Good morning everyone,

I want you to imagine something for a moment.

A family in California wakes up in the middle of the night because of wildfire evacuation alerts. The sky outside is orange, smoke fills the air, and even after escaping the flames, the danger is still inside their home. Their children are coughing. Elderly family members struggle to breathe. Schools close. Hospitals become overcrowded. And for many families, the only protection available is an air purifier that costs hundreds of dollars.

My name is Kelly Ndizeye, an undergraduate student in Chemical Engineering.

The reality is that we cannot completely stop wildfires from happening. But people should not lose access to clean air because of a disaster.

That is why my proposal is called **“Breathe Safe Again.”**

My project focuses on developing an affordable portable air purification system for wildfire-affected communities. The goal is simple: create a low-cost device that helps families breathe safer indoor air during wildfire emergencies. The flyer I give you explains how this device can provide emergency air filtration using biochar-based filters while remaining affordable and accessible for vulnerable communities.

Wildfires are becoming one of the fastest-growing natural disasters in the United States, especially in states like California and Oregon. Even after flames disappear, dangerous smoke remains in homes, schools, hospitals, and shelters for days or even weeks. According to research published in *Chemosphere* on activated carbon sorbents and wildfire air purification, wildfire smoke contains harmful particles and toxic chemicals that can damage respiratory and cardiovascular health.

We have already seen the devastating effects of this problem in real life. During the 2023 Canadian wildfires, smoke spread across large parts of the United States, including New York City. Millions of people were advised to stay indoors because the air quality reached dangerous levels. The sky turned orange, and people wore masks outside just to breathe safely. That moment showed that wildfire smoke is no longer only a Western United States issue. It is becoming a national public health concern.

One major issue is affordability.

Many existing air purifiers are designed for general indoor comfort rather than emergency wildfire situations. Most commercial systems cost between $150 and $600,

and they often require expensive HEPA filter replacements over time. For families already facing evacuation costs, property damage, or medical expenses after wildfires, these devices can become financially unrealistic.

My proposed device focuses on affordability and accessibility without sacrificing functionality. The estimated prototype cost is approximately $40 to $80, making it significantly more affordable than many existing systems. Instead of relying on costly replacement filters, the device uses biochar-based filtration, which is low-cost, sustainable, and made from waste biomass materials. This allows the purifier to remain practical for low-income households and communities that need emergency protection the most.

My proposed device is different because it focuses on three things:

- Affordability
- Accessibility
- Emergency readiness

This biochar is a carbon-rich material made from waste biomass, and research shows that carbon-based filtration materials are highly effective at trapping airborne pollutants and toxic particles.

The way the device works is simple.

First, a small fan pulls smoky air into the purifier. Then the air passes through a biochar-based filter that traps harmful smoke particles and chemicals. Finally, cleaner air is released back into the room. The device is portable, lightweight, and designed for homes, shelters, schools, and emergency centers.

Another important part of this project is feasibility and implementation.

My timeline is divided into three phases:

Phase 1 : Research & Design (1–2 Months)

During this phase, I will research wildfire smoke pollutants, identify appropriate biochar materials, and design the prototype structure.

Phase 2 : Prototype Development (2–3 Months)

I will build the prototype device, assemble the filtration system, and begin airflow testing.

Phase 3 :Testing & Improvement (1–2 Months)

I will test filtration effectiveness, identify weaknesses, improve portability and durability, and evaluate how effectively the device reduces smoke particles indoors.

This timeline makes the project realistic and achievable within an undergraduate research setting.

The estimated total budget for this project is approximately $325, which includes prototype materials, biochar testing, airflow testing, and performance improvements. Compared to many engineering research projects, this budget is relatively low while still offering strong humanitarian impact.

The primary funders I am targeting include:

- Alumni donors from The City College of New York
- Environmental and sustainability organizations
- Public health-focused foundations
- Disaster relief and emergency preparedness organizations
- Research programs supporting affordable engineering innovation

These funders would not simply be supporting an undergraduate project. They would be investing in a practical solution that addresses a growing public health emergency affecting real communities.

What makes this project especially meaningful to me is its humanitarian impact.

Clean air should not become a luxury during disasters. Families with low income, children, elderly individuals, and vulnerable communities are often the most affected by wildfire smoke because they have fewer resources to protect themselves. My proposal is not only about engineering a device; it is about protecting human health and helping communities recover more safely after disasters.

As a Chemical Engineering student at The City College of New York, I have developed knowledge in materials science, filtration systems, mass transfer, and environmental engineering principles that directly support this project. With guidance and mentorship from a faculty member in the department, I plan to research, test, and improve this design to make it realistic and achievable.

When people think about disasters, they often think only about survival during the event itself. But recovery after disasters matters too. Families still need to breathe safely after the flames disappear.

That is why I believe this project matters.

This proposal is about more than building a portable air purifier. It is about using chemical engineering to create a practical, affordable, and life-saving solution for communities facing one of the fastest-growing environmental and public health challenges in the world today.

With funding and support, this project has the potential to become more than an undergraduate research idea. It can become a meaningful innovation that helps families breathe safely again when they need it most.

Thank you.