June 24, 2022

Life without wood smoke

An essay based on science and recent news stories. The personal identities in the essay are fictional.
Dedicated to Walt Whitman

1.Midwest United States

“I contain multitudes” Walt Whitman

Now the network is mainly Americans, Canadians, Australians, New Zealanders, Germans, and Africans. The United Kingdom is taking inspiring steps to stop residential wood burning in London and beyond. The European Union voted to count carbon emissions from biomass burning, mainly wood burning, the same way they counted solid fossil fuel, such as coal, burning. Both wood and coal burning will now be seen as equal opportunity contributors to climate change.

The fictional persons in this essay, from the United States’ Midwest, Northeast, and West Coast, and from Canada, Australia, New Zealand, The United Kingdom, Germany in the European Union, Nigeria, and India, are reading real news stories published in the last two months.

Ninety percent of wood burning particulates are particulate matter of 2.5 micron (or micrometer) size, called PM 2.5. Two point five microns is the perfect size of particulate to infiltrate the human lung, producing a cascade of health problems. The worst news about PM 2.5 pollution came from India, in a flood. Some news about PM 2.5 pollution trickled in from countries in Africa. China was reporting wonderful results in curbing PM 2.5 pollution. And the United States will hold hearings soon on lowering the level considered safe for humans from 12 to 8 for PM 2.5 pollution, bringing it closer to the standard of 5 micrograms per meter cubed for the 24 hour mean, a level considered safe by the World Health Organization (W.H.O.).

Mary.

"Where is what I started for so long ago? And why is it yet unfound?" Walt Whitman

Her neighbor was burning wood sixty feet away. It was midsummer and he drove back and forth with wood piled in the back of his truck. He sometimes pulled brush slowly up the street in a child’s wagon. Then the chain saw buzzed for hours as a threat of what was to come. He worked as support staff for the forestry industry, but she thought of him as a wealthy hobbyist. His house cost twice as much as Mary’s. He lived in on a city block with houses sixty feet apart. Houses were constructed ten or twenty feet from the edges of their property, so his house was really eighty feet away from her house. She wished it was farther.

The cataracts appeared and then disappeared, according to the optometrists over the years, so they weren’t cataracts, of note, at all. There was one scar that remained on the right retina, which was a cataract. But the eye irritation and damage receded when she started using three air purifiers inside her house. She knew air purifiers were one way to stay safer and healthier amid the wood smoke that seeped into her home every night and day during the winter. She wasn’t going to be a victim, or a walking illustration of health problems caused by wood smoke. She would mainly stay indoors with her air purifiers, although beautiful flowers were growing in her garden, in rebuke to the smoky air they grew up into. She was going to be a survivor and a witness.

Mary had emailed and phoned the health department and fire department over seventeen years. The health department had noticed when she helped pass an outdoor wood boiler ban eleven years before. Then the health department went into the neighbor’s house and garages for an inspection. It turned out to be three wood stoves. One stove was shut down for its proximity to gas-fueled cars. The health department improved its web page over the years, but currently only recommended wood burners get a high smokestack as one way to protect neighbors from their wood smoke. The wood burning appliances were not illegal. Maintenance of clean operation was not required for indoor wood stoves. A few years ago, monitoring of the PM 2.5 pollution generated by residential wood stoves was probably costly

and time consuming for the Health Department, if it was even done. Fortunately, now monitoring by neighbors themselves was now on both PurpleAir and government AirNow Smoke and Fire maps accessible to the general public.

Mary told her new friendly neighbor, who lived farther away from the wood burner than she did, about the wood smoke, hoping he had noticed the wood smoke himself over the winter. She told him that there had been four sales in seventeen years of the home between her and the wood burner. She had overheard some of those neighbors between her and the wood burner complaining about the wood smoke. One wife saying to her husband "I can't live here because of the smoke", just before they sold the house. But either the wood smoke was hyper-localized into Mary's basin of a yard, or the friendly new neighbor was not focused on the air quality of the neighborhood. Mary knew the distractions of buying a new home. Within three years Mary replaced the furnace, cleaned the air ducts, and had sheet insulation and new vinyl siding put on the outside. Then a decade later, she had a blue metal roof put on which protected against everything that could befall a homeowner for more than thirty years. It was only fifteen years ago, two years after she purchased the house, when Mary had to cut down the south-facing trees next to her house whose roots threatened to buckle her slab, that Mary saw the wood smoke coming from her neighbor's stack. Then Mary knew where the eye irritation and cataract scar had come from, from sixty feet away. In addition to her complaints over the years, within the last year Mary had told the Health Department and the Health Department had told the wood burning neighbor of Mary's complaint about the wood smoke emission particulates.

