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Environmental Geoscience & Cannabis

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My Major and My Passion

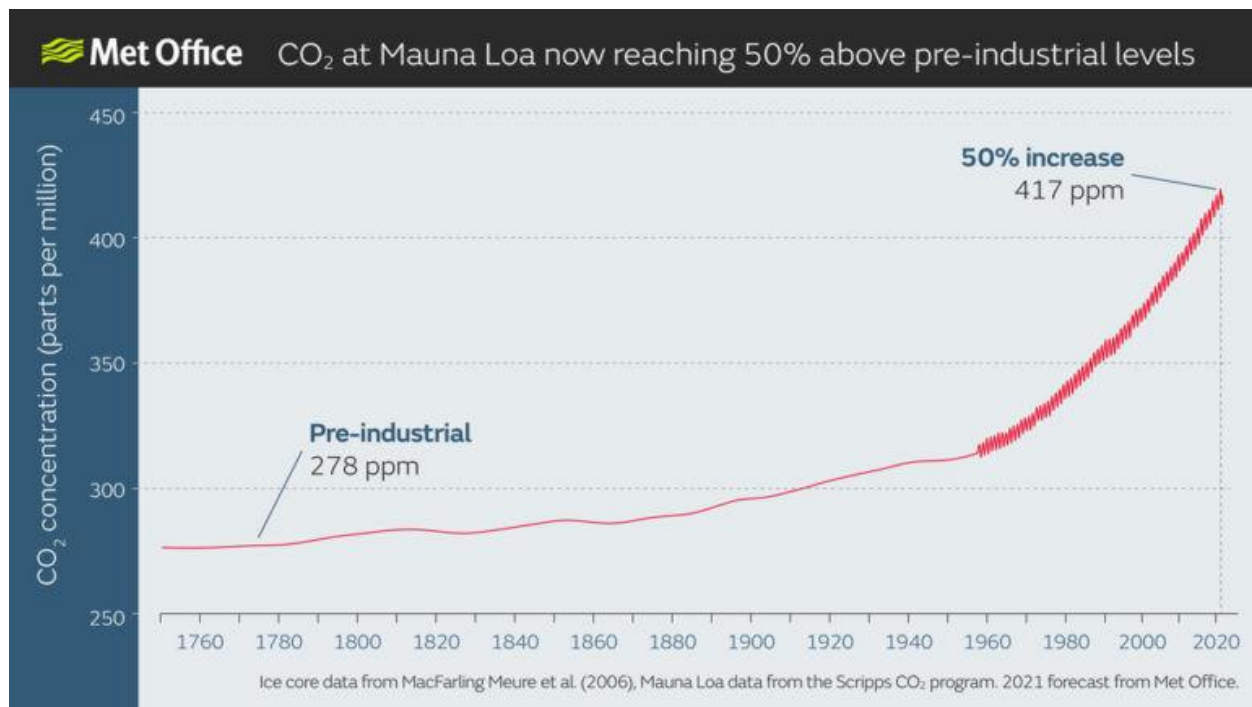
The cannabis/hemp industry opens up many opportunities for a broad range of fields; graphic designers are needed for advertisements, engineers for setting up and designing grow spaces, and many other types of professions. However, the most important job in the industry is obviously (arguably) the horticulturists who grow the plants. An aspect of the cannabis industry that may not be at the forefront of focus is the environmental effect of the cultivation of cannabis. Factors of the environment that focus on conservation are soil, water, and the atmosphere. That's where my major comes in, environmental geoscience, the focus on Earth's systems and how they are connected. The relationships between land, water, and air all can be affected by the cannabis industry. Due to the recent legalization of hemp being allowed to be grown industrially, enough research to substitute hemp with many mainstream products is still in the developmental stage. Nonetheless, there is great potential, enthusiasm, and optimism surrounding *cannabis Sativa Linn* (hemp) due to the fact that it can be used for food, feed, fiber, bioenergy, medicine, phytoremediation, and many other uses. (Clarke and Merlin 2013; Small 2015; Fike 2019). What can be said is that cannabis has served our ancestors well (Li 1974), and perhaps it's time we return to it.

In the case of the atmosphere, we must take greenhouse gasses into account. Greenhouse gasses are gasses that trap heat inside our atmosphere (NASA), examples of greenhouse gasses are water vapor, carbon dioxide (CO₂), methane (CH₄), ozone (O₃), any nitrous oxide molecule

(NO_x), and chlorofluorocarbons (CFCs, a type of aerosol). The most abundant gas is CO₂, making it the largest environmental concern. CO₂ levels have almost doubled since the start of the industrial revolution due to factories, along with increasing car emissions (Met Office).¹

Graph 1, CO₂ graph going back to pre-industrial.

The increasing amount of CO₂ has led to the Earth warming at rates of .32°F per decade since 1981. (climate gov). Increasing temperatures on Earth will lead to detrimental consequences, raising major concerns for our safety. At the rate we are going now, there needs to be sustainable change, and that's where the cannabis industry can play a part.



In relation to greenhouse gasses and the cannabis industry, cannabis is a relatively fast-growing crop, consuming 3 to 4 times more CO₂ than many of its competitors as it grows.

