

# How to Thrive in the Age of Megadrought

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For millions, the future is running dry. As our [atmosphere's carbon count ticks up](#) and the [planet continues to warm](#), those who live in arid-leaning areas are poised to see not just more frequent droughts, but decades-spanning megadroughts. Recent studies have shown that it's not just possible but likely that the American southwest will see such a [megadrought this century](#). Scientists say that [beginning around 2050, we will see](#) "unprecedented drought conditions." California may even be in the [early stages of megadrought](#) as we speak.

"The drought could end next year or it could go on and on—we don't know," Peter Gleick, water expert, climatologist, and winner of a MacArthur "genius" grant, recently told me in an email. "What we do know, is that the climate is changing in a way that raises the risks of more extreme events, and that higher temperatures will make droughts worse, just as they are already making this one worse."

We're fairly used to battling typical drought: Conserve water, embrace efficiency, let the lawn go native. Those prescriptions are among the tips now routinely issued in forums like [Texas' Drought Survival Kit](#), published in 2011 when the Lone Star state was in the grip of its own record-breaking dry spell. It's pretty simple thinking: cut back until the rains return.

But how do you survive a *megadrought*? How might we triumph over Mad Max-levels

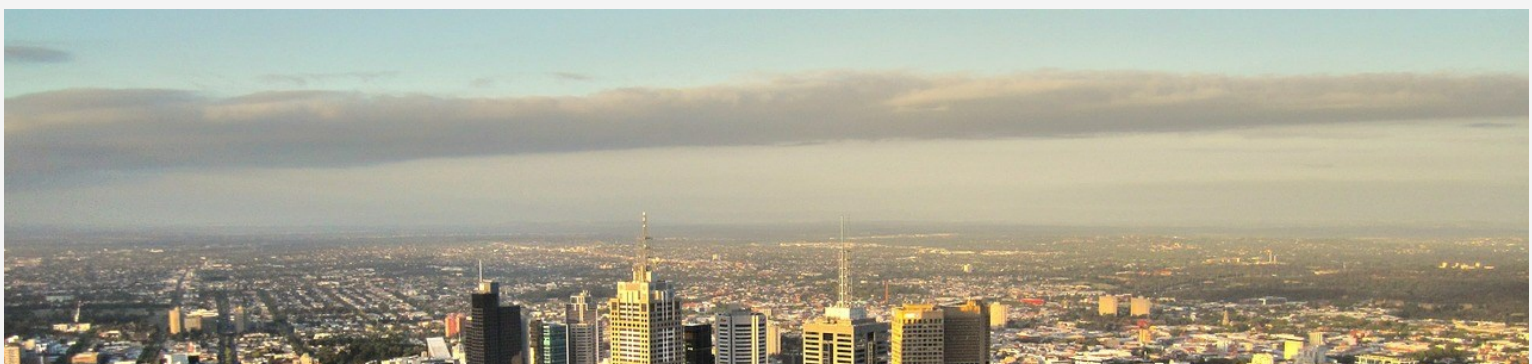
of wasteland dry, without turning into water-hoarding, Valhalla-worshipping mutants? (It's clearly on our minds; the future-desert film is already [a critical and popular hit](#).) Seriously: How might civilization persist when the H<sub>2</sub>O is short for five, ten, even twenty or thirty years—the sort of hefty timeframes for the rain-strapped spells likely to become more common as we tumble into the Anthropocene, and the age of the megadrought? That sort of an adjustment is going to require a more fundamental rethinking of how we water human life than just laying off the tap for a bit.

Thankfully (if unfortunately) there's something of a blueprint for conquering a sustained scorch: [Australia's Millennium Drought](#). Spanning from 1995 to 2009, it may not have been quite long enough to earn the mantle of “megadrought,” a term that typically describes a drought that lasts over two decades. But the Millennium Drought was long, harsh, and painful. It was the longest in Australia's recorded history, yet the afflicted communities adapted, even thrived, in spite of the parch.

