BIOCHAR SITING & ENVIRONMENTAL JUSTICE:

A GUIDE FOR CITIES AND COMMUNITIES

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Biochar's Potentials for Climate and Communities:

In an era of increasingly complex and daunting climactic, environmental, and social problems, **biochar** is often welcomed as good news – – a potential and even miraculous solution that can help us to sequester carbon, regenerate soils, feed plants, heal toxic sites, clean water, generate energy, and more.[1] Simultaneously communities, systems thinkers, organizations, and people working on climate action and climate justice tell us again and again that there is “no silver bullet” to the large scale environmental and climate problems we face. There is no one solution, one technology, or even one approach to climate that will solve the myriad of issues we face from environmental degradation, pollution, and exploitation. Our climate and social justice issues call for whole systems thinking, integrated design, and site-specific solutions.

This guide was written for cities and communities looking to technologies such as biochar to tackle climate in a way that centers equity and communities and supports whole systems design.

The environmental justice movement has shown us that environmental and social justice issues are rarely divorced or siloed and therefore, we must work to take action on both at the same time. The environmental justice movement has helped make it clear that when we allow and resource communities that are impacted to lead in solutions-making, they are able to solve problems more effectively, often solving for multiple problems at once, all while building resilience through social cohesion.

If biochar is to be used, it should be part of a larger strategy and part of a menu of solutions that communities have identified. Like all potential solutions, bio-char is not a silver bullet, must be site appropriate, and may not be the best solution for all communities. Climate and sustainability solutions should be holistic, community-oriented, ecologically appropriate, and site-specific. In fact, if misapplied or done poorly, biochar could become part of an equation of environmental injustice for some communities. Historically there have been too many examples of facilities that purport to create environmental benefits and economic engines while placing the overlooked burdens in communities of color and other

disinvested communities. It would be damaging for the biochar and climate movements as a whole if this were to happen with biochar.

For cities: This guide will help cities ask better questions and act as better partners as they work towards climate, sustainability, and resilience goals. Cities have an important role to play in supporting community-driven planning, work, solutions, and education by providing resources to increase community capacity, technical assistance, broader networks, and institutional knowledge. While global and national priorities are key aspirational commitments, municipalities are where many climate policies are actualized or killed. Cities have a unique responsibility in thinking through and mitigating potential harms of any climate policy or action that could harm frontline communities.

For communities: This guide is also designed to help communities navigate their climate goals, particularly to better understand the potential benefits and drawbacks of biochar in the context of a wider, equity-centered, holistic approach to sustainability solutions. This guide is written with the aim of being accessible to communities and reflective of their larger challenges and approaches. Communities, especially frontline communities, should be in charge of the framing of their issues, solutions design, and the implementation of their solutions, with governments, institutions, experts, and resources in support.

This guide draws upon a variety of viewpoints and experience: secondary research and reporting; relevant environmental justice frameworks, principles, and practices; and interviews. This is not an exhaustive or prescriptive resource, but rather a starting point. This guide was developed as a pilot, given a short time for an initial inquiry into a complicated topic. More interviews with frontline communities and climate justice practitioners are needed. This is especially true as this guide is hoping to be of service internationally. More research is needed, including on the many variables, frameworks and considerations that change according to place and community. Recommendations at the end suggest additional research by those operating biochar also might shape future conversations. Nevertheless, this guide hope to provide a helpful starting point for communities interested in biochar today.

Environmental Justice Overview

The Environmental Justice Movement has made it clear that racism and other forms of oppression express themselves environmentally. Racism and other forms of oppression do not just show up interpersonally or in terms of economic or resource access but also in environmental benefits and burdens and the health outcomes that follow. In recognition of the unequal environmental burden faced by so many communities of color, Robert Bullard, “the father of the Environmental Justice Movement,” defines **environmental racism** as “any policy, practice or directive that differentially affects or disadvantages (where intended or unintended) individuals, groups or communities based on race.[2]” It is important to note that environmental racism is perpetrated nationally in the United States, as in the context of Bullard, but is also pervasive internationally (and inter-nationally).

Too often the siting of industrial facilities, waste, toxic waste, pollutants, exhaust, and other environmental burdens are placed in communities of color first and foremost, and often in low-income areas as well by decision-makers, governments, historical zoning, business, and industrial interests. These communities are often referred to as **“frontline communities”** in recognition that they are often hit “first and worst” by environmental problems and climate chaos. In terms of climate globally, many have pointed out that frontline communities contribute the least to global greenhouse gasses, but are impacted the most.

Even in attempting to create climate and environmental solutions (including biochar), there is a pattern of frontline communities not being included in decision-making processes that may ultimately affect them and leave them with facilities, products, and processes they may not want and harm their health, wellbeing, and property values. At the crux of it, Environmental Justice requires **procedural justice**, that is, ensuring that all people have equal access to decision-making processes and powers, as well as **distributive justice**, that is, ensuring no one is unduly burdened by technological expansions through industrial and environmental hardships[3]. These considerations must be addressed as we move forward to make communities healthier, safer, economically sound, and environmentally vibrant. If a community is impacted, they should have a seat, or several seats at the table.

