

Aquatech

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Greg Dalton: I'm Greg Dalton and this is Climate One, a conversation about America's energy, economy and environment. To understand any of them, you have to understand them all.

Our topic today is how technology can ease the three-year drought that is gripping California and the Western United States. Despite recent rains, California's reservoirs and snowpack remain dangerously low. Mandatory water rationing is expected in many parts of the state this summer. But the reality is most homes and businesses have very little information about their water consumption.

Complicated bills arise every couple of months in a format that may or may not be intelligible to average people. Water entrepreneurs are seeking to change that, but they face an uphill battle. Our culture expects water use to be merely free and easy. But climate-driven severe weather is going to make water stress an even bigger part of the California dream that it has been in the past. Can technology save us? What role does human psychology play?

Over the next hour, we will look at water innovation on this program which is underwritten by the S. D. Bechtel, Jr. Foundation and the Pisces Foundation. Joining our live audience at the Commonwealth Club in San Francisco, we are pleased to have with us the CEOs of three startup water companies. Steve Hartmeier is CEO of mOasis, a company working on water efficiency and agriculture; Tamin Pechet is CEO of Banyan Water, which helps institutions manage their water resources; and Peter Yolles is CEO of WaterSmart, a startup helping water agencies provide more information to their customers.

Please welcome them to Climate One.

[Applause]

Greg Dalton: Peter Yolles, let's begin with you. You've been in the water business a very long time. Tell us how you came to your current role.

Peter Yolles: Sure. So I've devoted my career to sustainable water management. I grew up here in California and I lived through several droughts growing up. My first work in the water field was actually working on what was called the Miller-Bradley legislation that became the Central Valley Project Improvement Act, and what it did was elevate environmental protection equal to other consumptive uses.

I went on to work on river restoration with the Nature Conservancy finance water projects. I even did water rights trading between agriculture and cities. WaterSmart Software, my current company, is really devoted to the same topic of sustainable water management by educating urban residential customers and commercial customers around how they use water, how they compare to their neighbors, and the best ways for them to save water in a very personalized way.

Greg Dalton: And we'll get into more of that later. Tamin Pechet, how did you come from Wall Street to currently where you are now?

Tamin Pechet: Well, in the early 2000s, I was working for Goldman Sachs in the energy sector and I had a friend who left Goldman to go help GE buy up water businesses. I remember asking him,

"What is a water business?" because I have never thought beyond turning on the tap and getting water out of it.

Then when I learned that at the time it was a multi-hundred billion dollar industry and it felt like it was a ripe opportunity with a lot less, new human capital entering to solve the problems that existed. I became passionate about it since then. I've worked as a venture capitalist in the sector. I started an organization called Imagine H2O, which helps new innovation reach the market and most recently Banyan Water.

Greg Dalton: Thank you. Steve Hartmeier, tell us about how you came to your current position working on putting little sponges into the soil for crops?

Steve Hartmeier: Well, I actually grew up in California and my first experience was water. It was when my mother was telling me in mid-70s to take the second rinse out of the washing machine to save her Meyer lemon tree in the backyard because you couldn't water anything on your lawns and turf. I joined mOasis really because they had a technology to address the global need which is water, and I became really interested in it because of this technology that could allow you to reduce water consumption dramatically without impacting yields and many times increasing it. I think since water is a finite resource globally, it's something that we're going to have to manage if we're going to feed the world as it approaches 10 billion people.

Greg Dalton: And we'll get to that, but let's put this current drought in context of what people referenced the 1977, 1978 drought. I certainly remember those days growing up in Monterey. Tamin Pechet, is this going to be as bad as '77? Do we know yet?

Tamin Pechet: I certainly don't know and I don't know that anyone knows. I think that what we do know is that, over the past couple of decades, the pressures on our water system have increased so that when we face an acute event, like a drought or alternatively an acute event like a heavy series of rains that causes more water to enter into our storm and sewer systems, we don't have the same level of excess capacity to deal with that as we used to. We just have more people, higher energy cost, higher infrastructure breakage, and so we essentially need a new wave of innovation to address those problems.

Greg Dalton: Peter Yolles, the population of California is about double what it was during the '77 drought. Have we doubled our water capacity? The economy has grown; the population has grown since the last time California had a really serious drought.

Peter Yolles: Well, we actually have become much more efficient since the last drought, especially since 1977. In fact, we're now in an era of peak water, which means that we've actually, in the early 1980s, we used more water than we do today. So there's less water available for our human uses. And so what we've done is actually separate our human productivity from our water use. In fact, our gross domestic product in California has doubled while our water use has stayed flat or even declined.

How we've done that? We've become much more efficient in many of the ways we use water today, so our water productivity has increased. We can generate more economic value from the same amount of water, and even in our homes, we've used and implemented many more water-efficient appliances and devices, so our demand, in a sense, is hardened. We don't have a cushion and we can't conserve our way quite as much as we used to, so we have to look for more and more technological advances and behavioral advances to become more water efficient and maintain our existing lifestyle and way of life.

Greg Dalton: So it's a very positive story, California is using water more smartly, but most people still have very little information about the water they use, where it goes, they get a bill, maybe look at it, maybe it's in English, and maybe it's not. Why is there so little information, Peter Yolles, around water when it's so important, but there's so little information wrapped around it?

Peter Yolles: Well, we can only manage what we measure, and in large extent, we haven't done a very good job of measuring how much water we use and for what purposes. So, for example, we're just now implementing smart meters that just vary at the very beginning stages, whereas in electricity, we've seen much more greater deployment of technology. Water is lagging behind by 10 or 20 years, so that's one piece is measuring the sensors we use to measure water.

Greg Dalton: Why is it lagging so far behind?

Peter Yolles: One reason is that water is cheaper and so there's less reason for us to be measuring that water. The other piece of it is the rate structure, how do we pay for water? So for many places in the United States we pay a flat rate or a uniform rate, which means that we pay the same amount in the first gallon we use as the last gallon, or in some cases, we pay with the same amount no matter how much we use. That's now changing. We're actually implementing what we call "conservation rates" or otherwise known as "tiered rates", where the more you use, the more you pay and I think that makes a lot more sense for the era that we live in today with in drought and reduced water availability.

