

# SUSTAINABILITY TIPS

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Portola Valley Sustainability Committee

## What's up with Sustainability in Portola Valley? Possibly more than you know!

### **Dear Portola Valley Friends and Neighbors,**

Some of the things I love most about Portola Valley are how deeply we care for our neighbors, our environment, including our frog pond, our dark skies, extensive trails, and the varied wildlife, wildflowers, and beautiful trees that share our yards and open spaces with us. And our belief in an attitude of "If not me, who? If not now, when?" that powers our volunteering in town and in efforts to improve conditions in the world at large.

I (Dr. Leslie Field) **recently joined the PV Sustainability Committee led by Scott Elrod, and I've been asked to give a brief overview of three important climate change efforts led by Portola Valley residents, each with the potential for large positive effects for PV and potential benefits far beyond our own town borders.**

First, I'll introduce [Bright Ice Initiative](#), my second nonprofit, (founded in March 2022), whose aim is to preserve ice in regions where we can obtain permission for research testing and where it is most needed.

You may wonder:

1. **Why care about ice?** Because its reflectivity has been helping to keep temperatures and weather patterns stable throughout human history, and its accelerating disappearance due to rising temperatures from global warming, is in a positive feedback loop, which in turn accelerates further temperature rise, climate instability, and risks of sea level rise, permafrost melt, water crises (floods and droughts) and species extinctions.

2. **Why care about a feedback loop?** The loss of ice is a leverage point on climate. If we slow the ice melt, we can, to a certain extent depending on location and scale, slow the climate damages and risks. The question I asked myself years ago was simple – what safe nature-based bright reflective materials might preserve icy reflectivity and slow the melt? We’ve developed solutions that work, and that have passed our safety metrics. We stay on the lookout for any unintended consequences, or potential risks, because “First do no Harm” has been one of our guiding principles for many years.
3. **What have you accomplished?** Since starting the new nonprofit, we have, with our collaborators, published our peer-reviewed work detailing our research test methods and results, which showed significant slowing of ice melt. The observations were accompanied by a detailed thermodynamic model that was consistent with the measurements. This year we also conducted research tests on pond ice and sloping and darkened areas with our collaborators in Minnesota - and on a glacier in Iceland. In 2024 we are planning to do research tests on glacial ice in India and in Iceland. We work with an Indigenous expert in Environmental Impact Assessment and Water Quality who lives in the Himalayas, and glaciologists from Indian Institute of Technology Indore and the Icelandic Met Office.
4. **Why Iceland?** This is a great location for our first tests on actual glaciers, because Iceland’s leadership, especially Former Icelandic President Grimsson, hosts one of the most impactful Forums on Arctic matters in the world, the Arctic Circle Assembly; Iceland has strong connections with neighboring Greenland, which is melting rapidly; and because the Icelandic Meteorological Office has proven to be a wonderful collaborator with our Bright Ice Initiative team for this work.
5. **Why India?** Because the water supply of more than 1 billion people is at risk from glacial melt; flooding and droughts are already destroying infrastructure, homes, and agriculture; and the food for roughly 1/3 of the world comes from India. We and the Healthy Climate Initiative have built solid collaborations that include a key glaciologist from IIT Indore and a key environmental impact assessment and water quality expert from the Indian Himalayas.
6. **What about Greenland and Antarctica?** Both are critically important, especially for sea level rise concerns, and we’re engaging in discussions concerning both regions.
7. **What aspects do you consider?** There is so much that goes into an effort like this: possible technologies, testing effectiveness and safety, policy frameworks, fundraising to do the work, understanding local peoples’ concerns, and collaborating on solutions that satisfy everyone’s needs, communicating the status of the work through local and scientific talks, teaching, and engagement with scientific and local experts in the icy regions, and sharing our results with climate modeling experts to further evaluate potential best places to benefit from this work, and potential impacts.

8. **How could I learn more?** To learn more, navigate to the [Bright Ice Initiative, Inc. website](http://BrightIceInitiative.com), reach out to me at [leslie@brighticeinitiative.org](mailto:leslie@brighticeinitiative.org), or to our team at [info@brighticeinitiative.org](mailto:info@brighticeinitiative.org)
9. **Extra credit:** Also, if of interest, I teach an annual class at Stanford on Engineering, Entrepreneurship and Climate Change, EE292H. This year it will be held in Winter Quarter, once per week, with lectures by myself and wonderful guest lecturers. If I'm granted a large enough room for auditors, I'll welcome your attendance. Please do wear masks if you come in person. We usually record the class, so if the room is too small for auditors, I can share the recordings of interest to you for your own personal education (but please don't post the recordings further.)