Mary wanted to educate the wood burner. She wanted to tell him about geothermal heat pumps, solar chimneys, solar panels, and wind turbines. She wanted to tell him that natural gas, a non-solid fossil fuel that could serve as a bridge to the clean energy of wind and solar, produces thousands of times less particulates than wood burning. Then she realized he probably would know about innovations if he wanted to. If he wanted to go camping and keep his smart phone charged, he could use a solar charger or even a portable wind turbine which could fit in his backpack. He could be prepared, as Boy Scouts are told, with alternatives to wood burning, outdoors and indoors. He could be part of the future if he wanted to. If he was living in poverty, in the United States he could get financial help with his heating bill for alternatives to wood heating, through the Low Income Economic Assistance Program (L.I.H.E.A.P.).

Mary wanted to let him know she had a particulate monitor that had been collecting data on Particulate Matter of 2.5 micron (micrometer) size. PM 2.5 data had been collected on his wood burning emission particulates for around one year. She had kept her internet on 24 hours a day so she could collect data in the middle of the night, when he burned the most wood, when the air purifiers in her house worked the hardest. She had gone door to door in her neighborhood to distribute letters telling all her neighbors except him that her monitor was collecting data. She had done that in early fall last year, almost nine months ago. He had probably been informed by other neighbors that she was collecting data. The data was on a PurpleAir map for anyone who wanted to see it, as well as on an AirNow map alongside EPA monitor data. The polluting emissions of wood burning are 90% PM 2.5. She bought her PM 2.5 air quality monitor and suspended it outside from her eaves. She also had an indoor air quality monitor to clue her in on when to turn on her air purifiers. When she told her neighbors that her PurpleAir PM 2.5 monitor was one of only about 55 on an EPA Fire and Smoke map located in her state, alongside only 15 EPA monitors located in her state which cost more than $100,000 each, there was murmuring that the EPA should have more air quality monitors. That was not exactly the reaction she was looking for. She wanted other residents to invest less than $300 in more residential PurpleAir monitors in the area. She wanted them to be Citizen-Scientists in the hyper-localized area of their neighborhood.

Mary had started a web page at the beginning, fifteen years before, putting news about residential wood burning out for hundreds of regular readers around the world. Back then it was Americans, Canadians, Australians, and New Zealanders. It still was. They all spoke the same language.

This spring she had started a new webpage and a podcast. She had distributed leaflets about the website. There was a theory that people who were uninformed about vital matters unfortunately got their news mainly from network television and the people who they met in person. It seemed that face-to-face interactions would have the most impact. But that was harder in the last two and a half years because of the pandemic.

Now the network was mainly Americans, Canadians, Australians, New Zealanders, Germans, and Africans. The United Kingdom was taking inspiring steps to stop residential wood burning in London and beyond. The European Union voted to count carbon emissions from biomass burning, mainly wood burning, the same way they counted solid fossil fuel, such as coal, burning. Both wood and coal burning would be seen as equal opportunity contributors to climate change.

Ninety percent of wood burning particulates is particulate matter of 2.5 micron size, called PM 2.5. Two point five microns is the perfect size to infiltrate the human lung, producing a cascade of health problems. The worst news about PM 2.5 pollution came from India, in a flood. Some news about PM 2.5 pollution trickled in from countries in Africa. China was reporting wonderful results in curbing PM 2.5 pollution. And the United States would hold hearing soon on lowering the level considered safe for humans from 12 to 8 for PM 2.5 pollution, bringing it closer to the standard of 5 micrograms per meter cubed for the 24 hour mean, a level considered safe by the World Health Organization.

