 1 in 10 community college students have gone a whole day without eating in the past month. That number was 6 percent among university students.

US has regressed to developing nation status, MIT economist warns

Peter Temin says 80 per cent of the population is burdened with debt and anxious about job security

- [Chloe Farand](#)
- *Friday 21 April 2017 14:06 BST*

America is regressing to have the economic and political structure of a developing nation, an MIT economist has warned.

Peter Temin says the world's largest economy has roads and bridges that look more like those in Thailand and Venezuela than those in parts of Europe.

In his new book, "The Vanishing Middle Class", reviewed by the [Institute for New Economic Thinking](#), Mr Temin says the fracture of US society is leading the middle class to disappear.

The economist describes a two-track economy with on the one hand 20 per cent of the population that is educated and enjoys good jobs and supportive social networks.

On the other hand, the remaining 80 per cent, he said, are part of the US' low-wage sector; where the world of possibility has shrunk and people are burdened with debts and anxious about job security.

The William Mundell Article

California GOper: Put China's T-Bills in 'U.S. Belt, U.S. Road'

April 4 (EIRNS) -- William A. Mundell, a leading Republican activist and Trump supporter in California, has been proposing for 18 months that China's holdings of U.S. Treasury securities be invested in building new American economic infrastructure. His proposal has lacked the idea of a national infrastructure bank.

On Dec. 6, 2016 Mundell wrote in {Forbes}, "China and the Art of the Deal:" "What if U.S. sentiment towards China could be changed now through a policy that settled the score – returned solid middle-class jobs to America...? What if such a policy would also reduce our treasury debt to China, replacing it with longer-term equity, also made a significant dent in our infrastructure deficit?... China has built up an astounding mountain of monetary reserves, a large portion of which is comprised of U.S. government securities. But this Chinese capital faces a specific dilemma in today's loose monetary

environment: How to convert soft-dollar assets like Treasury bills into hard-dollar assets to inoculate it, amongst other things, against the possibility of future inflation.... There is a fairly obvious exchange that aligns China's needs to protect its reserves with America's need to reduce its debt while renovating its infrastructure. China would over time redeem its holdings of U.S. debt into a more protected stake in U.S. infrastructure providing the crucial capital to rebuild its rival."

On April 3, 2018 in {Forbes}, Mundell wrote "Specifically, recycling a portion of China's trade surplus to rebuild American infrastructure-- think 'U.S. belt, U.S. road' -- would provide immediate funding to jump start Trump's number one domestic policy initiative for 2018. This isn't pie in the sky. The Chinese have repeatedly expressed interest in this, as they see it as not only a good investment proposition but also a way to create more stability in the relationship. A highly visible multiyear, multi-billion dollar commitment to American infrastructure could be the quickest path to demonstrate relief from the dislocation globalization has created."

*Mundell led Proposition 77, which established court-created redistricting in California; more recently he made a film about U.S.-China relations, **Better Angels**. He teaches courses at Columbia and at Tsinghua University, and heads Productivity Point International, Inc., a Santa Monica firm.*

Feature: A Thoughtful Essay on the Real Economy

Apollo Mission on Earth: Transforming Our Relationship to the Physical World

by Bill Roberts

*This article appears in the [March 30, 2018 issue](#) of *Executive Intelligence Review*.*

http://www.larouchepub.com/other/2018/4513_apollo_mission_on_earth.html

After decades of living in a national economy lacking any real long-term goals or a science-driver mission, concepts such as the difference between economic value and financial value is not very well understood by infrastructure specialists or policymakers, let alone most professional economists.

Promethean Fire

Scientific revolutions create economic value by transforming man's relationship to the physical universe, and increase our productivity per capita as a spinoff. The level of energy-flux density utilized by man changes the way we are able to produce and use the various elements of the periodic table. Our ability to mass-produce aluminum, for example, depends upon the ability to produce a lot of electricity, cheaply. For identical reasons, it is not accidental that breakthroughs both in the mass production of chemical fertilizer and in the development of the atomic bomb, occurred within a short distance from the cheap and abundant electricity produced by the hydroelectric generation capacity built by the Tennessee Valley Authority.

Infrastructure upgrades (as with other capital investments)—the expansion of the infrastructure qualitatively and quantitatively—are necessitated not by the linear projection of current user habits, but by non-linear changes in mankind's behavior.

For example, over half of the trips on the busiest lines generated by the construction of China's 22,000 km of high-speed rail, are trips that would not occur if it were not for the availability of high-speed trains. Every year during the 40-day Spring Festival, there is a mass migration of roughly 385 million people travelling across the country and back, to vacation or visit family. If, instead, all of these people

had cars, it would not be possible for them all to be on the road during this period. A certain proportion of the estimated 2.98 billion trips for *all* purposes during the 40 days, is what are called “generated trips,” that is, trips produced as a function of social and economic attributes of households. The extent of construction of China’s high-speed rail system is changing the social characteristics of the Chinese population.

