DR. MICHAEL KIPARSKY: Can Recharge Net Metering contribute to sustainable groundwater management?

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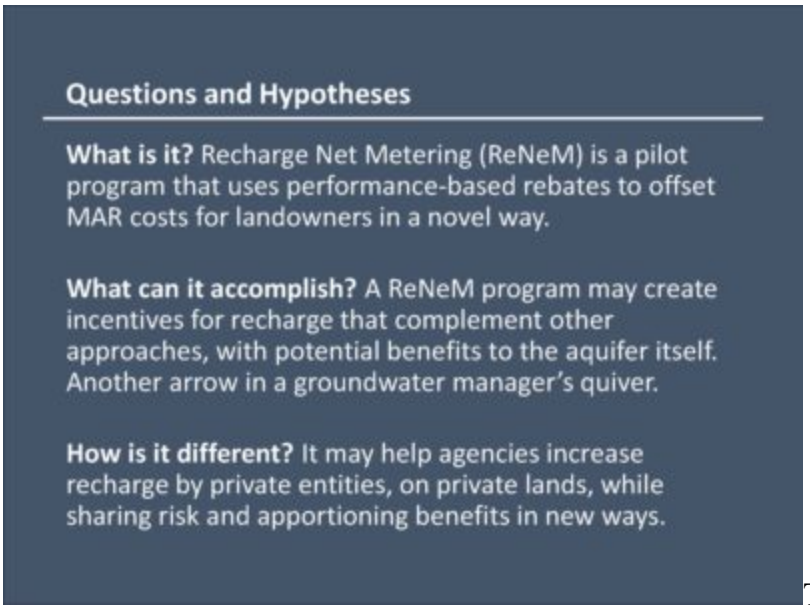
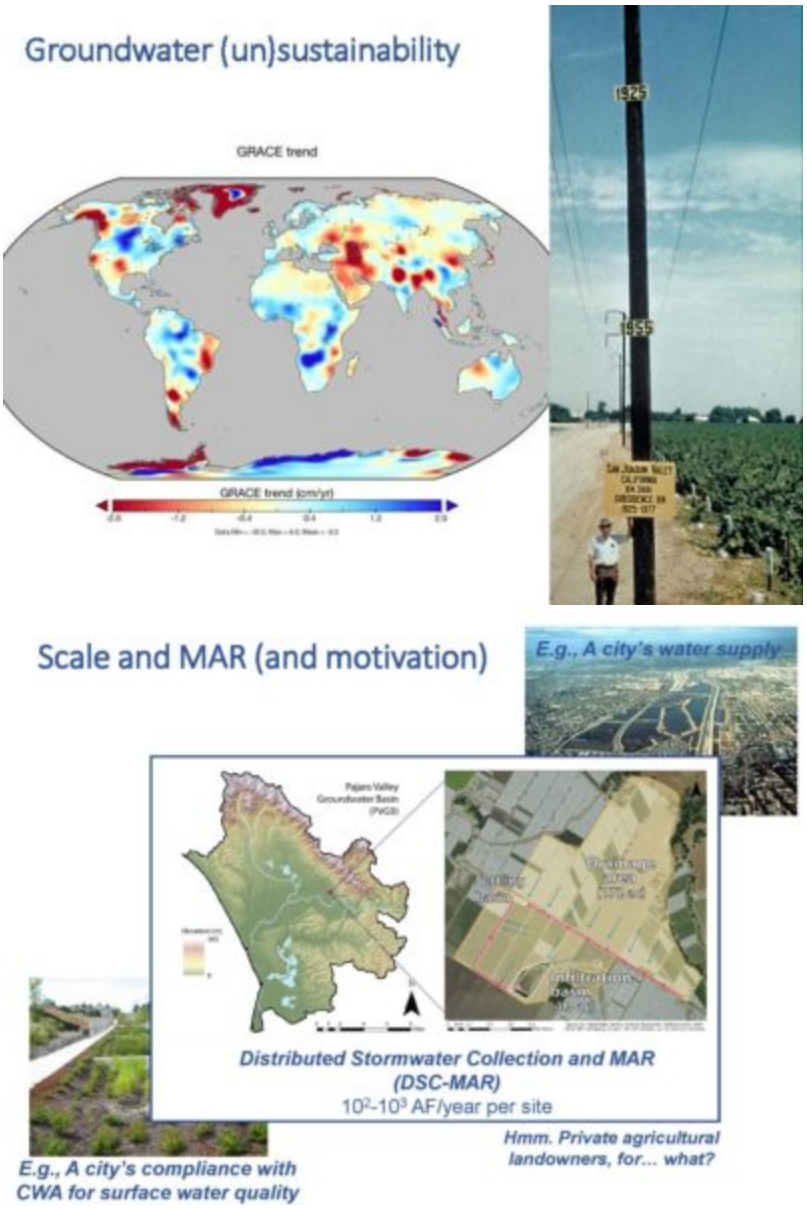
Dr. Michael Kiparsky is the founding director of the Wheeler Water Institute within the Center for Law, Energy, and Environment at the UC Berkeley School of Law and has worked at the intersection of the technical and policy aspects of water resources management for 15 years. In this presentation from GRA's 2019 Western Groundwater Congress, Dr. Kiparsky discussed a pilot project in the Pajaro Valley that is designed to incentivize private landowners to do groundwater recharge.