Mary kept up with the news on particulate pollution from wood burning, and news on air pollution in general. The Environmental Defense Fund was now publicizing their Air Tracker site, which used Aerosol Monitors that cost about $5,900 and monitored PM 2.5 but also other air pollutants. This was not a PM 2.5 monitor she could afford. And the Air Tracker site made no mention of residential wood burning causing PM 2.5 pollution, although the Air Tracker site mentioned that air pollution tracking should be hyper-localized to link the study of the ill health effects of air pollution with the source of the air pollution.

Mary kept thinking back to solar chimneys. If they could replace chimneys meant for wood smoke emissions, what a wonderful change that would be. Solar chimneys warm homes by forcing warm air down the chute into a room. The chimneys also increase ventilation by using natural temperature differentiations to circulate indoor air. Advertisements said that residents are investing in solar chimneys to increase their properties' temperatures without generating smoke. Solar chimneys looked like little greenhouses atop roofs.

The National Oceanic and Atmospheric Association (NOAA) were improving their detection of wildfires, and prediction of future wildfires. Wildfires produce the same kind of air pollution as residential wood burning, PM 2.5. But articles about the new, better, NOAA predictions didn't mention the hyper-localized problem of residential wood burning. NOAA concentrated on the news that NOAA was getting better at predicting wildfires.

Mary read the news about a house fire which burned through a wood floor. A firefighter burned his arm trying to open a window and was taken to a hospital with minor injuries. If that fireman opened a window to the outside in the winter in her neighborhood, he would be engulfed with wood smoke from her neighbor's wood burning. She read about an unauthorized burn during a burn ban that spread over four acres and into a woods. Firefighters said the fire raged for days with flames 60 feet high, and it was still burning 24 hours after firefighters arrived to fight it. It produced heavy smoke across an entire county for days. She read about one restaurant's wood-burning grill that produced wood smoke that seeped into an adjoining restaurant and ruined the second restaurant's business. One restaurant was suing another restaurant. A fire department was called when someone set a pile of yard waste, straw and some larger wood items on fire. She read about firefighters going to fight a fire started in a wood shed that burned down the adjacent business, and another fire started by wood pallets and cardboard that burned down a business.

Mary read about the health effects of wood smoke in the form of PM 2.5. She read that wood smoke could trigger asthma. Patients receiving dialysis, when exposed to PM 2.5, had more cardiovascular effects, such as heart attacks, than people not receiving dialysis. Another article said a new specialty of "climate cardiology" was needed, to deal with heart attacks caused by pollution. Another study said exposure to particulates could cause heart rhythm disorder, and that article stated that the PM 2.5 produced by residential wood burning caused it. She read that lung cancer, diabetes and dementia were suspected to be exacerbated by particulate pollution, PM 2.5. She read that there might be a cure for cardiac dysfunction caused by PM 2.5, in the form of extracellular vesicles enclosed-miR-421 suppressing PM2.5-induced cardiac dysfunction via ACE 2 signaling. She read that PM 2.5 was associated with increased risk of Kawasaki disease in children. She read that PM 2.5 was also called respirable particulate matter, another of way of saying that PM 2.5 was the perfect size to infiltrate the human lung, setting off a cascade of health problems. She read that particulate matter of PM 2.5 size was tied to stroke mortality. She read that PM 2.5 was linked to increased risk for in-hospital fatality. She read there was an increased risk of Amyotrophic Lateral Sclerosis (ALS) aggravation with PM 2.5 exposure. PM 2.5 exposure had been linked to brain