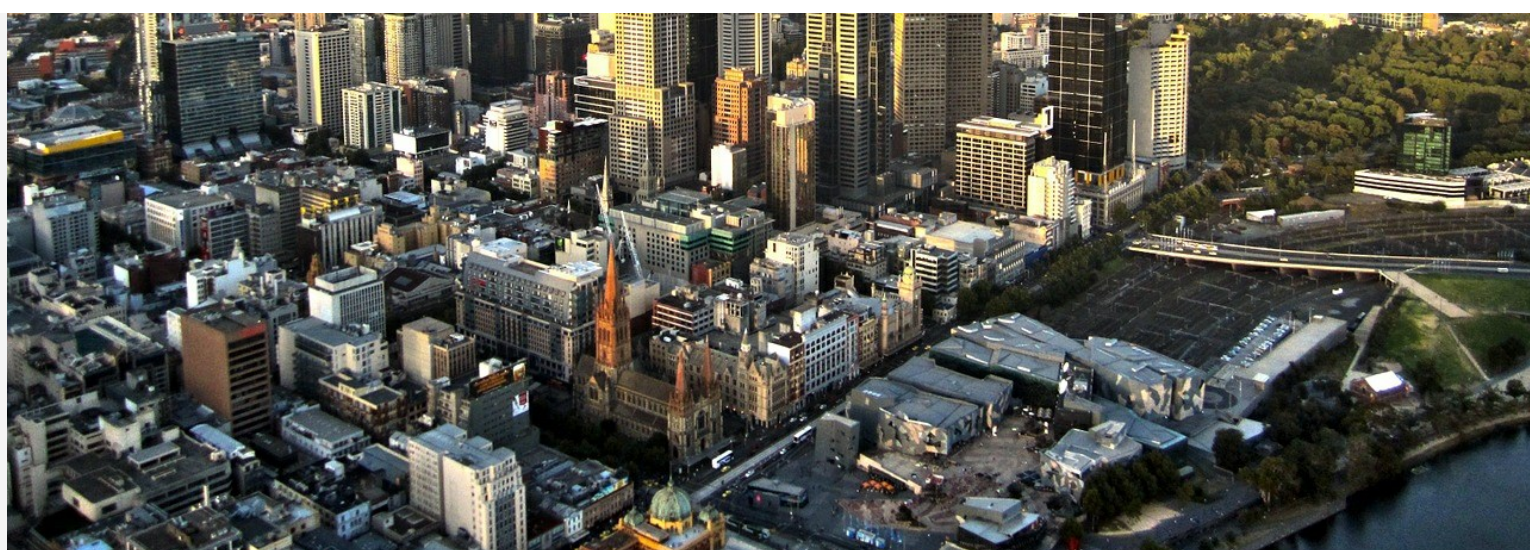
Take Melbourne. At times during the drought, it recorded 90 percent less rainfall than average, and its water storage was all but drained. In 2010, the average resident of Australia's second-largest metropolis—a rich, modern city of 4.3 million—was using less than half the amount of water that a Californian in Los Angeles does right now, four years into their own drought. Yes, half. One in three Melbournians installed rainwater tanks on their roofs, citizens built retention ponds to bolster urban water supplies, recycled wastewater plants sent reclaimed aqua to irrigate nearby agriculture, and water markets were put in place to better serve those whose wells were driest. A multibillion dollar desalination plant was finished but never used.

This was hard work, sure, and some of the measures made Australians uncomfortable. But Melbourne actually boomed during the desiccated times. Over the 2000s, Melbourne's [economy continued to grow](#), to the point where it [rivalled Australia's biggest city](#). And in the first half of 2009, before the drought lifted, Melbourne was deemed [one of the happiest cities in the world](#), a distinction it [continues to win](#) from a range of [researchers](#) and [thinkpiece penners](#).

So how did Melbourne pull it off? And can California, and all the other regions destined for megadrought, emulate the strategies that helped the Victoria stay quenched? Hopefully; though said strategies differ depending on where you live. And since most of we future megadrought survivors [will be living in cities](#), let's start there.







Melbourne. Pixabay, Creative Commons.

## Megadrought in the City

"The real take home lesson from Melbourne is that water conservation can go a long way toward addressing the acute challenges of drought and the 'new normal' associated with climate change and population growth," Stanley B. Grant, a professor of civil engineering at the University of Irvine, and a visiting chair at the University of Melbourne, told me.

Grant and his colleagues have recently published a study, "*Fighting drought with innovation*" in the journal *WIREs Water*. They found that years into the drought, the big technological fixes—desalination plants, massive water-moving pipelines—ultimately proved secondary to public cooperation, conservation, and good policy. When staring down the barrel of a long-lasting drought, the first step towards addressing the drought in a complex, modern, and water-dependent society is making sure everyone's on the same page.

"I think the lever is public education and civic engagement," Grant said. "Everyone in Melbourne tracked the city's reservoir level like their life depended on it." He notes that the drought was "front page news, the lead story on the nightly news, and on electronic billboards all over the city." The drought seemed—and clearly was—pressing, urgent.