Greg Dalton: Tamin Pechet, should people pay more money for water?

Tamin Pechet: Well, water pricing is a complicated and pretty hot political topic. I think that what most people would agree on is that we can improve the structures by which we charge for water and sewer services, so that people are provided with their basic needs in an affordable way, whereas their discretionary and excessive use is priced according to how they value it.

Overall, if you look at studies of what a median affordable percentage of household income would be, most studies suggest that would be somewhere between 2% and 2.5%, and we're far less than that, so there's certainly room to increase water and sewer rates.

Greg Dalton: So that saying that there could be a baseline budget for - I think Irvine may be one place that's doing this baseline saying, "Each house gets this amount of water." Of course, in Marin, you got to include the hot tubs and everything else that might be different in different parts of the state, and then pricing goes up from there. Is that where you think we might be going?

Tamin Pechet: I do think that is a growing trend as is tiered pricing for excessive rates. We serve customers in cities all over the country, and in some places, there are actually declining block rate structures so that they have to pay - the utilities have to pay for their fixed costs. And once they do, the more you use, the cheaper it gets. So there's a lot of room for improvement.

Greg Dalton: So are pools in Palm Springs excessive or those are just lifestyle? You fly into some of the places in very arid parts of the state; you see backyard pools all over. Is that something that's sustainable, Tamin?

Tamin Pechet: Well, I think whether you're talking about pools or outdoor landscape watering, all discretionary uses in drought-stricken environments are coming under some pressure. And I think that the lesson that we've learned is that you can't have discretionary water at such a cheap price,

and so most cities have actually been increasing rate structures for what they would consider to be discretionary use and that train has left the station. I think that's going to continue.

Greg Dalton: This is California hot tubs and pools, they're not discretionary; they're part of our lifestyle. Come on, this is why people moved here. Steve Hartmeier, should farmers pay more for water?

Steve Hartmeier: I think farmers are paying more for water now.

Greg Dalton: More than they want to, but still not as much as some people think they should.

Steve Hartmeier: It's a complicated issue when you look at agriculture and farmers and water, because some of it goes back a hundred years to water rights and why you developed it. The reality is, in California, it's the fifth largest ag economy, most of it is in a desert and we're growing crops that need water that are grown in the desert. So the question that really comes in, will a grower pay more for water?

They're paying more now than they have before. Some of them are paying higher market rates, which is improving efficiency, but the question is long-term is, what is a sustainable value for that water as it passes through from a grower to a consumer? And what will they pay then will the consumer be willing to pay if a grower's input costs go up? But I think eventually growers will end up paying more for water because it is a fixed commodity, and eventually, they will have to address the market needs.

Greg Dalton: One thing that's happening in electricity is people paying more certain times of day. Should we pay more for water in a drought? I mean a lot of other things - think of all the other commodities that are traded. Tamin Pechet, you were at Goldman Sachs, right? I mean maybe that's where some of this investment is thinking, but there ought to be some reflection between supply and demand, and that might change depending on water situations.

Tamin Pechet: I think that is happening. The key to making that happen is, as Peter mentioned, being able to measure what you're using and when, so that you can accurately charge for it.

Greg Dalton: Okay. In terms of capital flows into the water sector, why does so little - well, first of all, let me ask, how much money, Tamin Pechet, goes into the water industry compared to energy and other areas of innovation?

Tamin Pechet: Well, what's interesting and I think this highlights how good of an opportunity it is for innovation is water is actually a huge industry. It's over \$600 billion a year in goods and services purchased in the water industry, and yet it's less than -

Greg Dalton: That's in the United States?

Tamin Pechet: That's globally.

Greg Dalton: Okay.

Tamin Pechet: But it's only \$200 million worth of venture investing every year so.

Greg Dalton: The drop in the bucket.

Tamin Pechet: It's a drop in the bucket. Last year, there was over \$29 billion of venture and angel

investment, and \$200 million in the water sector. So I do think that we've been building the capacity for more investment and sort of greasing the wheels, so that we will find better entrepreneurs, more sophisticated investors and capital will start flowing into the sector more than it has, but it's still a small percentage of investment.

Greg Dalton: And that capital flow is going to happen because people see profit potential. They see something that's increasingly scarce, rising prices, better profit margins. Is that part of the picture?

Tamin Pechet: I think that is part of the picture. I think that also what's happened in the water industry is that large industrial conglomerates have decided that the value of water will be appreciated more in the future and is currently a large business. They've bought up midsized companies and now there's a dearth of midsized acquisition targets for those hungry acquirers, which gives small startup companies who are able to grow a good chance of achieving a good return for their investors.

Greg Dalton: Peter Yolles, is government support going to be necessary for innovation in water like it has been in alternative energy or solar? Other energies have had a helping hand from the government to get them off the ground. Is that true for water innovation also?

Peter Yolles: It isn't needed, but it's certainly helpful. And we've seen that WaterSmart was actually started with venture investment. Yet most of our contracts today with the 15 cities around the country we have without a helping hand. However, there is some support coming through both the state of California and potentially through the federal government. The state of California supports water investment and water programs through the Department of Water Resources has an integrated regional water management program, which the state is using to funnel funds to communities who are thinking about how to integrate water management both the surface water and groundwater and waste water.

Altogether, I think that's the right approach for us and I think that there's a big opportunity for the state and federal governments to support innovative new technologies in water management today. I think that's where the big opportunities lie, and I think that the government really sees that today and is thinking about how to incorporate new technologies and thinking about what can Silicon Valley do to address the drought.

Greg Dalton: Tamin Pechet, does the government need to give a helping hand to the water industry to get it more innovative and efficient, or will the market take care of it?

Tamin Pechet: Well, I think you can see that it's possible to build good businesses in the water sector without a helping hand, but contrasting water to energy, water companies have had next to no help.

Greg Dalton: We have a U.S. Department of Energy. We don't have a U.S. Department of Water funneling funds.

Tamin Pechet: There's a very fragmented set of policy decision making and an inconsistent way of supporting new technology in the water sector, and the absolute number of dollars is paltry compared to energy.

Greg Dalton: Peter Yolles, let's talk about the psychology and behavioral science piece of this in terms of what actually motivates individuals to conserve water. It's not Mother Nature or saving a few pennies. What is it?

