Date: June 21, 2023

Re: Agenda Item VI.1

Members of the Environmental Management Commission,

Agenda Item VI.1 - Presentation by Douglass Adams, Director of Research and Development, on topics relevant to DEM: Technical and economic viability of the Yummet biochar process on Hawai'i Island and the likelihood of sufficient hydrogen output from county landfills to be economically useful.

At first glance, Yummet seems to offer some exciting new strategies in resource management that could help to revolutionize the life cycle of many products being used in our island state. However, the relative isolation and dependency on importation/exportation of resources to support this company's processes may also be a hindrance to its success in Hawai ʻi. One could argue that to truly reach climate resiliency and self sufficiency as an island state, it is imperative to focus on more traditional circular economies that can be implemented and maintained on island first. It can be argued that the development and implementation of a robust commercial composting system, scalable reusable systems and their associated infrastructure, resource recovery parks, and cooperation between government and business leaders to support these new circular economies can be more effective in helping the state rapidly reduce our carbon footprint and reach our Aloha + challenge. Yummet's technology sounds innovative, but the vague detail on the actual process is cause for concern.

Many of us in the zero waste and environmental community in the state are concerned at the counties move in this direction, as most of what we call "waste" are reusable and recyclable resources that do not need to be broken down into their basic molecules and rebuilt to be utilized. We would much rather see the county focus on improving its waste collection systems, waste prevention programs, and on-island reuse, recycling and refurbishment of materials. There is no explanation of how and which materials are processed by this technology. **Production of biochar could be dangerous to human health, the environment and soil microbes as biochar can contain toxins such as "heavy metals, polycyclic aromatic hydrocarbons (PAHs), environmentally persistent free radicals (EPFRs), dioxins, and perfluorochemicals (PFCs)" depending on the feedstock used, and preparation conditions and methods (Sources listed below).**

Instead of taking our chances on a new, poorly described technology, would it not be better to focus the resources we have on tried and true materials management applications from around the world, such as reduce, reuse, recycle and rot? Rather than looking for innovative new technologies to solve our consumption problem, wouldn't the

Yummet process encourage the continued importation of 80% of Hawaii's consumables? What is to slow the constant demand for imported goods if there is a perceived way to make the waste "disappear"? This type of solution may very well contribute to the continued dependence on fossil fuel derived products (plastics), which inevitably creates another greenwashing industry, rather than a scalable and sustainable solution.

Wouldn't it be better to instead focus on a return to the indigenous system of malama 'aina? (Refer to Kamala Beemer's work). Bringing stakeholders together to reach a consensus and work towards building sustainable circular systems, this is how we honor and utilize the teachings of Hawaiian knowledge. Technology like Yummet sounds wonderful, but it is not a feasible first step for a county that has yet to implement basic resource management practices such as composting, reuse, and basic recycling education and outreach.

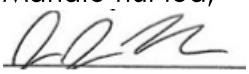
We urge you to be cautious in relying on new and expensive technology to try to solve our waste crisis, we need to follow best practices in resource management, and those will continue to be based on the circular economies of reduce, reuse, and rot. **We urge the commission to please write a letter to the county council and relevant departments to discourage pursuit of this plan and ask the county to put attention to traditional materials management methods that follow the zero waste hierarchy which prioritizes reduction, reuse and recycling of materials**.

<u>Questions for consideration</u>

- Where is the data on the carbon footprint and waste products associated with the processes that Yummet plans to implement?
- Have there been similar projects in which Environmental Impact Review's have already been produced?
- How would these 4 products they produce be utilized and transported on island?
- Would they help to reduce our dependency on imported products? (Subtext: or create an opportunity for increased imports and consumption) Or would they be exported?
- What is the associated carbon footprint with the creation of new technology plants vs setting up more traditional systems such as compost and dishwashing facilities on island?
- Biochar vs compost for regenerative farming?
- Which components of the waste stream will be utilized to create biochar?
- Does the Yummet process require separation of materials?
- How will the county get out of the contract with WM, to divert waste to this facility?

Thank you for this opportunity to submit testimony.

Mahalo nui loa,



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Zero Waste Hawai'i Island's mission is to connect diverse Hawai'i Island Communities to support equitable systems redesign and policy change to achieve zero waste.

