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Editorial Article

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Can the Use of Biochar in Green Infrastructure and Green Landscaping Slow Climate Change and Reduce the Damage of Downstream Flood Mud

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ABSTRACT

As climate change accelerates, our response must evolve beyond flashy technologies and carbon markets. A quieter revolution is underway, one rooted in soil, storm drains, and biochar. Biochar, a carbon-negative material with powerful filtration properties, is emerging as a cornerstone of sustainable urban infrastructure. When paired with green landscaping and stormwater management, it offers a pragmatic, scalable, and affordable way to mitigate climate impacts while cleaning up our cities.

Keywords: Biochar, Green Infrastructure, Green Landscaping, Climate, Lead, Flood Abatement

The Overlooked Frontline of Climate Action

While headlines focus on Direct Air Capture and carbon trading, the everyday infrastructure that shapes our cities, roads, parks, drains, remains largely untouched by innovation. Yet this is often where climate change hits hardest. Floods, intensified by warming, sweep through neighborhoods, leaving behind toxic sludge laced with oil, pharmaceuticals, and heavy metals like lead. Stormwater systems, overwhelmed by runoff from impervious surfaces, flush pollutants into rivers and oceans. These are not abstract problems, but demand solutions that are not only effective but deployable at scale. That's where biochar comes in.

What Is Biochar—and Why Should We Care?

Biochar is produced by heating organic material (like wood waste) in a low-oxygen environment. The result is a porous, carbon-rich substance that acts like a sponge for contaminants. It's chemically similar to activated carbon but far cheaper to produce. Even better, its creation sequesters carbon, making it a climate-positive material.

Studies show that biochar can absorb heavy metals, dyes, pharmaceuticals, and hydrocarbons. It improves soil health, boosts crop yields, and reduces irrigation needs. In stormwater catchments and flood-prone landscapes, it can trap pollutants before they reach waterways.

Stormwater: A Hidden Climate Crisis

Consider this: the U.S. alone has over 4 million miles of roads. These impervious surfaces funnel rainwater into storm drains, which often overflow during heavy storms. That runoff carries a toxic cocktail: oil, rubber, pesticides, and more into rivers and lakes.

Green infrastructure, like bioswales and permeable pavements, helps slow and filter this runoff. But biochar when added to catchments, swales, or engineered soils, absorbs contaminants and retains water, reducing pollution and flood risk. Minnesota's Storm Water Manual outlines multiple applications—from turf amendments to underground basins.

Yet despite its promise, biochar remains underused in highway construction and urban planning. Why? Lack of awareness, fragmented responsibility, and inertia.

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Floods and Lead: A Toxic Legacy

Floodwaters don't just damage property; they mobilize the contaminants of past decades, e.g. old contaminants such as lead. Lead, banned from paint and gasoline, still lingers in soil across parks, yards, and streets. Every flood or heavy rain can spread it anew.

The EPA's current recommendation removing - and incinerating the top three inches of soil - is prohibitively expensive for most communities. Biochar offers a better way. It binds lead chemically, rendering it bio unavailable. Applied to landscapes, sidewalks, and storm drains, it can reduce exposure without costly excavation.

And it's not just lead. Biochar can trap agricultural runoff, industrial chemicals, and pharmaceuticals. It's a low-cost, high-impact tool for post-flood remediation.

Turning Waste into Gold

Cities already manage vast amounts of biomass, such as fallen trees, pruned branches, yard waste. Even twenty years ago, New York City, for example, landfilled nearly 20,000 tons of wood at the cost of $1.4 million annually. That's enough feedstock to produce thousands of tonnes of biochar and lots of money.

Instead of discarding this material, municipalities could convert it into biochar and use it across departments, parks, public works, emergency services. Parks departments, already equipped the staff and budget to manage landscaping, are well-positioned to lead this charge.

Implementation: Who Pays and Who Leads?

The biggest barrier to biochar adoption isn't cost; it's coordination. No single agency owns the lead problem. Is it Public Health's job to clean lead from parks? Should Emergency Services handle post-flood soil remediation? Who pays for green catchments in highway design?

These questions need answers. But in the meantime, pilot programs can begin. Cities can start small for example, by adding biochar to a few swales, testing its impact in flood-prone zones, converting yard waste into usable material. Grants, climate funds, and public-private partnerships can help scale these efforts.

A Call to Action

Biochar is not a silver bullet. But it's a shovel-ready solution that addresses multiple climate challenges at once: carbon sequestration, water pollution, soil health, and flood resilience. It's affordable, accessible, and adaptable, so why not?