Peter Yolles: It really is about providing a social framework or a social context in which to think about how people use water in their daily lives. So we've done a lot of research and the research literature tells us that only 1 out of 10 people will change their behavior to save money. Only 1 out of 10 people will change their behavior to save the environment, but 8 out of 10 will do so because of what's happening around them and they see other people doing the same thing, and they want to follow that.

So we're creating, for the first time, a social framework to think about how each home uses water in an individualized way by comparing their water use to other homes with similar attributes, like the same number of people and the same yard size, and comparing apples to apples. And that really motivates people to say, "Gosh, I'm using a lot more than my neighbor's. What can I do to save water?"

Greg Dalton: So does the bill say that you're a pig, you're a water pig? I mean what does it say on there? Does it say you're an outlier compared to your more virtuous neighbors?

Peter Yolles: Yes. We're actually giving people a water score with a smiley face or a not-so smiley face, and color coding them and providing them with a bar chart, which compares their actual water use in the most recent billing period in gallons per day. A unit that people understand, gallons, compared to the average of homes like them, and compared to efficient homes.

So what they'll see is, "Gosh, my line is longer than the other lines of my neighbors and what can I do?" We actually provide them with personalized ways to save water. The best ways to save water at their house, at that time of year and that's really motivating.

Greg Dalton: What's the scale of this? How many company, how many individuals, how much water savings have been realized so far yet in your young company?

Peter Yolles: Well, WaterSmart Software just completed an independent evaluation and pilot study with the East Bay Municipal Utility District. It was funded by the California Water Foundation and the evaluation was conducted by independent researchers. It found that, on average, homes that received our home water reports save 5% of their water use across the first year. They're also twice as likely to participate in the water conservation programs promoted by East Bay MUD, and they were twice as likely to rate their utility as excellent at providing on ways to save money and water at home. So it's really a win-win for the utility and for the customers.

Greg Dalton: And how many locations are you involved in so far?

Peter Yolles: Currently, about 15 cities in California and Colorado, Texas and Utah.

Greg Dalton: Tamin Pechet, you do this for institutional customers, big factories, businesses that save water. What are you finding there in terms of water savings?

Tamin Pechet: Positive trends in two fronts. First of all, those customers are very much profit-motivated, and we're able to show a fast payback and a good return from saving water. They also are starting to value water, not just in the absolute bill savings, but in how it affects their assets.

One of the biggest value propositions to better water management is protecting property, because if you've ever had a water leak in your home or an overflowing toilet, you know how much of a hassle that is and how expensive it is to repair. So our smart system is able to detect and shut off leaks,

which is a significant value proposition to customers.

In terms of overall water savings, you can generate savings from information, and you can also generate savings from using smart control networks to actually automate intelligently using data how and when water is used. In doing that, we've saved over 50% of the initial benchmark water that we control and over half a billion gallons of water last year.

Greg Dalton: Steve Hartmeier, most of the water use in California is for agricultural purposes. You're making little sponges that go in the soil. Tell us what you're doing and how it's helping - potentially helping save water.

Steve Hartmeier: Sure. What we do is we make a great description of a sponge that is put in the soil. When the excess water is put in or water is put in, it absorbs that excess water and stores it to when the plant needs it as the soil is drying out, so you reduce the stress on a plant. And by reducing the stress on a plant, it's promoting more growth rather than looking for water, which results in a healthier plant and higher yields. So the amount of product or crop you're getting per unit of water is increased.

Greg Dalton: And what's the sponge made of?

Steve Hartmeier: It's a polymer. It's a proprietary polymer that was designed as a new technology, a next version of what many of you saw many years ago which was the product is in a diaper. And what this was designed is to make it more environmentally sustainable in farming operations and be able to last longer and be more efficient. So if you looked at soil, six inches of soil weighs about two million pounds, and we put 20 pounds of the product per acre for two million pounds of soil. So it's very efficient in the way it works.

Greg Dalton: Is it petroleum-based?

Steve Hartmeier: Yes.

Greg Dalton: What are the health and environmental impacts of putting that petroleum-based product so close to a food supply?

Steve Hartmeier: Well, anytime you want to put something into an agricultural commodity, you have to get regulatory approval. So we submitted it to EPA, and they looked at it and said, "We don't have any regulatory concerns about it as far as doing testing about residue studies, which are required on conventional pesticides." And then we have to register it with the local ag authority. So we actually went to California Department of Food and Ag, submitted the products, submitted the breakdown structure of it, and they looked at it. And they registered it for use and sale in California and in Arizona, and we submitted it for registration in Mexico.

Greg Dalton: I think I read about another company that's using soy-based products for something similar. Is that an option? To use something that's not oil-based but soy-based?

Steve Hartmeier: What we're trying to do is get the most efficient product that's out there. So if it turns out it's a soy-based product that is efficient and works as well, it would be something we'd look at. We're not concerned right now with the environmental characteristics, it's more the performance characteristics of it that says the product will work in a sustainable manner and perform higher yields for crops with less water.

Greg Dalton: We're talking about water stress and aqua technology at Climate One. I'm Greg Dalton and my guests are Steve Hartmeier, CEO of mOasis; Tamin Pechet, CEO of Banyan Water; and Peter Yolles, CEO of WaterSmart. I'd like to ask you how California is as an environment for starting and growing a water startup business. California is often thought of being not so business friendly, or these people might start businesses, but grow them elsewhere. Peter Yolles, is California a good place to start a water business?

Peter Yolles: I think it's an excellent place to start a water business and there are really three reasons why. First is, we have an excellent venture investment network here in the Bay Area particularly, who are interested in funding clean tech, water, energy startups like WaterSmart Software.

Second is, we have incubators. The best case being Imagine H2O which helped WaterSmart get its start. They run an excellent competitive business competition just for water companies. WaterSmart was a winner of their inaugural competition and it was an immense help to WaterSmart both for credibility and to grow it. The third is we have willing partners, so both from government agencies and from water utilities who are willing to take a risk on new technologies, and to pilot and experiment with new technology. So all three of those are the reasons why California is an excellent place to start a water business.