tumors. She read there might be a link between wildfire smoke and premature birth. She read that COVID 19 masks might be used for protection from wildfire smoke. She read that the PM 2.5 toll was on those most vulnerable: children, pregnant women, the elderly and those with pre-existing heart or lung disease. Mary read that the most likely sources in a home would be PM 2.5 from residential wood smoke or traffic fumes. She read that the burning of wood pellets releases more carbon (PM 2.5) into the atmosphere than burning coal. She read that Europe had cooled on biomass, primarily wood, burning. The European Union had voted in May to stop incentives for biomass, primarily wood, burning. Europe was going to stop considering wood burning "carbon neutral", a term which scientists had never believed in. "Carbon neutral" was a political construct. Particulate emissions from wood were going to be considered real emissions, measured the same way that particulate emissions from solid fossil fuel emissions like coal were measured, at least in Europe. She read an article by a scientist who said that the "fight over wood-burning playing out in the European Union now (is) an object lesson in the kinds of perverse outcomes that arise when policymakers ignore science." The perverse outcomes she seemed to be referring to were excessive particulate production by burning wood and other solid fuel biomasses. She read that the U.S. states of Georgia, North Carolina and Louisiana were concerned that their wood pellet plants would lose customers in Europe because of their change from biomass burning to the cleaner alternatives of wind, solar and even the bridge natural gas, which produces thousands of times less particulates than wood burning. She read the statistic that 1 million deaths per year were attributable to burning coal or biomass for cooking or heating indoors. She wondered if using the term biomass rather than wood would make residential wood burners complacent about the harm they were causing. She read that one-year exposure to particulate matter (PM 2.5) was associated with increased COVID-19 severity. She read that there were open burning regulations in a county's rural areas.

Mary read about Chicago's Eclipse study, which started in 2021, where PM 2.5 air quality monitors were handed out to residents in disadvantaged areas to find out the cardiovascular health effects of traffic particulates, but one of the highest PM 2.5 readings was on a day when wildfire smoke drifted into Chicago. Friday, July 23, 2021, a 90-degree day, with wildfire smoke plumes arriving from the West, stood out as one of the year's worst days for particulate matter.

Mary read that starting in 2021 local Chicago local news stations, in the Eclipse study, handed out 100 Custom hardware: Air Quality (Pro II) sensors which were installed in Chicago neighborhoods. Like Environmental Law and Policy Center - Chicago's (E.L.P.C.'s) mobile AirBeam monitors, the new stationary sensors use light scattering technology to document the concentration of PM2.5 in the air. The monitors are weather-resistant and solar-powered, and the public can view real-time data by scanning the QR code at a monitor location or on Microsoft's Urban Air website. The new sensors can be found in every ward of the city. She read that Microsoft's PM 2.5 map in Chicago uses Eclipse solar powered sensors that are custom designed, from the electrical engineering firmware to the enclosure, and calibrated in a hardware lab at Microsoft Research in Redmond. The air quality sensors measure CO, NO2, SO2, and O3, as well as PM 1, PM 2.5, and PM 10, along with temperature, humidity and pressure. Data is uploaded using cellular LTE-M technology directly to an Azure data stack. The devices take sensor readings at 60-second and 15-minute intervals, powered by solar devices that run perpetually.

Mary read that the U.S. EPA's air monitors remain the leading standard for gathering air quality data, but they are not designed to inform the public of local conditions.

Mary read that cutting air pollution emissions would save 50,000 US lives and save $600 billion each year. The World Economic Forum said that at the 2021 26th United Nations Climate Change conference, held October to November 2021 (called C.O.P.26) "countries with about 85% of the world's forests pledged to end deforestation by 2030."

2.Northeast United States

Noel.

"Not I, nor anyone else can travel that road for you. You must travel it by yourself. It is not far. It is within reach." Walt Whitman

Noel was a retired engineer. He was a religious man. He wanted to protect his daughter who had asthma. They lived with air purifiers on night and day. She eventually grew up and moved away, careful to find a neighborhood to live in that did not presently have wood burners in it.

Noel read that after a devastating fire caused by a fireplace, where the son was taken away in an ambulance because of burns on fingers and toes, the family rebuilt the house around a new fireplace. He read that a junkyard fire which emitted PM 2.5 was no threat to health, because it was quickly put out. He read that a wood-fired pizzeria caused a spreading fire which firefighters had to put out. He read that fire damaged a firewood business. He read that fire took a cabin in the woods, but spared the residents. He read that a controlled burn's smoke generated complaints by residents. He read that a woods fire threatened a building.