The recharge net metering pilot in the Pajaro Valley is a pilot program that uses performance-based rebates to offset managed aquifer recharge costs for landowners in a novel way, he began. A recharge net metering program may create incentives for recharge that complement other approaches with potential benefits to the aquifer itself.

"*Essentially, Recharge Net Metering is another arrow in the quiver for groundwater managers and has particular relevance for SGMA in ways that I will discuss,*" Dr. Kiparsky said. "*Recharge net metering is different because it can help agencies to increase recharge by private entities on private lands while sharing risk and apportioning benefits in ways that are different than the other schemes that we've observed previously*."

California is not the only place that is struggling with groundwater management; the impacts of groundwater mismanagement are increasingly apparent around the world and it's impacting groundwater users, ecosystems, communities, and the future sustainability of the resource itself, he said. He pointed out that this has been known for many years but we still haven't solved the problem, so this is why we need to try innovative approaches and new methods to address this problem.



One of those methods revolves around managed aquifer recharge, which is defined as using natural or built infrastructure to increase the amount of water that infiltrates into aquifer systems. Managed aquifer recharge takes many forms and operates on a number of different scales. There are very small scale low impact development techniques and best management practices that can infiltrate small amounts of water per site; at the other end of the spectrum there are large regional spreading grounds such as in Orange County that can infiltrate a significant amounts of water into the aquifer.

In the Pajaro Valley, the projects are intermediate in scale. Dr. Kiparsky noted that they are also distinct in a number of other ways. "*BMPs in an urban context typically have a city as the primary actor and proponent that is interested in compliance with the Clean Water Act; surface*

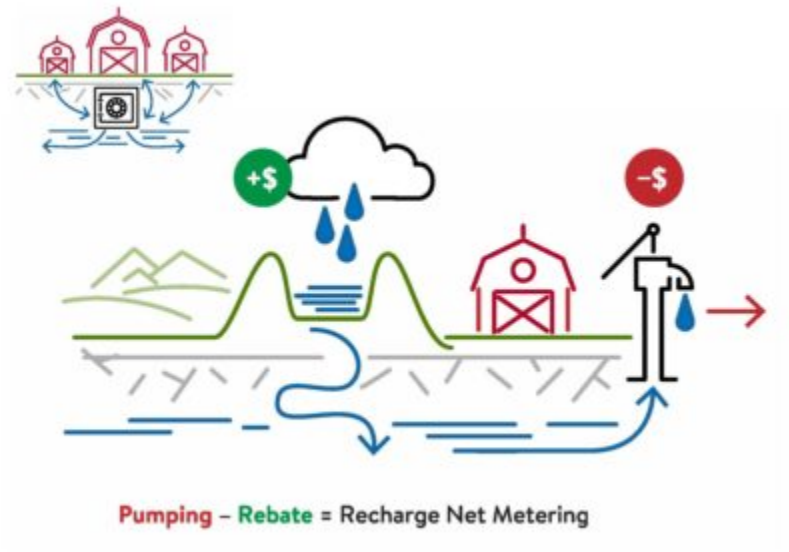
water quality is one of the main goals in avoiding hydro modification as much or more than augmenting the groundwater resources for supply purposes itself. At the other end of the spectrum, the large regional spreading grounds will have an urban entity as the primary motivator, but they are often focused on water supply and in particular, a water supply that that city as the infiltrating actor can expect to remove at some point in the future for a future use."

He pointed out that private agricultural landowners comprise much of the land use in many basins around the world that are impacted by groundwater mismanagement. So by only focusing on centralized projects where a particular public entity will own and control the land on which recharge occurs, we're missing an opportunity by not accessing a lot of the land that is in privately held.

He acknowledged that agricultural lands tend to be surrounded by other agricultural lands and therefore there's no way to exclude neighbors from taking the benefits of water that's recharged under your lands, so the motivation and incentive is weakened or not there at all.