Greg Dalton: Tamin Pechet, you're also chairman of Imagine H2O. What are the obstacles to fast-growing water businesses in California? What are some of the speed bumps?

Tamin Pechet: I think the first one is there's a pervasive lack of awareness of how good the opportunity is. If you ask the average person, they don't know that water is a big business. They don't know that they could be commercially successful while also doing some good. And I think that extends to their roles in investment and partnering and everything else that you need to get a business off the ground. So one of the obstacles is just showcasing how good of an opportunity this is.

I think the second big obstacle is helping innovation get to market. Water customers, by and large, have been risk averse. There's a lot at stake if you don't manage water properly, and as a result, have been slow to buy. And overcoming the challenge of getting an innovation into customer's hands and getting it proven so that they talk to each other and it becomes broadly adopted, has been one of the biggest challenges and that's what Imagine H2O really set out to do is to provide a conduit to market for innovation.

Greg Dalton: So water as big business might make some people nervous. General Electric, Goldman Sachs getting into water might make people concerned about privatization, the profit motive putting upward pressure on water prices which is necessary for life. So what would you say about the concern about privatization, Tamin Pechet?

Tamin Pechet: Well, some of the large companies in water are not actually privatizing water in the sense of the systems that we depend on as residential water customers; they are serving predominantly large industrial users for things like treating their water. On the other hand, many of the large privatized investor-owned utilities in the water space have been successful because they have been able to achieve efficiencies.

And one of the reasons for that is that, in the U.S., for example, there's a fairly limited number of investor owned electric utilities, whereas every town sprouted their own municipal water system and we have over 50,000 of them. It's illogical to think that all 50,000 of those are managed as well as

they could be, and so I think one of the alleviations to concerns around having private ownership and management of water systems, is are there strong institutions to protect stakeholders who could be at risk if things go off the rails.

Greg Dalton: Let's talk about some cool technologies. What are some companies and technologies we may not have heard of in the water area that you'd like to share? Steve Hartmeier, anything that's crossed your radar in terms of, other than your own company, who's out there doing cool stuff in water?

Steve Hartmeier: I think in general in water what you're seeing is the software and hardware that you would see monitoring some of this technology. These guys are doing and moving into ag right now, so there's a lot of startups that are out there monitoring the water, monitoring wells, monitoring the right time to pump.

You had mentioned earlier about electrical rates, most growers now try to use most of the electricity at night when it's cheaper. I mean it's counterintuitive, but that's really when it's less expensive and the same with water. And so there's a lot of new technology out there for monitoring water on a per acre basis.

And so I think what you see is software moving into the agriculture space. And then most recently, there was a number of acquisitions where you see where the data mining, an ability to take data in agriculture and mine it for most efficient use. Climate Corp is probably the best example where there's a large acquisition, and that's really a data management which will help growers really use water more efficiently.

Greg Dalton: I read about one called WaterFX. They're using solar power to desalinate water, drainage water that can no longer be put into the San Joaquin River, and they're desalinating that water using solar electricity and they have a reverse osmosis plant next door, so that's clean energy, clean water. Tamin Pechet, what are some other things, cool things happening in water technology?

Tamin Pechet: If you're willing to look, there's a lot of really cool stuff out there. The history of water in civilization is one of innovation. It's just that it's been local innovation and it hasn't spread broadly to the market. And so just about anything that you dream up or think of is something that someone could innovate and come up with. If you look hard enough, you can find a company doing it.

Banyan Water actually got started by buying one of those small technology companies, and we've been out on the hunt for more really in the IT space as Steve mentioned. I have the pleasure of seeing around a hundred new water technology companies every year come through the Imagine H2O program, and that has different programs every year around different needs in the water sector. And this year's is water innovation for food and ag.

In that context, we've seen some really innovative companies gathering data in interesting ways to help manage water better in farms and in food processing context. And we've also seen a lot of innovation of taking waste and turning that into value-added byproduct in agriculture, in particular.

Greg Dalton: And there's one called Planet Labs that's doing some cool things with mapping. Who knows about Planet Labs? Peter Yolles?

Peter Yolles: Yes, I'm familiar with it. So I think it's sensing, in particularly remote sensing, which means the use of satellites to gather imagery of the earth's surface is really cool. So Planet Labs is actually a new startup and they're launching about 60 or 70 low-orbit satellites that actually will only

be up for two or three years before they come back and burn up in the atmosphere.

But during those two, three years, they actually take very precise imagery largely of environmental factors of water, water temperature, vegetation. All that information would then be sold to companies who are managing water and land and agriculture to make them more efficient. So I think remote sensing and sensors, in general, are really going to be a growth area in this industry.

Greg Dalton: We're talking about water technology at Climate One. A lot of California's water history has been finding new supply, developing new water, so is that era over? Are more dams drilling deeper? Most of the rivers are tapped out. Tamin Pechet, is developing new supply, is that over?

Tamin Pechet: It can't be over because we're going to need more supply. So it's not over, but I think that what I hope will be increasingly recognized is that the cheapest source of new supply is efficiency. We have made significant efficiency gains, as Peter mentioned earlier, but we're far from a water-efficient civilization in the agricultural or the urban context. And I think we see proof of that on a daily basis with our interactions with very sophisticated business users of water, who have a long way to go and lots of savings to achieve. In addition to more efficient use as a source of supply, I think we're going to see increasing reuse in recycling of water as a source of supply, and more and more plants and systems set up to do that.

Greg Dalton: Greywater used to be illegal in some places. I think San Francisco and others have done that away because there's health concerns about standing water and parasites, et cetera. So is greywater something that an average homeowner ought to think about capturing? My grandparents had a cistern down in the basement. Is that something we're going to see coming back, Peter Yolles?

Peter Yolles: I do think it's going to come back. In fact, it's becoming very popular in a lot of places because, especially in a Mediterranean climate like here in California, greywater is much more efficient than say rainwater capture. Because here, the rain doesn't usually come down from April to October, but you are using water every day in your home, and that's the water that can be reused at your home through laundry to landscape, or capturing of shower water and to be put into your gardens, for example.

Greg Dalton: Showers to flowers, laundry to landscape, okay.

Peter Yolles: That's right. So I think it's a great way to sort of go off the grid and a way for water just like you would for solar on your home.