Noel read that in a state pumps were being suggested for home heating, rather than wood burning. He read that a state has a master plan for wood-fired power plants, but that the plan draws skepticism of its utility and skepticism of its place in slowing climate change. He read that wood emits more particulates that coal when burned, and that climate researchers should include carbon emissions from wood pellets as contributors to climate change, as the Europeans are now doing.

Noel read that stroke mortality was higher in the presence of PM 2.5, a respirate particulate. He read that small particulate size (PM 2.5) was linked to stroke mortality.

3.West Coast United States

Wendy.

"Those who love each other shall become invincible." Walt Whitman

Wendy lived in the northern California county which is known as the heart of the California lumber industry. She was surrounded by residential wood burners on three sides. Wood burning was the main method in her area for energy generation. Wildfires also added to the mix of wood burning particulates in the air. But she noticed the wood burning of her neighbors the most, because particulates only stay in the air for a while, and then fall to earth, so pollution from wood burning is hyper-localized.

Wendy read that a city council sought to snub out some beach bonfires. She read that a public utilities commission stopped a nearly completed wood burning power plant from going online in Hawaii. She read about a weatherman who specialized in monitoring of PM 2.5. She read about eight wood-burning rings on a pier, and eight that use charcoal. She read about the first emergency fire authority since 2018 in a city, where wood burning stoves and burn barrels were restricted. She read that a fire destroyed a garage. The owner of the garage was burning some wood for baseboards, in the garage. There was smoke damage to the main floor of the house and the basement. She read that a fire broke out on a reservation, with smoke visible to local communities. She read that health drones were being used to detect wood smoke on a reservation, while fire restrictions were in place. She read that air quality in South America is bad, on the internet. She read that the Spanish word for prison is "Calabozo", and calabozo was depicted by a dark cloud. She read that Latinos are more likely than any other U.S. racial or ethnic group to worry about climate change.

Wendy read that rain brought relief to a massive, record wildfire in a state. She read a city campground opened, but officials advised fire rules. She read the US Forest Service explained the controlled burn process in the wake of a gulch burn pile reignition. She read about legislative efforts at state and federal levels to work to promote cleaner air for the state.

Wendy read that a southern California city moved to ban wood or charcoal fires, grills and stoves at city beaches. She read that residential wood burning drives the pollution in a city. She read that an ordinance was passed in a northern California county, to restrict wood burning. She read that a western state has rules on allowable employee exposure to PM 2.5. She read that tax credits and discounts exist in a county to help residents afford more efficient wood or coal burning appliances. She read that a burn ban was lifted, but there would continue to be no permits for

bonfires during burn restrictions, and the burn restrictions would include grills that are fueled by wood, and restrictions continuing for recreational wood fires. She saw a video about hyper-local monitoring of air pollution in her state. She read that a woodsmoke reduction program was offering grants for woodstove replacement projects. She read that a city council voted to ban smoking in multi-unit homes. She read that a city was under a burn ban and fire restrictions and punishment included fines and jail. She read burn bans went into effect for a city because of an uptick in fire activity. She read that a county highlighted caution ahead of a dry, hot summer, and have stopped issuing permits to burn wood waste on private property. She read that open burning was banned while firefighters are fighting fires.

Wendy read that a county supervisor warned of the risk of inhaling smoke during the wildfire season. She read that the fire department said that wildfire smoke can create a health hazard. She read about all campfires and wood burning and charcoal fires being prohibited along with wood splitters and other internal combustion tools. She read about PM 2.5 air pollution's toll on people of color. She read about a river valley helping to make a wood stove turn-in a success. Old wood stoves were decommissioned. She read a county warned of potential risks from backyard campfires. Officials warned people to consider the negative impacts on air quality from wood fueled fires. The official said wood fires in the county are currently one of the major causes of pollution, right behind cars and trucks. County health officials warned the public of the potential health risks from outdoor wood burning, including things like having a campfire in the backyard.

4.British Columbia, Canada

Cameron.