"That gave government leaders the authority to act decisively," he said, pointing to water restrictions that the Melbourne government was then able to implement and enforce. And, at first glance, those restrictions may seem pretty harsh to Americans, who love their big, manicured lawns and suburban swimming pools. When Melbourne instituted the maximum level of water restrictions, [Stage 4](#), all outside watering—of lawns, of plants, of hard surfaces—[was banned](#).

Filling up swimming pools was verboten, and Australians were only permitted to wash the mirrors, windows, and lights of their cars. And then, only with a bucket, not a hose. But, as Grant's research shows, the effective public outreach, and the subsequent collective understanding of urgency of the situation, primed neighbors

to be more open to sometimes unsavory-seeming solutions. They were in the decadal drought together.

Motherboard's own Sarah Emerson lived in Melbourne during the height of the drought, from 2007-2010, and she barely remembers an inconvenience. "When I moved to Australia I noticed that everyone as a whole seemed to be more conscious about conserving water," she says. "I took shorter showers and did the not flushing pee thing, which is a big deal there."

That "if it's yellow, let it mellow" mantra may be considered hippie philosophy here in the States, but it's apparently the happy norm in much of Australia.

In fact, such conservationist attitude permeated the city—people understood that everyone had to do their part to save. According to Grant, that attitude also allowed Melbourne to "experiment with innovative approaches for augmenting water supply"—like the rainwater tanks—"and reducing demand"—like rebate programs for water saving appliances. If you're going to beat a megadrought, you're going to want to have the right tools; efficient implements and appliances that can get their respective jobs done while wasting as little water as possible. And you're going to want to encourage people to find ways to catch and contribute water supplies on their own.

So Melbourne offered rebates to citizens who built those rainwater tanks and retention ponds, as well as for the purchase water-efficient appliances like dishwashers and washing machines. Importantly, [those policies still remain in place today](#), where they can continue to assist Australia to prepare for the next dry spell.

They improve [resiliency](#), to deploy the sustainability buzz term du jour. Even if Melbourne could get by without the rooftop water tanks, low-water washing machines, and artificial ponds right now, when the next decadal drought rolls around, the city will be much better prepared. Especially because it will have some better tech on hand, too.





Research on new biofiltration techniques. [Monash niversity](#).

“Biofilters are one technology well suited for stormwater use in Melbourne; in addition to reducing potable demand, such systems have many co-benefits for human and ecosystem health,” the authors write in the *Innovation* paper. [Biofilters](#) help gather stormwater, filter and remove any pollutants it may contain, and divert the newly safe water for use. “After the drought, about a dozen stormwater harvesting projects have been completed mostly to irrigate gardens, sports and golf courses.” New research was spurred, too, such as projects to develop new [sand-based filtration techniques](#). They haven’t been tested by megadrought yet, but the promise is there.

As it was, the water-saving measures that were instituted drastically reduced the average Melbournian’s water footprint to 41 gallons of water a day. Compare that to the average Angeleno, four years into the California drought, sucks down 83 gallons daily. That’s certainly not megadrought-compatible.

But Californians too are showing signs of improvement—[nobody’s hopeless](#). Drought is certainly in the headlines in LA, and it’s starting to sink in that this kind of dry may in fact be the new normal. Policy is shifting; first come the restrictions, then the creative fixes.

So-called “drought-shaming”—calling neighbors out for wasting water—probably wasn’t uncommon in Australia during the Millennium Drought. But the denizens of Silicon Valley are upping the ante; they’ve gone and built an app to highlight and amplify drought-shaming online, and it’s [actually gaining currency](#).

**“When it comes to water, California is still in the oasis stage,” UC Irvine’s David Feldman, another author on the study, said. They’re mostly in denial.** It took years for the Australian public to accept the scope of the drought for what it was—the rise of drought-shaming may be a sign that the times are changing.

But technically, while water conservation in the cities really is important, it’s nothing compared to the strides that need to be made to reform water-guzzling agriculture.







Australian farmer in 2002. Wikimedia, CGoodwin.

## Farming in a Megadrought

Agriculture [usurps 80 percent of California's water](#). So even if city-dwelling Californians became as water-savvy as Melbournians, it'd only move the needle so much. In a megadrought, we're going to have to reorganize how we farm, too.

"If this drought continues," Gleick told me, "we will see growing pressure to rethink California—and western—water laws and institutions in ways never before considered, including reallocation of water rights, creation of water markets, higher prices for urban water along with a great expansion of water treatment and reuse, and fundamental changes in agricultural practices."