"*This is because groundwater is the classic common pool resource,*" Dr. Kiparsky said. "*Because many users have access to the same groundwater system, there's no one individual that asserts control over that resource, and because of that, none of the many users have strong incentives to exercise restraint in its use and that leads ultimately to the race to the bottom that we're all really familiar with*."

"*Now the flip side of this take on the common pool resource management problem is that because none of these users control the resource, they can't exclude their neighbors from these benefits, and then there isn't naturally an incentive to invest in these recharge projects which take time and effort to put into place. So how can we develop incentives?*"



Recharge net metering program is similar to net energy metering. For example, if an individual has solar panels on their house so whenever the sun is shining, they are generating power whether or not anyone is home; the electricity that is generated but not used runs onto the grid and the electricity meter spins

backwards. At night when it's dark, the power now comes from the grid, and the electricity meter runs forward. It's the net of those flows over the billing period that results in the electricity bill.

So the question is, can that concept be applied to groundwater? Dr. Kiparsky acknowledged that net energy metering has a few requirements. Those requirements include reliable measurement and accounting, a formula to understand what the rebate is for providing energy to the grid, the charge for drawing energy from the grid, and then how does that relate to one another at the end of the billing cycle. All of that results in the need for strong institutions and trust, so that people are willing to invest in solar panels with the expectation of those terms. However, all of that is not obvious how that would be done in a groundwater context, which is what researchers are working on now.

Dr. Kiparsky noted that recharge net metering is different than groundwater banking. Groundwater banking is a situation where multiple groundwater users recharge water into an aquifer system with the expectation that the water used for recharge will be available to them at a later time for their extraction and use or possibly trading with others who are involved in the bank. The incentive there is the expectation of having water you put into the ground later, such as during a drought.

"*Recharge net metering, however, is subtly and profoundly different than that*," he said. "*In recharge net metering in the Pajaro Valley, groundwater users are charged an extraction fee on a per acre basis, and it's fairly significant – $100-$138 depending on the specifics of the situation. UC Santa Cruz and the Resource Conservation District in the Pajaro Valley Groundwater Management Agency have set in place a pilot program where participants put projects in place on their land that infiltrate water at the surface, and unlike in groundwater banking or in managed aquifer recharge for water supply purposes, no right is granted to withdraw that water at a later time. Instead, the reward happens in an offset on your groundwater bill at the end of the year*."

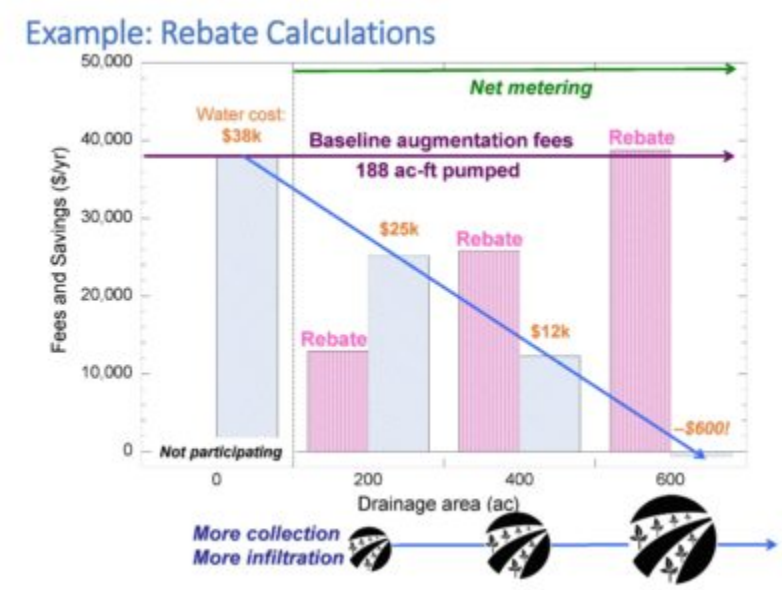
He explained that the pumping costs are offset, so how much water is infiltrated and the reduction of the groundwater bill is an immediate incentive for putting a project in place and having it perform well. The crucial element here is that there's no claim and no right to remove the water that's infiltrated later, so that can have benefits for the aquifer system itself.

"*Those of you familiar with SGMA and wondering how can to commit more water to the aquifer to avoid the six undesirable results, this is a scheme that unlike groundwater banking or banking for water supply, you can do that for in situ for non-extractive uses*," Dr. Kiparsky said.