Henry Ford and the American System

An earlier example of how capital expenditures were necessitated by an intention to transform man’s relationship to the physical world in a non-linear way, is the case of the Ford Motor Company in its early years. In 1914, when Henry Ford announced a pay raise from \$2 a day to \$5 a day for his employees, he actually saw it as a cost-*saving* measure, which in fact it turned out to be—even more successfully than he had imagined. He was opposed by his directors, some of whom thought they could get him to give up the idea by ridiculing it! The news was so shocking, that it was probably the biggest international news item in history ever, at the time.

The key to increasing productivity was not simply paying his workers more, although that was part of it; the pay raise was possible *because* of their higher productivity. As Henry Ford’s spokesman explained the effect after the fact, increasing the wage of his workers made it possible for them to afford the Model T. That created a ripple-effect of increased earnings throughout the country, which, in turn, made the Model T affordable to many others.

Increasing the number of people who could purchase the Model T by raising wage levels throughout the country, and simultaneously bringing down the cost of his cars, was necessary for one simple reason: The really massive capital investments that had the biggest effect on cost reduction, required a dramatic growth in the number of cars produced in order to justify the investment. In other words, in order to make the ownership of the personal automobile possible for the average American, Henry Ford had to think on the scale of the U.S. economy as a whole, and transform it.

In addition to more than doubling their hourly wage, Ford also reduced their work day from 10 to 8 hours, a significant drop from the grueling 60-hour work week that was the standard in American manufacturing at that time.

China’s approach to international investments is not entirely different. It approaches loans and investments in infrastructure not from the standpoint of always maximizing profits, but sometimes to create the conditions for raising the standard of living and productivity of other nations’ populations.

That is why Henry Ford decided to build the massive River Rouge Complex seven years after his plant in Highland Park, Michigan, opened, which itself had been designed to mass-produce the Model T, the first factory in the world to assemble cars on a moving assembly line. Ultimately, to make a car as affordable as possible, he decided he had to control all the costs, beginning with raw-materials extraction, making it possible to introduce cost-saving innovations throughout the entire manufacturing process, and thus requiring a fully integrated manufacturing process. The Rouge was designed to build cars from scratch, bringing in the raw materials directly on barges on the Detroit River.

The 2,000-acre mega-complex was the most technologically advanced manufacturing plant the world had ever seen, employing 103,000 workers at its peak in 1924. In order get the raw materials in, and the cars out, the Ford Motor Company had to purchase a railroad and dredge the Rouge River along a three-mile stretch connecting to the Detroit River.

The early history of the Ford Motor Company is riddled with opposition to Ford’s reinvestment decisions by stockholders such as the Dodge brothers, who sued him over his policy. They opposed his boldest plans—the Rouge, for example—to reinvest company profits in state-of-the-art improvements

in plant and equipment. Ford eventually gave ultimate authority over expenditures to the production departments, which were tasked with finding ways to bring the cost of production down to the price at which Ford wanted the car to be sold.

Henry Ford's right hand man and closest collaborator over forty years, Charlie Sorensen, described in his book, *My Forty Years with Ford*, how completely revolutionary and anti-British this approach was:

Until then, American business had operated on the principle that prices should be kept at the highest point at which people would buy. That is still the operating principle of much French and British industry. But the foundation of the American industrial system, which today out produces the world, is the mass production technique worked out at Ford Motor Company coupled with Henry Ford's economic heresies that higher wages and lower prices resulted in more abundant production at lower cost.

Like China's leadership today, Sorensen thought it better to tear down an old factory and build an entirely new one, rather than stick with old habits and old ideas, which, while profitable in the short term, ensured stagnation and eventual failure. Sorensen described his line of thinking in starting from scratch and building a new iron-smelting plant:

The need for such a superplant was stressed by our experience at Highland Park, which was based on the best we knew how, but also on the same practices that would have been familiar to Egyptian bronze casters of 2500 BC. When something new and different is sought, it is useless to copy; start fresh on a new idea. This means fresh minds at work. Seeking help on planning this new foundry, I had to cast aside all precedent, for there were no engineering groups that could or would satisfy our demands for something different.

Where there is no vision, the people perish.

Like the spirit of the New Silk Road, and like the Americans who understood where real value in an economy comes from, we too must endeavor to cast aside all precedent and craft a vision of the future—not from old habits and tricks, but rather by a total vision for the future, a mission orientation, like the Apollo mission, and then figure out how to make it possible.