Greg Dalton: So what does that mean? Putting a big tank outside or in the garage? How does that work?

Peter Yolles: It works if there's a capture system usually in the gross space of a home. They gather it, they run it through a filter, and then it gets spread out as the water is used into your garden. So laundry to lawns or other shrubbery, and there can be a storage tank, but it's not very large. So it just goes out as you use water in your home.

Greg Dalton: And if you don't have an outside need for that water, if you live in apartment in San Francisco, you can't get into the toilets probably without some serious plumbing, so you have to have some landscape needs to do that.

Peter Yolles: That's the best way to use greywater. I think we've seen some large buildings,

including the Academy of Science here, use rainwater capture and then that water can be used for some indoor purposes.

Greg Dalton: What are some of the top 10 tips, Tamin Pechet, that people listening at a home ought to do, check your toilets, but what are some of the top 3 tips for water efficiency for homeowners?

Tamin Pechet: Well, one tip would be look at your bill, which I think a lot of people don't do.

Greg Dalton: Let's ask how many people understand their water bill? We'll just ask for maybe a fifth of people in the audience say they understand their water bill. Okay.

Tamin Pechet: And understanding your water bill is a pretty complicated task, especially if you're a big business with a complicated water bill and lots of meters, but it's pretty hard for most homeowners if it hasn't been simplified for you. And a lot of times, you don't get a bill in a period of time that would enable you to understand what you could do differently. You get a bill 60 or 90 days in arrears.

So the first thing would be, look at your bill and understand it. The second would be most utilities really offer a lot of programs to help homeowners become water efficient. There is lots of free stuff out there if you go to your utility. So I would look into that. And a third would be one of the largest sources of waste in the U.S., in cities, is outdoor watering. The EPA estimates that 50% of water used in cities is used on landscapes, and about 50% of that is wasted.

There are increasingly sophisticated control technologies that function like a nest thermostat that manage your outdoor water. We use those for clients in the industrial and institutional context, and they work very well.

Greg Dalton: So that means they won't water your lawn. Hopefully, you don't have a lawn, but it won't water your landscaping when it's raining and things like that?

Tamin Pechet: Right.

Greg Dalton: Peter Yolles, tips for home water efficiency.

Peter Yolles: Well, it turns out that 1 out of 4 homes at any time have a leak, so leak detection is really important. And so one of the things that WaterSmart is doing is implementing leak detection technology, so when we analyze historical water meter data, we can actually flag a home that may have a leak and communicate that to the homeowner, or to the utility which can then call the homeowner themselves to help identify it.

So we're helping empower homeowners or residents to identify leaks themselves, find out where that leak might be occurring, and put a stop to it. So that's really one of the great ways that we can save water at home.

Greg Dalton: I've talked to one expert recently who said that toilets can leak and you may not hear it. You think that, your toilet is leaking, you'll hear it. Toilets can leak a thousand gallons a day, and the way to test it is you put food coloring in the tank. And if the food coloring comes into the bowl, you know that you've got a leak and you may not know it. But you could be losing a ton of water through a bad toilet.

Peter Yolles: You can have those continuous leaks like a toilet leak, or you can have a leak in your

irrigation system. You may never find it because oftentimes those irrigation lines are underground, and you may not even see it. We found in the city of Sacramento where we work and they have smart meters, they're actually logging water use on an hourly basis. We actually found one leak of 67 gallons per hour, and we actually flagged it and messaged the homeowner, who have then discovered it and stopped it the next day.

Greg Dalton: What percentage of Californians have smart water meters?

Peter Yolles: It's less than 10%, but it's growing quickly.

Greg Dalton: We're talking about water and technology at Climate One. Our guests are Peter Yolles, CEO of WaterSmart; Tamin Pechet, CEO of Banyan Water; and Steve Hartmeier, CEO of mOasis. I'm Greg Dalton. Tamin Pechet, what are some of the model societies or cities that manage water really well? I'm thinking globally. Who does it really well?

Tamin Pechet: Well, not surprisingly, the regions which have experienced the most acute pain around water management have developed the most sophisticated mechanisms for dealing with it. You started to talk about Israel. I had mentioned Singapore and Australia as other examples. I'd also mention the Netherlands in a different context, which is because of the geography there and the topology, they have serious flood issues. And we think about water here, mostly in terms of how to deal with too little of it, dealing with too much water is, as we've seen in places like New Orleans, an equally dire problem.

Greg Dalton: Let's talk about the California Emergency Drought program in terms of, recently California passed about \$700 million to address the droughts. Steve Hartmeier, is that money going to good use?

Steve Hartmeier: I think anytime you address the fact that California has a drought, the money is going to go to good use. It's more of a longer term use than a near-term use, I think, in addressing long-term issues related to California agriculture. So I think anytime you focus on the fact that California is in a drought, you mentioned earlier about the supply issues, I think it will be in a perpetual drought. There just not going to be enough supply to address it and so anytime you have a program that raises awareness about that, it will address it.

Greg Dalton: How about climate change? With your clients, you're dealing with the agricultural sector, how do you think climate will affect future water stress?

Steve Hartmeier: I think there's no doubt that agriculture is looking at climate change and say, "How do you position yourself longer term for climate change?" and water is obviously one factor of that. In the Central Valley of California, it's growing in a desert right now, so they're figuring out how do you be more efficient with water?

Tomato production in California, everybody is probably seeing, at some point, the big trailers running up and down I-5 with tomatoes. In the last 10 years, they, for example, have gone from furrow irrigation to all drip irrigation, and it's done two things really for them. I think one they anticipated, was they use a lot less water, but they've also had a large yield increase, which means if you need so many tons to supply the needs of the canneries, you're going to need less acres and less waters to supply those tons because the water is being used more efficiently.

The other thing I think what's happening globally is there's lot of areas in the world - you mentioned Australia - where they are already dealing with a drought. One close by here, which everybody in

this room, your winter vegetables basically come from Mexico. Well Baja, Mexico has been in a drought ever since the Colorado River started to shut off.

And so they're probably further ahead than the U.S. and really looking at water management. There's tomato growers down there right now and strawberry growers where we get all our winter vegetables that already have desalinization plants, and they're looking at, how do I manage water cost when I don't have fresh water to irrigate my crops?