"Keep your face always toward the sunshine - and shadows will fall behind you." Walt Whitman

Connie, a Canadian woman, had started the anti-Wood Burning newsletter, sent to Canadians, Americans, Australians, and New Zealanders for many years. Connie decided she needed to travel the world and enjoy life more. She had documented stories of illness, sorrow, and anger, all caused by the health problems brought on by residential wood smoke generated by neighbors. This year a man, Cameron, took over the network. Cameron reached out to others. He tried to persuade others to stop burning wood in his neighborhood. He was patient and hopeful.

Cameron read Canadian stories that year-long exposure to PM 2.5 may contribute to COVID 19 severity. He read that some residents are eligible to receive free smoke alarms. He read that fire services reminded residents that open air burning is not permitted. He read that the hearth industry is not happy with the airshed roundtable process. He read that a property owner was fined for illegal burning. He read that improper use of a fire pit was explained. He read that $350,000 in damages resulted from two separate fires. One fire started in wood pallets, and one fire started from smoking. He read that a $755,000 study will look at the feasibility of using biomass burning to meet climate goals. The article stated that biomass burning may be a counter-intuitive solution.

5.Australia

Audrey.

"Henceforth I ask not good-fortune, I myself am good-fortune" Walt Whitman

When Australia and New Zealand have winter, the northern hemisphere has summer. The innovations and steps taken against residential wood burning in Australia seemed breathtaking to people in America and Canada. But changes were taking place in desperation, because wood burning increases during winter in Australia and New Zealand.

Asthma Australia started to help the people all over Australia pass local ordinances against wood burning. In a trial program, in Canberra entire residential electrical heating units were planned to be given free to residents meeting a means test, in exchange for retiring their wood stoves. People from all over Australia had banded together years before to compare stories and come up with solutions to the problem of particulates generated by wood burning neighbors.

In Australia, Audrey read that a capital territory started a free handout of residential electrical heating units to replace wood stoves. She read that a capital territory is offering incentives from $250 to remove your wood stove to $1,250 to remove your wood heater and install a ducted electric reverse-cycle system. She read an explanation of why burning wood in a fire pit is illegal in one part of Australia. She read that a city has come under scrutiny over a push to ban wood heaters. She read that Asthma Australia said wood fire heaters could impact asthma sufferers to the point they required hospitalization. She read that just 4.4% of residents of Sydney burn wood to warm their homes. She read that an Asthma Australia representative told a reporter “We have calls all the time during the winter months from people who are frustrated, feeling helpless, angry, because neighboring homes are burning their wood heaters,” “The smoke gets into their own homes – so it’s not even just about not being able to walk in the street” and the Asthma Australia representative called residential wood burning “the leading human-made source of the unhealthy air pollutant PM2.5”. Audrey heard that burn-off haze contributes to COVID 19.

6.New Zealand

Zach.

"I am an acme of things accomplished, and I am an encloser of things to be." Walt Whitman

In New Zealand, enforcement of existing ordinances against wood burning began to be aided this year by handheld Infrared Sensors, which could see through walls to reveal whether the chimneys of wood burners were heated by wood burning within.

Zach read about new low-cost hand-held infrared cameras being used to identify illegal residential wood burning and subsequently identify wood burning occupants. He read that New Zealand areas with a higher density of wood burners per hectare had higher rates of General Practitioner (GP) visits for acute respiratory infections. He read that cutting greenhouse gases also improves our health. He read that controls on open fires and solid fuel burning are needed because domestic fires and wood smoke are the greatest sources of air pollution in parts of New Zealand.

7.United Kingdom

Isla.

"If you see a good deal remarkable in me, I see just as much remarkable in you.” Walt Whitman

A grant of over ten million Pounds Sterling was distributed to communities in the United Kingdom. Some of the money was used to purchase and hand out hand-held particulate monitors to residents of often disadvantaged communities. It was widely publicized that better-off residents who bought and renovated old Victorian houses on a hill in one neighborhood then started burning wood fires because it was fashionable. Another reason why residents were burning wood was that they thought they would save money by turning off their gas heat and using wood to heat one room. And it was observed that people who lived in vans heated with wood.