**Now, let's investigate the work of Dr. Armand Neukermans, a PV Resident Scientist who is an expert in droplet formation from his work at Xerox and at Hewlett-Packard. Armand got interested in climate 50 years ago, through his work with Jim Lovelock at HP. He and his team have worked hard for over a decade on a method called Marine Cloud Brightening (MCB).**

Much like Bright Ice's localized glacial ice preservation, MCB is considered a low-risk technology, using nature-based materials for brightening areas in need of preserved reflectivity. In MCB, the aim is to generate nano sized droplets of saltwater, called cloud nuclei, from spraying seawater into the air. These nuclei lift and join low hanging marine clouds, where with the right supersaturation, the nuclei develop into micron sized droplets, like the rest of the clouds. This makes the cloud denser and whiter, thereby reflecting more incoming sunlight away from the earth, providing some form of artificial sunscreen. It is now well understood that burning fossil fuels, besides producing CO<sub>2</sub>, also provide us with sun protection due to the sulfate pollution, which will be lost in the near future as fossil fuels are eliminated.. The MCB technique may provide a temporary stopgap measure to avoid planet temperature overshoot due to the excessive CO<sub>2</sub> accumulation already in the atmosphere while the crucial measures of fossil fuel elimination and carbon sequestration are implemented at scale.

The focus of Armand's group of volunteers has been on the detailed design of sprayers that can deliver 10<sup>15</sup> to 10<sup>17</sup> nuclei per second of the right size. While the formation of small laboratory quantities is relatively easy, this is a complex and challenging task to design a mechanism to hold up to corrosive salt water at scale. Several of these designs were implemented in the ongoing attempts of cooling the Great barrier Reef in Australia with promising but not yet definitive results. His group has been working with the University of Washington, PARC, Cambridge University, and New South Wales. Armand tells me that he is now looking at an intriguing alternative method, using superheated water to generate the nuclei for brightening at the desired locations.

It should be noted that fellow scientist/engineer of Armand's, Professor Emeritus Stephen Salter, of Scotland and Australia, has also done diligent long-term work on some other aspects

of MCB, illustrating how efforts near and far can complement each other in humanity's urgent race to reduce climate harm.

MCB is an important technique to watch, with its potential for temporary, benign treatments that can be potentially remotely controlled to react to changing climate risks and weather conditions.

**The third local resident featured today is Dr. Brent Constantz, Founder of [Blue Planet Systems](http://www.blueplanetsystems.com) (www.blueplanetsystems.com). Brent is an expert on marine environments and biomineralization, who uses his skills to reduce CO2 emissions from cement production, one of the largest industrial sectors and one of the largest CO2 emitters.**

Blue Planet Systems captures and permanently sequesters CO2 by converting it to carbonates to be reacted further for use as aggregate in concrete manufacture, turning the embodied carbon levels of concrete from carbon emitting to carbon negative. The company's technology and products have already been piloted in a concrete project at SFO and will help California reach its sustainability goals as legislation that requires sustainable practices in building materials becomes required. More information can be found in this recent article on Brent's company, Blue Planet Systems, available at [this link](#).

**What are your thoughts?** What problems in climate do you see as most urgent? What potential paths come to your mind as most helpful? **Are you working on a project to help avert climate disaster? Please let us know** so the Sustainability Committee can spotlight your work, too.

For myself, I've found over the years I've spent staring into the fiery pits of the hell that climate change is already bringing, that I can stay positive by creating, testing, and evaluating safe localized solutions for potential use, sharing what we learn, and continuing my own learning about the amazing and hopeful work others are doing in climate.

**As Katherine Hayhoe, wonderful climate communicator and scientist says, "None of us can fix climate alone". And like Dr. Hayhoe, I am convinced that what we can do together, with the brilliance and resources in our area and beyond, could be amazing. If we start now and give it our all, it may just be enough to preserve a habitable world. Let's try it and see.**

**With thanks for your interest, and best regards,  
Leslie Field, Ph.D.**