Greg Dalton: Peter Yolles, on the Emergency Drought program, California has \$700 million. Is that being well spent?

Peter Yolles: I do think it's going to be very well spent. The majority of it will then go through the integrated regional water management programs to the local authorities who know best how to spend that money. I think that we now have technologies in recycling, in storm water capture and efficiency where we're going to really make good use of those two. It will increase.

The name of the game is local supply reliability, especially in a year like this one where the state water project and the federal Central Valley project have decided to provide zero water allocations to their customers. That means local communities are on their own and I think it really highlights the importance that each community, each region be self-reliant. And recycling storm water capture and efficiency really are the ways to do that.

Greg Dalton: What about more dams? There's not enough capture. California only has what? Three years of storage. We're on our third year of a drought. Does California need more concrete and steel for capture?

Peter Yolles: You know, dam sites have pretty much all been taken. We now have 10,000 dams here in California alone and about 50,000 nationwide, so there really aren't very many. There are no on-stream storage spaces left, they've all been taken. In fact, we're now taking dams out in many places to restore fisheries, which needs to occur. So we're looking to other storage options, particularly groundwater storage, conjunctive use. That's really an area where California can make great strides in reforming groundwater policy to encourage and incentivize more groundwater storage.

Greg Dalton: Los Angeles did some good things and they're in better shape, partly because they did some groundwater storage. Tamin Pechet, Steve Hartmeier mentioned desalination, is that part of California's future?

Tamin Pechet: I think it probably is. It's very hard to build new desalination capacity, but it depends on how stressed we get as a region, that can be part of the solution. There are costs to desalination. There are costs to just about every other source of water. I would hope that we push as hard as we can on efficiency before we start pushing on building more projects and steel, but I think it's likely to be a continued part of our future.

Greg Dalton: Peter Yolles?

Peter Yolles: Yes. I wanted to add something about desalination. That's very expensive, so we do have to think about the cost of water. We talked about rising prices. And as we have less water available, we're going to go to more and more expensive new sources of water. It could be desalination. It could be longer and longer pipelines and farther away. All those things are going to drive water prices higher.

Desalination in the plants that California is building is going to be over \$2,000 per acre-foot. Efficiency like WaterSmart is less than \$500 per acre-foot, so communities can actually reduce their cost by becoming more efficient and pass those savings on to their customers.

Greg Dalton: From a climate perspective, desalination is very energy-intensive, so it's burning some fossil fuels usually to get that clean water supply.

Let's turn to audience questions. Welcome to Climate One.

Male Participant: Hi. I run a waste water agency and you haven't spoken about recycling waste water which is becoming more and more common in California as a source and at a cost-effective price compared to desal certainly. I wonder if you could talk a little more about that.

Greg Dalton: Toilet to tap, who wants that? Peter Yolles?

Peter Yolles: I'll take that. Waste water recycling is actually really important. When I mentioned recycling, I meant to include waste water recycling. Orange County, for example, is a real leader in this area where they're actually recharging groundwater basins with treated-waste water, and then they pump it back out later. And they are using it for what they call "direct potable reuse," so they can actually use it for indoor uses, and I think it's going to become increasingly important to do that. You mentioned Israel earlier. Israel treats and reuses 85% of its water today, a real leader. Out here in California, I think, we reuse less than 2% of our waste water here, so there's a huge room for improvement in that area. So thanks for that suggestion.

Greg Dalton: Steve Hartmeier?

Steve Hartmeier: Yes. I think in agriculture, one of the probably the biggest success stories in waste water is down where most of our artichokes come from down in the area between Santa Cruz and Monterey, where they teamed up with the urban users of water and figured out how to use waste water out of treatment plants to do two things. One to provide irrigation water for - they don't really want me to tell you this - for most of the artichokes that you eat are using waste water, retreated water. And then two, because they're pushing that water down into the aquifer, it's keeping the saltwater out which is basically meaning the saltwater isn't coming in and contaminating the ground which it would need more water to push it back down into the aquifer.

Greg Dalton: Tamin Pechet, anything to add on waste water?

Tamin Pechet: Waste water reuse is one of the fastest growing subsectors of the water industry, and we have seen successes with it with many of our customers off-taking city partially treated waste water and using it for irrigation. In the industrial context, on site, a lot of sophisticated industrial manufacturers reuse the water in their production processes. That has grown substantially and been very successful.

Greg Dalton: Let's have our next question on Climate One. Welcome.

Male Participant: Hello. Thank you all for being with us tonight. You mentioned regulatory context in terms of government support. I wanted to know in terms of legal and otherwise framing issues, do we have either laws on the books now that are still holding back some of these innovations, or just the fact that every community has to approve it on its own and doesn't have a common basis. And/or for things like San Francisco allowing indirect reuse and greywater use, are there still laws that we need to reform to allow some of these efficiencies to be brought into a marketable scale?

Greg Dalton: Tamin Pechet?

Tamin Pechet: I'll take a stab at that one. I think that you alluded to one of the big opportunities for improvement there which is because every town created its own water and waste water system, the policy governing what you can and cannot sell as a solution and innovative solution to water needs varies from town to town, which makes it very hard to have a cookie-cutter solution and to have that approved everywhere. More consistent policy which could come actually in the form of copycatting successful policy, I think will help quite a bit. I think the second area for real improvement is that what's easy for agencies to manage is stuff, widgets, things. Sell a toilet, we'll give you a rebate on that, a showerhead, et cetera, as opposed to measuring and verifying the outcome of programmatic initiatives to improve water supply and use.

Greg Dalton: Let's have our next question.

Gary Malazian: Hi, Gary Malazian. Thanks for your participation. I've heard quite a few of these talks and have done a lot of reading on this and studied it in school as well. I'm curious why we don't ever talk about water law and how that's affected the supply and demand of water in California. Nobody has mentioned that. Like Westlands Water [District].

Greg Dalton: Very arcane area. Who would like to? Steve Hartmeier?

Steve Hartmeier: I think with most things associated with law, it's best left to the lawyers to debate whether it was good, bad or otherwise. I guess if you have water rights that were at the turn of the century and you bought ground, you think the water laws are great. I think if you are looking for new water sources, sometimes they seem archaic, but it's part of the water debate and it will always be part of the water debate. I don't know if you could solve it now or comment other than it's always going to be part of the debate on water use and pricing and who should use it.