Isla read that PM 2.5 monitors were handed out to residents of a city where the wealthier residents were burning wood in renovated Victorian homes on a hill. Residents of an adjacent disadvantaged area below them reported PM 2.5 increased from that source. She read that wood burning costs the European Union (E.U.) and the U.K. 13 billion euros a year in health-related costs and is responsible for 48% of health costs from air pollution. She read that homeowners are thinking twice about using log burners after learning about that any level of PM 2.5 is harmful to human health. She read that the neighborhood of Westminster, England has a PM 2.5 concentration more than two times higher than that of the W.H.O. standard. She read that home wood burning causes almost 1 billion Pounds Sterling in health costs a year in the United Kingdom. She read that air pollution of home wood burning causes 54% of all harm from home heating, but provides only 11% of the heat. She read that the Glastonbury Festival intended to create a 40 foot sculpture out of wood with names of people who died in the lockdown on it, and then intended to burn the sculpture down. She read that 11.6 million Pounds Sterling given to local communities to tackle air pollution includes 300,000 Pounds Sterling to lead a campaign across London on the harm to health caused by wood burning. She read that 40% of the particulate pollution

in London was caused by residential burning by up to only 9% of London residents who could still burn wood as a primary source of heat. This London residential wood burning is the largest producer of particulates and surpasses particulate production from London vehicles. She read about engagement activities for the most vulnerable. She read about purchase of sensors to publicize real time data on particulate matter on an existing website. She read about a communication campaign to raise awareness in Cheshire East on the health impacts around domestic burning to encourage behavioral change. She read about additional monitoring and public awareness campaigns to improve knowledge of particulate matter. She read about a Schools' education and awareness theatre production and air Quality monitoring in schools. She read about a domestic burning behavior change campaign. She read that living in an area with more PM 2.5 pollution directly correlates with an increased risk of death.

8.Germany

Gerda.

"Logic and sermons never convince, The damp of the night drives deeper into my soul." Walt Whitman

In the early twenty-teens, Germans had turned to wood burning because of the high cost of gas fuel, and the results were disastrous for air quality.

Gerda read about her neighbors in the European Union and other parts of Europe. Gerda read that Latvians are rushing to burn wood to save money since the heating costs are expected to double this winter. She read an Italian study suggesting that particulates may contribute to increased rates of immune-mediated diseases such as rheumatoid arthritis. She read a Polish study suggesting that nitrophenols produced in wood smoke can cause cancer. She read that the European Union said that emissions from road traffic and domestic heating particularly in southern and eastern Europe (Croatia, Cyprus, Bulgaria, Italy, Poland, Romania, Slovakia, and Slovenia) are behind breaches in air quality standards. She read a Denmark study showing a link between long-term exposure to air pollution, and cardiopulmonary disease and lung cancer. She read that in Denmark there is a new law which allows municipalities to ban old wood burners. She read that the European Union voted to de-incentivize wood burning and recognize wood burning emissions as the same or more particulate emission threat to climate change as fossil fuel burning. She heard that the first big COVID wave in Italy might have been spread by wood burning stoves in north Italy in the winter of 2019-2020. She heard that politicians are very angry about having their wood burning taken away. They like the flames and the feeling of wood burning. She heard it is wrong for personal preference to stand in the way of science, when science says there is no safe level of particulate pollution. She heard that it is dangerous for people with influenza, or any respiratory or cardiac disease to have to suffer because authorities like to sit by their wood fires churning out smoke. She heard that everybody deserves clean air. She heard that the biomass industry is pushing back against Europe's plans to protect their woodlands.

9.Nigeria

Nasha

"And as to me, I know nothing else but miracles." Walt Whitman

More than ten years ago, solar stoves were distributed to Nigerians, as well as residents of other African nations, by a charitable organization, to replace polluting wood stoves. This year, a leader of a non-Governmental Organization (N.G.O.) called on the Nigerian president to reduce wood smoke pollution.

Nasha read that the people who rely on wood burning for cooking risk their health and it is bad for the planet. He read that pollution can be tackled by replacing wood stoves with electric stoves. He read that there is not enough awareness of the dangers of pollution.