In other words, do a lot of what the Victoria government did. Southeastern Australians didn't just slash water use in the cities. They instituted wide-ranging wastewater treatment plans that led to the somewhat gross-seeming act of watering crops with water that was, once upon a time, sewage. And it worked. The jury is still out as to whether it worked *as well as* irrigating farmland with regular old water (the reclaimed stuff came with higher salinity, and crops weren't as productive, but that may also have been the oppressive, sustained heat) yet the water recycling helped the crops survive.

In fact, by the height of the drought in 2008, 23 percent of sewage inflows were being captured and recycled for farm use. That's a lot.

California has begun [turning to treated wastewater](#), too. Of course, there are risks. For instance, it was discovered that [potentially toxic waste water from oil refineries](#) was being redirected for use in farming irrigation. Treated wastewater is one thing—that's mostly a public conception problem, of encouraging folks to be comfortable with the idea of drinking treated sewage—but toxic oil residue is another. Missteps like that risk poisoning the public against the concept in the first place. And in the megadrought era, residents of dry areas are going to have to get used to the idea of reusing water in every way they can. That probably won't mean recycled pee suits—though [NASA, and some Nevada scientists are working on them](#)—but it will mean accepting that highly treated wastewater is safe, especially for irrigation.

Beyond wastewater recycling, there's another important part Gleick mentioned; many think it's *the* key to beating drought: Water markets, and raising the price of water.

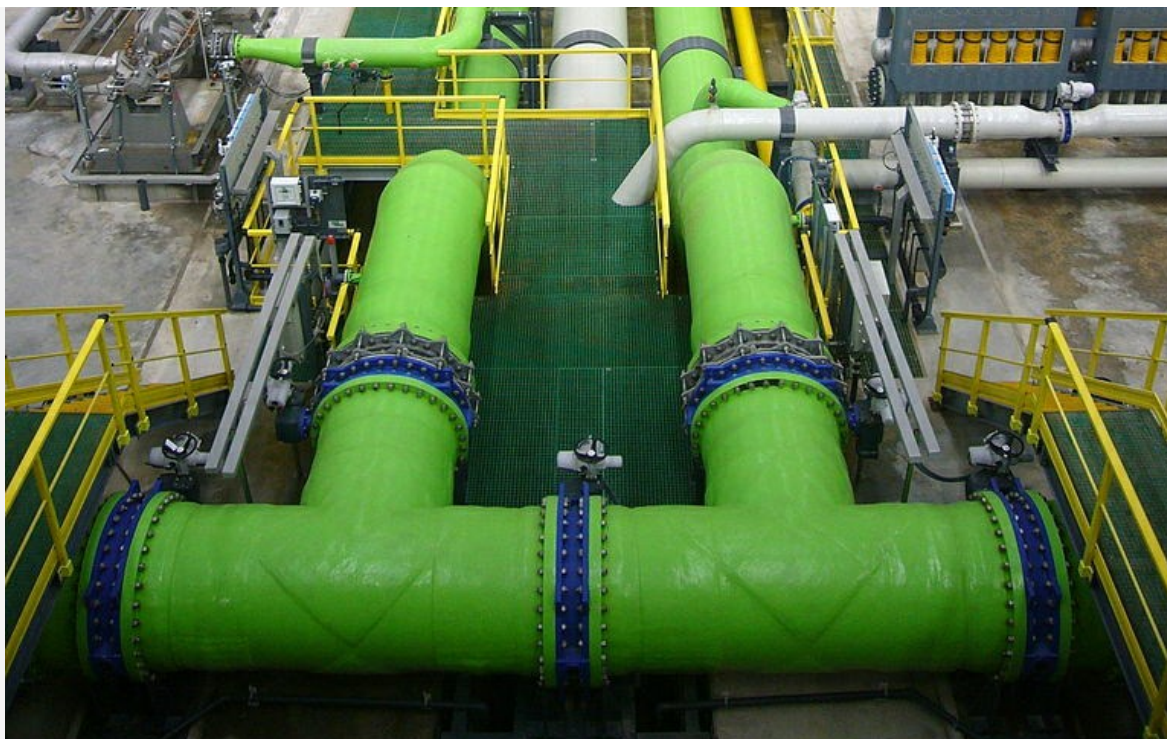
In a separate paper that Grant published in *Science* last year, he explains how Australia pulled them off: "The use of water markets was particularly critical," Grant wrote. "More than 40 percent of annual water allocations were traded at the height of the drought in 2007. For example, increased water prices allowed dairy farmers to sell their allocation and purchase fodder with the proceeds rather than irrigate pasture. Fruit growers and other producers who needed to maintain irrigation throughout the drought could purchase the dairy farmers' water to keep their operations viable."

