

I. Brief scientific introduction – the Usnea genus

Usnea is a genus of mostly pale grayish-green lichens that grow all over the world. Members of the genus, 600 as of 2012, are commonly called “old man’s beard” or “beard papa,” as a reminder of the way they look – shrubby and gray.

Usnea prefers that its living environment is healthy – no Usnea will ever grow in areas with heavy air pollution, as it is very sensitive to sulfur dioxide. In the unlikely event that Usnea does grow in a place with high levels of sulfur dioxide, it will grow no longer than a few millimeters. In contrast, in healthier environments, it can reach 10-20 centimeters, up to 200 times more than in polluted regions.

II. The First Earth Crisis, 2027-2035

In November 2027 the Earth reached a critical point for its global economy and tourism – every single major city was so polluted that you could not leave your home without a mask on, and the smog was so bad that you could not see ten feet ahead without smog-protruding glasses.¹ Any sort of production except for organic plant growing had to be stopped, and all international flights were cancelled indefinitely.

Now the problem is that air pollution effects are impossible to isolate, so inevitably by the end of the year, the carbon and sulfur oxides, as well as the particulate matter ended up enveloping the Earth like a blanket. By law, no one was allowed to run or jog outside anymore, regardless of their location. Living in a settlement unable to separate the inside from the outside air was forbidden – no more yurts, no more camping tents, and for the ones of us that have been more traditional and were already living in apartments or houses, no open windows were allowed. All refugee settlements were closed and by December all individuals were relocated to apartments in countries with low population densities such as Greenland and Mongolia. And you thought life was miserable when your school residence management set up window blocks that made it impossible to open your window more than 2 inches?

No travel ban exemptions have been granted since 2026 – not even Donald Trump, currently in his 5th mandate as President of the United States of America, is allowed to travel internationally anymore. Currently located in Nigeria and unable to return to his home country, Trump has publicly declared countless times his dissatisfaction with the current situation.

Due to budget cuts in environmental protection agencies in 2017-2020 in the United States, Russia, and China, as well as the lack of enforcement of sustainable production laws in South-East Asia and South America, the world’s situation has exponentially worsened over the last decade, morphing into what everyone calls now “the First Earth Crisis.”

¹ 250,000 US dollars a pair, mind you. In 2018 dollars.

The high levels of air pollutants have affected flora and fauna in a way that even by 2050 scientists had trouble fully quantifying. Additionally, the Homo sapiens population started decreasing – it was estimated that if no change occurred, by 2100 there would only be 5% of humans left. It was still under discussion where these people would live and what their livelihoods would look like.

III. Impetus and steps towards change – the 23rd “Avenir humain” Online Convention

Something had to be done. Homo sapiens loved themselves too much to allow all of their species’ members to vanish, and a perspective of 5% survival rate was not satisfactory. Books had to be written, stocks had to be traded, businesses created, money earned, cancer cures discovered, politics played, and wealth managed.

On December 15 2027, a group of scientists from the United States, Japan, South Africa, France, Maldives, and Taiwan led an online convention with the main aim of brainstorming and coming up with potential solutions to remove the world from its current environmental rut.

After long debates, it was unanimously decided that Rumoko Tukaya and Dhushanthi Khondel’s “pol-vac” would be implemented. At first in a few select cities, then if there were minimal additional disturbances, every human settlement would adopt it, having pol-vacs placed strategically throughout countries. All world’s political leaders who were present at the convention agreed to implement this solution in their countries.

It was expected that by March 2028, the following cities would have pol-vacs installed and running: Portland OR (United States), Algiers (Algeria), Nagoya (Japan), London (United Kingdom), and Paris (France). There would be a one-year trial period in which all arising issues will be troubleshooted and by 2040, 95% of the world would have pol-vacs.