10.India

Ishan

"Do anything, but let it produce joy." Walt Whitman

India had wood smoke pollution from wood burning stoves. A beloved woman who provided food cooked on a wood stove during the pandemic was given a gas stove by a grateful philanthropist businessman. Ishan read about a wealthy philanthropist giving a gas stove to replace a wood stove to a woman beloved in her community as “idli amma” who cooked idlis, savory rice cakes, to feed the poor during COVID lockdown.

Ishan read that China achieved a 40% reduction in PM 2.5 levels since 2013. He read that some of the places that did not meeting WHO PM 2.5 standards included Australia, New Zealand, Ireland, Iceland, most of Scandinavia--Norway, Sweden, Finland--countries in Oceania and the Caribbean and not entire countries but significant portions of Canada and Scotland. He read that pollution cuts live expectancy by 8 years in India. He read that pollution reduces live expectancy by 5 years in South Asia. He read that pollution could lose 10 year of life expectancy in Delhi. He read that industry owners are being educated on rules for PM 2.5 caps. He read that Jakarta, Indonesia’s PM 2.5 exceed by 25 times WHO PM 2.5 standards. He read that Dhaka, Bangladesh exceeds by 5 times WHO PM 2.5 standards. He read there were over 90,000 deaths in Bangladesh caused by indoor air pollution in 2019. He read that in Buriganga, Bangladesh overall PM 2.5 was a 77 microgram annual average. He read about new electric car charging stations in Ludhiana. He read about Delhi’s need to fight air pollution. He read about the many kinds of dangerous smoke in Putra, Malaysia. He read a Peshawar, Pakistan editorial against bad air. He read that Peshawar, Pakistan residents lose 2.3 years of their lives to Air Pollution. He read that a Chinese study finds particulate matter exposure is associated with incidents of chronic kidney disease. He read a study about the PM 2.5 health impact during a 2019-2020 biomass burning event in Southeast Asia. He read about biomass burning surges in Japan and South Korea, but wonders where Asia will get its wood. He read that many of the air pollution problems in India are caused by cooking over open wood fires. He read that 94% of Indian women construction workers don’t raise their voice against air pollution for fear of job loss. He read that 74% of Indian women were aware of the problem of air pollution but were not familiar with the terms PM 2.5 or PM 10. He read that in Delhi, India, air pollution can cause deadly fog.

11.The Future

PurpleAir.and other PM 2.5 monitoring

“Let your soul stand cool and composed before a million universes” Walt Whitman

The United States will hold hearings soon on lowering the level considered safe for humans from 12 to 8 for PM 2.5 pollution, bringing it closer to the standard of 5 micrograms per meter cubed for the 24 hour mean, a level considered safe by the World Health Organization. Mary, Noel and Wendy are ready to testify before the Environmental Protection Agency (E.P.A.). They will ask the E.P.A. to reduce the E.P.A. pollution standard for PM 2.5 from 12 to 8, to bring it closer to the World Health Organization (W.H.O.) standard of 5 micrograms per meter cubed for the 24 hour mean. Residential PurpleAir PM 2.5 monitor data showing that their wood burning neighbors are the source of PM 2.5 is Mary, Noel and Wendy’s proof. Mary, Noel and Wendy shouldn’t need to wait to develop illness as proof. Mary, Noel and Wendy should stop the wood smoke, before the wood smoke becomes their wood smoke illness.
Cameron in Canada is watching the United Kingdom, the United States and especially Australia and New Zealand to see what can be achieved to stop wood smoke emission particulate pollution. Canadian rural areas are considered the worst-hit areas for residential wood smoke pollution from wood burning neighbors.
Audrey in Australia will testify about her wood smoke induced Asthma to help pass local ordinances against residential wood burning.
Zach, a local official in New Zealand, will use his Infrared Sensor to shut down wood burners in his neighborhood who have continued to burn wood after being warned it was illegal.
Isla in the British Isles has been given a portable PM 2.5 sensor and will use it to shut down the wood burning neighbors in her neighborhood.
Gerda in Germany has become a solar panel installer for homes that had previously burned wood for heat.
Nasha in Nigeria distributes solar stoves to his village and makes speeches about how it changes his neighbors’ lives.
Ishan works distributing free meals his mother has cooked, on her new gas stove, to those needing food during the pandemic.