(Agrawal vii). Surprisingly enough, cannabis is faster than forests at consuming CO₂. Fields of cannabis are consuming CO₂ at rates three times faster. This rate is extremely beneficial to the atmosphere, and when cannabis is processed, the carbon inside of the plant (if not burned) is trapped inside the products. This means that hemp fibers and hemp concrete, among other

products, will successfully store carbon dioxide, thus reducing the amount of carbon dioxide in the atmosphere even after the plant is done growing. A major benefit of hemp production is that it can be grown all over the world, an interesting side effect of being one of the earliest domesticated crops. Cannabis can sprout in almost all soil conditions as long as a few basic requirements are met. This means that cannabis could be grown in abundance almost anywhere and with its many uses, a market could be found regardless of location.

Growing cannabis has a direct positive effect on the air, furthermore, a byproduct of hemp could benefit water. The water sector of hemp's potential is just as environmentally friendly. Studies, trials, and experiments are being done on hemp in hopes of it being used to treat wastewater. Where does dirty water/wastewater originate from? Besides the obvious answer, sewage, a lot of water in need of treatment comes from chemical run-off. Sometimes in the form of factory pollution, but mostly from chemical run-off resulting from excessive use of industrial fertilizers on farms. Currently, treating wastewater is fossil fuel dependent, and isn't fully reliable(C. Mongiovi et al. 240). This has led to a boom in research pertaining to using hemp products to clean wastewater. Hemp products can be used in multiple ways to clean water through biosorption. Biosorption, specifically liquid-solid biosorption, is defined as the removal of metals from a solution using biological materials, a.k.a biosorbents(Gadd 2009). In the case of many biosorbents, they are much cheaper than their man-made counterparts (adsorbents). The advantage of hemp in this field would be its versatility, hemp can be made into a multitude of forms; powders, shives/hurds, fivers, and felt are four forms of hemp, all of which have been undergoing tests(C. Mongiovi et al. 248). Three separate groups of scientists; Romanian Paduraru, Serbian Kostic, and French Crini, have all come to the same conclusion, that non-conventional hemp-based biosorbents are an effective and economical method to remove metal

(C. Mongiovi et al. 250). Hemp is a renewable, biodegradable, environmentally friendly, and economical alternative to absorbents, however; the pH of the solution has a large impact on its effectiveness. While absorbents can be made to operate in specific pH levels, hemp only has a set range of effectiveness. (Table 2 & 3 C. Mongiovi et al.). Modifications of hemp products are being tested through grafting, so this limitation could possibly be eliminated. This would make the accessibility of hemp as a biosorbent less, but more effective.

The third aspect in which my major studies is the land. When cultivating hemp it is important to take into consideration its effects on the environment. Hemp can be grown inside and outdoors, both locations posing their own benefits and detriments. Most of the time the only problem indoor cultivation of hemp poses is the increase in energy and water use. Water for indoor cultivation comes from pipes, not rivers, which are often diverted when it comes to growing any plant outside. Outdoor cultivation of hemp can have an impact on the environment, especially in places where environmental policies aren't heavily regulated. A major example of this would be the sudden widespread hemp cultivation in post-World War II Africa. (Odejide 2006). As mentioned above, rivers being diverted to produce this cash crop disrupted natural hydrological conditions. Still, in modern times, disrupted rivers are a major concern, the main focus being on fertilizers. Fertilizers, as previously mentioned; produce chemical runoff that harms neighboring farms, and contaminates water, which can lead to harmful algae blooms in rivers, lakes, and oceans. In response to this, studies into healthy and sustainable fertilizers are being carried out at this very moment. (Muscolo). While farmers wait on the scientists, cannabis is hard at work fixing the soil.

Contrary to the statement above, regarding how cannabis farms use fertilizers, which have extremely negative effects, cannabis roots, however; have been observed to increase soil

health by reducing the number of heavy metals and toxic chemicals. (Bona et al. 2007; Mihoc et al. 2012; Ledger 2020; Khan 2020). This makes cannabis harmful for consumption by organisms, mostly pests, and is also observed to repel harmful insects. Unfortunately, not all insects are repelled and the use of pesticides is a disadvantage in the cultivation of hemp. Although not nitrogen-fixing, cannabis improves the number of micronutrients in the soil, allowing future plants to flourish. (Rightford 2020). So much so that in 1991 cannabis was planted around Chernobyl to aid with the cleaning of nuclear spillage. (Guterman 1999).

Product-wise, the water sector might be the only marketable aspect discussed. Nonetheless, knowing that cannabis plants can positively affect the environment can be a major selling point for investors to expand the industry. Furthermore, these positive traits could lead to a larger level of federal legalization of cannabis. Not only can researching and implementing this research be used to manage growing cannabis operations but so can my major. With an environmental geoscience degree, one could work as an environmental consultant guiding a company on environmental policy. A significant factor of the environmental geoscience degree plan is becoming well-versed in environmental policy and learning how to implement it on a large scale. Every company needs a consultant as governments become stricter on mitigating negative effects on the Earth.

The uses of cannabis are wide and varied and the studies done by environmental geoscientists will have a direct effect on the cannabis market. That effect may not be as a tangible product but in the form of knowledge on how to cultivate cannabis so that the producers, consumers, and environment will benefit. As a result of the environmentally friendly results shown in the studies and experiments like the ones above, and many more to follow; industry growing government policy could rise. The emergence of government incentives such as tax

benefits, utility rate reductions, and many other incentives, could encourage many new investors. More investors will lead to an increase in the amount of cannabis being grown, which will lead to decreased concentration levels of CO₂, healthier soil, and if used correctly, healthier water. Cannabis might not be the only alternative for fixing the Earth, but with the growing cannabis industry, there is a lot of room for environmentally sustainable profit to be made.

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