Greg Dalton: Peter Yolles?

Peter Yolles: I'd like to add a little bit up there. So we do have water laws from the 19th century. We're looking for new technologies to reform an old industry, and I think that we can reform some laws and we can implement new policies that can encourage and incentivize new technologies like Tamin's company Banyan and WaterSmart Software and the many others that we talked about today.

We're looking for agricultural users, urban water districts, municipalities to try out new technologies to create an environment where they can try on new things in a conservative environment and conserve the culture. I think that's really important for us to address 21st century problems with 21st century technologies.

Greg Dalton: But it sounds like it's a very decentralized system, so that kind of change is going to have to happen at the local level. I've had state senators here before, Republicans and Democrats, who said that water rights is sort of beyond the legislature. Sacramento can't get at it because it is at that local level. A lot of water agencies are not under the California Public Utilities Commission, they can't get at it. Is that a fair and accurate that it has to happen at the local level? There's nothing that can happen statewide from Sacramento?

Peter Yolles: I disagree. I think there's a lot that the state can do actually. In fact, [California Senate President Pro Tem Darrell] Steinberg from Sacramento and the governor just signed this law

which is it is about money - the \$700 million - but also it's about policy change. There's also a talk about another water bond. And again, it's not just about money, but we can actually create policy change in a good way to create those incentives for new technology and I think that's really important that we all get behind that.

Greg Dalton: Let's talk about that water bond before we go to the next question. Some say \$6 billion, some say \$11 billion. Tamin Pechet, is that a good thing? Will it pass? What's going to be in it?

Tamin Pechet: I don't know if it will pass and I think that one of the most hopeful signs I've seen around water bond measures actually came out of a report between Sirius and JP Morgan which looked at bond pricing in the municipal markets, and water supply and infrastructure risk, and essentially suggested that investors should start pricing bonds in part based on water supplies and the quality of the water systems. And so I do think that bonds can serve as a signal to the financial and capital markets, and then affect better water management as a general matter.

Greg Dalton: Steve Hartmeier, do your agricultural customers want a water bond on the state ballot in November? Do they think that's going to be helpful to the agriculture industry in the state?

Steve Hartmeier: I haven't taken a poll of our customers to say whether or not they want a bond. I think anything that addresses the water needs of California, they would support it.

Greg Dalton: Even at \$11 billion?

Steve Hartmeier: If it supports it, they would. The question I would ask is, is the state of California ready to support a bond? And I'm not sure that they are.

Greg Dalton: It's not clear yet. Peter Yolles, any thoughts on a water bond?

Peter Yolles: Well, I think we never want to waste a crisis and we're in one today. And the bond and the urgency bill that the governor has signed are the best ways for the state to address it. I think there's a lot of good things in the current versions of the bond - there are many - and I think it's important that it's the best way for us to prioritize what's important to our state and water is what makes our state go. It's clear that in today's climate and today's infrastructure, it's insufficient for us to maintain our way of life.

We have water rationing today and we have 17 cities that are planning to run out of water in the next 90 days. Things have to change. I think the state needs to take the lead in showing communities and regions the way to innovate and provide new ways of doing business and new technologies to innovate.

Greg Dalton: Peter Yolles is CEO of WaterSmart. We're talking about water and technology at Climate One. I'm Greg Dalton. You can listen to a podcast of this and other Climate One programs in iTunes. Let's have our next question. Welcome.

Greg Dalton: Let's have our next audience question.

Male Participant: I'd like to hear more details about the consumer pricing of water, specifically where do you draw the line in distinguishing basic cost versus discretionary price? Is the price of water contingent upon climate and geography? So, for example, is the basic price of water going to be different for San Francisco versus Chicago, or versus San Francisco versus the desert? And so

what are those things that are going to determine what that line is between the basic price and the discretionary price? And what volume is going to be offered in where that is in terms of basic pricing?

Greg Dalton: That's politically charged, to some people a lawn might be wasteful, discretionary, to others a lawn might be sort of a deeply held value, or something that they got to have. Peter Yolles?

Peter Yolles: I think there are a couple of components to water pricing. The first is how has your community invested in water infrastructure in the past? Now, what they do is to issue bonds. They pay it off over 30 years, just like with your home, and so the prices today often reflect the previous investments that your city or water district has made.

The second component is what the water rate structure is that they have applied on how to pay back and to run other operating cost. So you can have uniform rates or you can have these increasing tiered rates. Where those tiers are, where they're set, determines whether people have lifeline rights for indoor usage.

Greg Dalton: We're in a situation where we're about to have water rationing and if there's percentage cuts, the people who have been water efficient are going to be punished, whereas the people who've been lavish with their water, they got up some cushion, they can afford to cut by 20% because they haven't been as miserly, as economic with their water. Steve Hartmeier?

Steve Hartmeier: I think unfortunately, that's somewhat of a harsh reality. A lot of people in agriculture have seen that where they went to drip irrigations or subservice irrigations, and all of a sudden, they had to cut their water use. I think unfortunately -

Greg Dalton: Good guys get punished.

Steve Hartmeier: A lot of times that's the reality of it, the good guys do get punished because they're a little bit more efficient. On the other side, because they're more efficient, they're cutting their cost dramatically which means they should be receiving on the other side. But I think unless you have a way of measuring, whether it's a homeowner or an agriculture, I would say, "You've been more efficient going forward, so we're not going to hurt you as much." Then the model would be more something like they were discussing about earlier for this area or this set, this is what you should be using. And anything above that, you're going to pay more for, which then wouldn't penalize the person who has already been saving.

Greg Dalton: Peter Yolles, a lot of the people in charge of water agencies are politically elected and perhaps they have political ambitions. Changing water pricing is fraught with political peril.

Peter Yolles: That's true and in fact there is limitations on the types of rate changes that publicly-elected boards can do and it's called Prop 218 that actually go out to about leadership to change rate structures many times. So what public-elected boards and councilmen or council people are looking for is ways to reduce the cost and don't increase rates so fast.