Journal articles on the potential hazards of biochar

Potential hazards of biochar: The negative environmental impacts of biochar applications.
https://www.sciencedirect.com/science/article/abs/pii/S0304389421015764#:~:text=Biochar%20has%20various%20potential%20environmental,soil%2C%20water%2C%20and%20atmosphere.&text=Feedstocks%2C%20production%20process%2C%20and%20application%20affect%20the%20ecotoxicity%20of%20biochar.&text=The%20harmful%20components%20in%20biochar%20have%20potential%20environmental%20risks.

"Although biochar has been widely regarded as an environmentally friendly soil amendment, harmful components [heavy metals, polycyclic aromatic hydrocarbons (PAHs), environmentally persistent free radicals (EPFRs), dioxins, and perfluorochemicals (PFCs)] may be produced because of the improper selection of biomass feedstocks, preparation conditions, and preparation methods (Table 1). Recent studies have turned their attention to the negative environmental effects of biochar owing to its potentially harmful components and various interactions with the environment (El-Naggar et al., 2020, Cui et al., 2021)."

THE DARK SIDE OF BLACK GOLD: Ecotoxicological aspects of biochar and biochar-amended soils

https://www.sciencedirect.com/science/article/abs/pii/S0304389420318227#:~:text=It%20is%20perceived%20as%20a,may%20be%20present%20in%20it

Abstract: Biochar, a product of biomass pyrolysis, is characterized by significant surface area, porosity, high water holding capacity, and environmental persistence. It is perceived as a material that can counteract climate change due to its high carbon stability and is also considered suitable for soil amendment (fertility improvement, soil remediation). However, biochar can have a toxic effect on organisms as harmful substances may be present in it. This paper reviews the literature regarding the current knowledge of harmful substances in biochar and their potential negative impact on organisms from different trophic levels. The effects of biochar on the content and toxicity of harmful substances in biochar-amended soils are also reviewed. Application of biochar into soil does not usually have a toxic effect and very often stimulate plants, bacteria activity and invertebrates. **The effect however is strictly determined by type of biochar (especially the feedstock used and pyrolysis temperature) as well as contaminants content.** The pH, electrical conductivity, polycyclic aromatic hydrocarbons as well as heavy metals are the main factor usually responsible for biochar toxicity.

Unravelling the impact of potentially toxic elements and biochar on soil: A review
https://www.sciencedirect.com/science/article/pii/S266701002200097X

"Biochar application may also negatively affect environmental quality and human health because of harmful compounds such as polycyclic aromatic hydrocarbons (PAHs), polychlorinated dibenzodioxins, and dibenzofurans (PCDD/DF). In this review, we discuss the linkage between biochar composition and function, evaluate the role biochar plays in soil fertility improvement and C sequestration, and discuss regulations and concerns regarding biochar's negative environmental impact."

Biochar composition-dependent impacts on soil nutrient release, carbon mineralization, and potential environmental risk: A review.

https://www.sciencedirect.com/science/article/abs/pii/S0301479719301951

Abstract: Biochar application has multiple benefits for soil fertility improvement and climate change mitigation. Biochar can act as a source of nutrients and sequester carbon (C) in the soil. The nutrient release capacity of biochar once applied to the soil varies with the composition of the biochar, which is a function of the feedstock type and pyrolysis condition used for biochar production. Biochar has a crucial influence on soil C mineralization, including its positive or negative priming of microorganisms involved in soil C cycling. However, in various cases, biochar application to the soil may cause negative effects in the soil and the wider environment. For instance, biochar may suppress soil nutrient availability and crop productivity due to the reduction in plant nutrient uptake or reduction in soil C mineralization. **Biochar application may also negatively affect environmental quality and human health because of harmful compounds such as polycyclic aromatic hydrocarbons (PAHs), polychlorinated dibenzodioxins, and dibenzofurans (PCDD/DF).** In this review, we discuss the linkage between biochar composition and function, evaluate the role biochar plays in soil fertility improvement and C sequestration, and discuss regulations and concerns regarding biochar's negative environmental impact. We also summarize advancements in biochar production technologies and discuss future challenges and priorities in biochar research.