In the Pajaro Valley, there's a five-year pilot currently underway. In the study, a landowner or a tenant builds and maintains a project to infiltrate stormwater into the ground; a third party certifier measures and monitors the infiltration and reports how much water was infiltrated above the baseline that would have happened without the project. It takes some technical monitoring and accounting; UC Santa Cruz and the Resource Conservation District have been playing that role in the pilot study.

The projects are relatively small – a pilot stage of 1,000 acre-feet per year. In context, Pajaro Valley Water's overall goal for its sustainability goals are an additional 14,000 acre-feet of change in its groundwater budget; the basin is currently overdrafted, so this program could be scaled up.

The agency that's running the project gives a rebate for the amount of that infiltration and that rebate is modified by a scaling factor, he said. Recharge more and the water bill decreases.



"*The scaling factor is currently 50%, so the credit for your water is given at about half the amount of water that is actually infiltrated because of the project*," Dr. Kiparsky said. "*That accounts for things like the administrative costs of running the program and the fact that there might be uncertainty in the monitoring as well as uncertainty in what happens under the ground. Accounting for the uncertainties enables this program to be financially viable and contribute to the health of the aquifer as well. That 50% factor could be adjusted up or down depending on how the program goes and so its adaptive, and it's another piece of the way that this scheme is flexible*."

The necessary ingredients are legal institutional structures that include strong agency metering; the extraction fee, the capacity to run the program, and capital costs that cover identification of recharge sites and optimizing their placement, as well as design, engineering, permitting, and installation. Validation is critical – having a trusted third party who is reliable and credible to tell you how the projects are performing given the basis for the rebate structure are required for the incentive structure to work. Also, there are the rebates that ultimately offset the O&M costs as well as the opportunity costs of taking a little more water from the aquifer.

"*We took a look at a wide range of incentives and one of the things that we found was recharge net metering doesn't fit into a number of other categories of schemes that are used to encourage or enable managed aquifer recharge, such as water supply, groundwater banking, or even interconnected groundwater and surface waters and some of the other categories*," Dr. Kiparsky said. "*Recharge net metering is somewhat unique*."

	Actor	Investment costs	Operating costs	Risks
Agency MAR project	Groundwater management agency	Land and construction costs	Operation and maintenance	All risks of project failure or shortfall
	Other entity	n/a	n/a	n/a
Groundwater banking	Banking agency	Land, permitting, and infrastructure	Operation and maintenance	Revenue shortfall; subsurface migration
	Recharging entity	Infrastructure, water rights	Water and conveyance	Subsurface migration, paper water, exchanges
ReNeM (fully realized?)	Agency	None req'd	Rebate per unit water infiltrated	Recharge does not meet supply or quality goals
	Landowner	Capital and permitting costs	Operation and maintenance	Loss of investment

It's not just the way that the incentive structure is set up, it's how that differs among the participating entities, he said.

"*In a centralized project that agency puts in place, they need to come up with all the capital costs for that project, and they bear the risk if it doesn't work out, so the costs and risks fall on the agency in classic centralized managed aquifer recharge project. In the SGMA context for example, Groundwater Sustainability Agencies are often having a difficult time figuring out how to generate funding even if that authority is available to them under the law. In contrast, with recharge net metering, because these are distributed projects, aside from the administrative costs of running the program, the agency can allow landowners to bear the costs and risks which they thus far seem to have been willing to do for the potential benefit of the rebate. So setting that structure in place means that an agency could potentially change its risk profile that in a way that might be helpful in a number of contexts*."

In addition, with recharge net metering, because the incentive ends with the infiltration of the water, that water infiltrates in the aquifer has in situ benefits, as opposed to in a groundwater banking context, during the next drought, the water put in the aquifer is taken out.

"*That has its place and there's nothing wrong, but in the SGMA context, this can be particularly of help*," he said.

The research continues. They are working to support the recharge net metering pilot and thinking about building decision support tools that can let the various different parties that need to come together do their own analysis of whether that might work for them. They are looking at the legal and institutional barriers that come up with any novel scheme. There is also the question of whether this can work outside of the Pajaro Valley.

Dr. Kiparsky then gave his summation. "*Recharge net metering is a pilot program that uses performance based rebates to offset MAR costs for landowners in a novel way. It can create incentives for recharge that complement other approaches, and it has potential benefits that can*

accrue to the aquifer itself which is crucial. And it might help agencies increase recharge by private entities on private land by sharing risk and apportioning benefits in new ways."

FOR MORE INFORMATION …

- Recharge net metering to enhance groundwater sustainability, webpage from UC Berkeley
- DR. ANDY FISHER: Enhancing groundwater recharge with stormwater, coverage of presentation by Maven's Notebook
- Creating Incentives to Boost Groundwater Recharge, article from Water Deeply