IV. What is the pol-vac?

Engineers Rumoko Tukaya and Dhushanthi Khondel used household vacuum cleaners as inspiration for this product. According to them, “pol-vac” stands for “pollution vacuum,”² and this machine works as follows: a 1x1 meters cube made of inert material is placed at 15-20 meters above the ground and is meant to selectively absorb carbon oxides, sulfite oxides, and particulate matter from the air. It has a small plant-powered noiseless engine and is otherwise empty inside. It then compresses the particles in a storage space located on the bottom of the cube, allowing them to form a layer of mass that can later be disposed of. The pol-vac needs to be emptied every 10 years, and in less polluted areas, even less often. Due to its design, it is easy to operate and emptying it poses no risks to human health.

² The two of them said they were open for other name suggestions.

V. The pol-vac aftermath, 2045

The implementation of pol-vacs was successful in the pilot cities and the initial plan was followed to a dot, so by 2040 the entire world had pol-vacs installed and running. Tukaya and Kondel's project turned out successful, as the world now had 70% less carbon and sulfur oxides, and 85% less particulate matter than it had in March 2028.

In a little less than two decades, the world has drastically changed – people were now allowed and even encouraged to open their windows, camping was allowed again, no more masks were needed when leaving ones' house, and a vast majority of the human population quit their day jobs and started backyard gardens in an attempt to be self-sustainable and to provide spaces that would serve as carbon sinks. Where there were no vegetables or fruit growing, people traded their lawn for various species of moss, also known as Bryophytes.

Resulting the removal of 70% of the world sulfur oxides, various *Usnea* species started growing all throughout the world. In 2020ies they were know as bioindicators (as they only tend to grow in regions where the air is clean and of high quality), so it was a great joy for local environmental scientists to see this lichen growing in cities like Lahore (Pakistan) and Xi'an (China). The First Earth Crisis was now forgotten, and most people were leading slow, simple lives. 75% of the world population gave up using the internet and the other 25% limited its access to it by disposing of their smartphones and other electronic gadgets. One might say the world was thriving.

VI. Connecting the dots, closing the circle

What started as 2-centimeter organisms quickly grew to their maximum possible height of 20 centimeters, and in some places even twice that. By 2050 there were more *Usnea* organisms per square kilometer than there were ants. There was not one tree across the world that did not have *Usnea* growing on it.

Additionally, the moss “escaped.” Bryophytes depend on moisture to sexually reproduce – as their spores ripen they are dispersed from the brown capsule they are housed in, and land in areas with enough moisture for them to grow. Since everyone was religiously watering their new gardens, there was plenty of moisture in the air, and although no one could possibly predict it, by the end of 2049, 80% of the streets and pavements were covered in moss.

On January 20, 2050, the first instance of moss on a building was observed in Portland Oregon, United States and by March 15 of the same year, 50% of the buildings in Portland were covered in a green thick layer of moss.

Everyone was enjoying this change – the grey of the buildings was replaced by a color that was described by multiple individuals as “finally pleasant to look at.” There was so much texture to the city that people had trouble believing they were living in an urban area. No one needed to get away from the city anymore, as the colors were calming and relaxing. The combination of Usnea and moss has turned their city into something that seemed perfect.

The Oregon Museum of State and Industry quickly adapted to this new situation and allocated two rooms exclusively meant for Usnea and, respectively, moss. Now everyone could learn the most intricate and obscure details about these plants and start building a connection with something so present in their lives.

VII. Pattern establishment

By the end of March 2050, twenty other world cities were in the same moss situation, however due to the limited internet use, people were not aware this was happening in cities other than their own. Unlike the citizens of Portland Oregon, most other city dwellers were not happy with this new situation, seeing the excessive moss and Usnea growth as invasive organisms. They then made isolated attempts at removing the plants. Since there was such a drastic change in thinking in the world in the past decades, by law no herbicides could be used towards the removal of moss, so everything had to be done by hand.

It took until August 2051 for Tukaya and Kondel to realize that there was a pattern to what was happening across the world and that something needed to be done. They tried to contact the rest of the scientists present at the 23rd “Avenir humain” Online Convention, hoping to brainstorm again and come up with a solution, but they managed get through to only one other person. Everyone else had disposed of their computers and was out gardening.