Now, what is actually happening is that water rates are rising much faster than any other utility today. In fact, water rates, since 1980, have risen at about one and a half times the rate of electricity. So while you may not think of water is very expensive today, it's becoming more expensive and you'll see that be reflected in rates. And our public officials are looking for ways to reduce the rate of increase of those water costs. The best way to do that is to do more water efficiency to keep the cost down instead of building more and more expensive water supply projects.

Greg Dalton: But isn't a lot of that cost increase because the water infrastructure in this country like our bridges and a lot of other things are antiquated. We have a lot of deferred maintenance so it's the chickens coming home to roost. We're paying for all this stuff. We've been kind of driving that car until 200,000 miles, and now it's just dying out on us.

Peter Yolles: That's right. The amount of deferred maintenance on our water system in the United States is estimated to be between \$500 billion and \$1 trillion over the next 30 years. So there's really no end in sight to water rate increase. The average water increase per year, over the last 20 years, is between 7% and 10%. That's expected increase indefinitely, so it's imperative that we look for new cost-effective ways to provide water.

Greg Dalton: And Tamin Pechet, with supply shocks, climate change, driving water stress, both too much water and not enough water, our systems are going to be tested in a way they've never been tested before and they're not ready. Or are they ready?

Tamin Pechet: They're not ready. That really is deferred maintenance CapEx. The gap is not closing as fast. Every year, that gap keeps getting pushed forward with minimal spending. I think there are a couple of encouraging things around that. The first is that an entire industry has sprung up called trenchless technology, which really is around smart infrastructure and repairing our broken roots of our system with a minimal cost and minimal disruption.

And the second is that water agencies have gotten smart and creative about creating a little bit of a dichotomy between stated rate increases and the actual increases on the rates paid by large users. As an example, one of our customers wanted to know, in a city, how much their rates were projected to go up next year. And the stated rate increase in that city was 6% and the effective rate increase that they were going to pay based on their meter sizes, the type of user that they were, et cetera, was 24%.

Greg Dalton: Wow. We got a couple of minutes left here. Quickly, what can we expect the rest of this year, this cycle? We've had some rain recently; maybe the drought is not as bad. What's your crystal ball for the rest of this water year, Tamin Pechet?

Tamin Pechet: I think that there will be enough attention to spur more interest, to spur more financing and entrepreneurship, and talks like this, events like some of those that are going on in Silicon Valley, will hopefully lead to a little bit of a catalyst for some more innovators coming in with solutions other than just building new steel and raising water prices.

Greg Dalton: Steve Hartmeier, are we going to have fundamental change in the way water is managed in the Central Valley as a result of this drought?

Steve Hartmeier: Firstly define fundamental, but I think there's already a rapid change going on and it will just be enhanced and sped up. Because right now, there's a system that isn't sustainable for agriculture right now in the Central Valley, or whether it's any water use in irrigation, whether it's ag, urban, golf courses, the Olympic club down the street if they want to water their golf courses, et cetera. There really is not a sustainable system we have now.

What the drought has done is raised the awareness. I think somebody mentioned earlier that all of a sudden it's brought up to the forefront, and I don't see that changing. I think what it will do is it will make change occur faster, whether it's investment in venture capital, new technologies or just growers figuring out how they can farm their last - half the crop that they normally would do.

Greg Dalton: Peter Yolles, are we going to go back to our old ways? If we get a bunch of rain, we're going to go, "Oh, it's over, we can go back. Forget about it."

Peter Yolles: I don't think so. I think we're in a new era and I think we all realize it. I think we're going to have to change our policies and reinvest, apply new technologies, and look to Silicon Valley for new solutions like software and some of these companies that we're talking about today. In addition, I want to bring up one other area that we haven't talked about today, which is the environment and I serve on the board of the Scott River Water Trust, and I just heard today that the snowpack today up in the Klamath River Basin is just 8% of normal. Eight percent.

So what does that mean for our salmon fisheries, for our farmers in that area? It means we're in a long-term longer term drought. We're going to have drought this summer, it'll probably be a multi-year one. And I think that we're in the new normal and we'll have to make the changes we talked about here today.

Greg Dalton: I want to end by asking each of you how you've managed your own personal water and carbon footprints starting with Steve Hartmeier.

Steve Hartmeier: I see a water bill. I have four sons and one thing my carbon footprint has done is dropped dramatically as they've gone away to college.

Greg Dalton: You've exported your carbon, okay.

Steve Hartmeier: I moved it somewhere else.

Greg Dalton: Off your balance sheet, yes.

Steve Hartmeier: Well, actually, they didn't take a car with them, so I know I dramatically reduced it because of community - but no, I think my personal carbon footprint every month, I see electrical bill and with four boys I've watched it for years to see whether it'd go up or down and the same with my carbon footprint with water. In the area I live, report water, use month by month and I found out - and maybe I should let them talk to one of you guys about metering - because I found out once when I called them, "Why did my water go up when I still haven't turned my irrigation on?" and they said, "Well, we sort of average it on a month-to-month. We only read it every two or three months."

So they had a data reporting system that was flawed to begin with, but I think everybody looks at carbon footprint right now and especially if you have kids in college and the next generation coming up. If you don't look at it, then raise your awareness very rapidly about what impact you're having on the environment.

Greg Dalton: Tamin Pechet, quickly your own water and carbon.

Tamin Pechet: Well, a couple of months ago, my wife gave me grief about our water bill, so I'm currently looking into solutions to reduce it.

Greg Dalton: It took that. Okay, all right. Peter Yolles?

Peter Yolles: Well, since we've purchased our home 13 years ago, we've been reducing our water use every year. In fact, we started off in 2001 with a total water use of 300,000 gallons, and last year, it was 100,000 gallons. And I think anyone with a home can do just as much to help reduce

their water use and in better energy. And their water use, like the water we use at home can help reduce our carbon emissions and footprint too.

Greg Dalton: We have to end it there. Our thanks to Peter Yolles, CEO of WaterSmart; Tamin Pechet, CEO of Banyan Water; and Steve Hartmeier, CEO of mOasis. I'm Greg Dalton. Thanks for coming to Climate One today. You can listen to a podcast of this and other programs in iTunes. Thanks for coming.

[Applause]

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