Eric Holthaus, a meteorologist and journalist who has [covered the California drought situation extensively](#), tells me that "basically what needs to happen is a gradual and structured transfer of water rights from farms to urban areas." He believes agriculture is sucking down an unsustainable amount of water in the Golden State, and increased prices could help better allocate the flow to where it's actually needed.

"As I've said before, California has plenty of water for even double the current population, but to make that happen, certain types of agriculture need to shift out-of-state." Notably, the water-intensive process of rearing livestock. "Almonds and other cash crops are fine to stay, but animal agriculture (especially growing feed for animals) just isn't possible in a desert. Period. I have no idea what the best way is to make this happen, but increasing the real price of water would result in cities outbidding agriculture every time."







Reverse osmosis desalination plant. [Wikimedia](#)

### **Megadrought Moonshots**

Which leaves us with the elephant in the room: [desalination](#). It's expensive, unwieldy, and energy-intensive. Australia spent billions on a desalination plant whose ribbon was cut at the very end of the Millennium Drought. It was never even turned on before it was mothballed, temporarily at least.

Here in the US, we're again experimenting with desal, as it's called for short, too, with [a behemoth of desalination plant](#) waiting in the wings near San Diego. More are proposed along the California coast. Whether or not these plants will be worth the cost and the energy they consume—[the critics are vocal](#)—Grant makes an interesting point.

"The desal story is a bit nuanced," he said. "Even though it hasn't been used to date, the water security it afforded created an environment where more environmentally friendly approaches (like rain water tanks and biofilters) could be trailed." The desalination plant has since become a target of conservatives, who lambast it as a waste of taxpayer funds; [others argue](#) that it will probably be needed the next time Australia enters drought. (There's that megadrought resiliency again.) But knowing that it's one option among many may allow megadrought preppers more flexibility and creativity in pursuing a raft of solutions—even if good, affordable desalination can seem a bit like nuclear fusion, perpetually ten years away.

Still, Grant says that "Technologically, the best fixes are probably water saving appliances and reducing leaks in the potable supply system." More important than desalination is repairing infrastructure; another fundamental plank in our anti-megadrought plan. Here in the US, crumbling water infrastructure [costs us trillions of gallons a year](#).



Patching them up should be a priority before the long dry era hits; leaky pipes are no longer a luxury we can afford in the age of the megadrought. And there's proof positive that upkeep can be done swiftly; cities like Tokyo have done an admirable job at keeping their water infrastructure efficient and functional. The world's largest megacity is actually a marvel of good water infrastructure; after a severe water crisis in the 60s resulted in water being cut to one million residents, Tokyo built a complex system of inter-basin transfers, dams, and high-quality piping that ensures an adequate water supply, delivered efficiently. It also prioritizes maintenance—to this day, Japan's water board issues same-day repairs, and collects a vast amount of data about its system to pinpoint flaws and losses.

To survive decades of dry, Los Angeles and its dry climate ilk will have to follow suit.

Finally, oddball proposals like William Shatner's plan to pipe in water to California from Northern, rainier regions, [are certainly a joke](#). But we should bear in mind that climate change is likely to exacerbate the extremes on both ends—since warmer air holds more moisture, wetter areas are going to see more flooding, perversely, at around the same time that places like the Southwestern are turning into death deserts. Accounting for new water stores in distant areas may eventually prove to be necessary—Melbourne built a mountain-traversing, 70 kilometer North-South pipeline to bring water to the city—but dealing with the weather extremes that result, as [they recently did to tragic effect in Texas](#), definitely will be. Part of the age of the long drought means anticipating them to end, suddenly and violently.

Ultimately, however, preparing for the long dry comes down to the simple stuff. We'll have to work together; even, democratic action was key to keeping the smart but aggressive policy rollouts smooth in Australia. Good, persistent public education about the mounting problem is crucial for broadcasting the fact that the pain and sacrifice is shared, and for recalibrating those paradigms that should become and stay archaic in the age of megadrought. For much of the world, the days of big green lawns and routinely refilled pools are, or should be, over. New technologies, from better water treatment to information-sharing apps to even more efficient appliances, will help.

Whether we choose to stagger through the age megadrought with parched throats, flourish in the face of it, or just dry up and blow away is up to us. It all depends on whether we're able to embrace a rather straightforward principle. Take it from Grant: "Learn to get by on less, and be smart about matching water quality to water needs. For example, there's no need to use potable water for the toilet. That is, quite literally, flushing our future down the drain."

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**TOPICS:** anthropocene survival guides, drought, climate change, carbon, megadroughts, melbourne, Australia, global warming, anthropocene, dry, parched