A vital part of the environmental justice movement recognizes that harms are done intentionally and unintentionally. Ultimately it does not matter if they are intentional or not, they are to be avoided and cities, communities, organizations, and others

Environmental justice contd

working towards climate solutions need to ensure that they are asking the right questions, and involving communities in the right ways, so that they do not reinforce, replicate, contribute to, or add to the harm faced by Frontline communities. In fact, part of the beauty of the environmental justice movement is that it does not seek to equally distribute pollution or environmental harms, but to illuminate them and transform systems to toward regeneration, sustainability, and justice.

Some helpful environmental justice questions that can help in any phase of project development are:

- Who benefits?
  - In what ways?
- Who pays?
  - In what ways?[4]

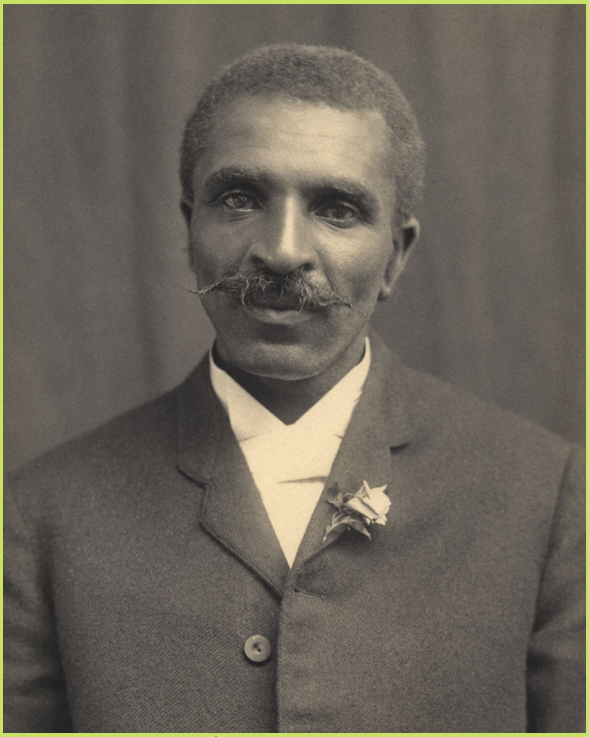
These questions are helpful at every stage of project development. Who benefits and how? Who pays and how? These questions are often illuminating because we see that sometimes the benefits may just be convenience or economic boon for one community (i.e., not critical), while the burdens may be intense health-threatening, life-threatening impacts or major impacts on quality of life for another. You can think of these questions every time a major decision is being made, anytime money is exchanging hands, any time contracts are being developed, anytime decision makers are being addressed, and even once projects are well underway or have been ongoing for years it may be helpful to revisit these questions to ensure environmental justice. As previously mentioned, frontline communities should be there for every step of the decision-making process, and even still, some of these questions may be invisibilized if not consciously returned to. For example, even if a community has consented to the purpose, siting, or scale of a facility, questions might remain about benefits or who will own or manage the facility. Communities and cities may be used to business people and others being poised to or supported to develop similar projects without considering creative community solutions such as community ownership, co-ops, and other innovative structures.

Around the world there are perennial questions about soil fertility and how to work with and grow on degraded soils. **Regenerative agriculture** gives us hope that we can both grow food, and restore soils and ecosystems and even improve them in the process by using ecological design practices (like using site-appropriate crops,

Environmental justice contd

native crops, utilizing perennial crops, farming with polycultures and intercropping, creating microclimates, smarter livestock production systems, rainwater harvesting, no-till and organic annual cropping, managed grazing, agroforestry, and perennial crops, incorporating cover crops, rotations, intercropping, composting, rainwater harvesting techniques, etc.[5]). In fact, doing so could be cornerstone of global climate action. As Vandana Shiva states “Fertile soils rich in organic matter are our best insurance against food insecurity and climate vulnerability… We need to build living soils because they are the very source of life. [6]”

Born in 1864[7], George Washington Carver should be regarded as one of the great fathers of regenerative agriculture. He provides us an amazing example of how ecological systems can also be social equity systems. Carver developed a multitude of agricultural inventions and processes, most famously involving the growing and processing of peanuts. Many do not realize he was working with peanuts, as well as soybeans[8], because they fix nitrogen, which builds soil fertility and restore nutrients while giving a yield[9]. He saw an urgent need to restore the lands that so many Black people recently freed from enslavement owned or sharecropped on land that had been extracted from and eroded to grow cotton. According to food historian and innovator Michael Twitty, Carver “gave [B]lack farmers a means of staying on the land. We all couldn’t move north to Chicago and New York.[10]” He knew that they needed to restore the land, while also providing for themselves in terms of food and economically… It seems that is still what the world needs. Proponents of biochar believe that it can be a powerful part of an equitable regenerative agriculture solution.



George Washington Carver circa 1910

Biochar Overview

The era of climate change, carbon is often imagined as a bad word. But the proper management of carbon (and other ecosystem elements, like water) also are important parts of the solution. **Biochar** is essentially carbon. Biochar is created through a specialized, low-oxygen burning process called *pyrolysis* in which organic matter (often farm or forestry waste) is burned down to its carbon elements and forms a black substance, which looks a lot like charcoal[11]. This black char is then applied largely to support agriculture and improve soil and is purported to do so in a number of unique ways.

Biochar is an ancient technology. It is often associated with *terra preta*, especially fertile, dark soil created up to 2,500 years ago by Indigenous people across cultural groups[12] in the Amazon. This improved soil is remarkable in part because the soils in the Amazon are otherwise infamously poor (at least for agriculture). Indigenous peoples created *terra preta* by mixing char, clay shards, fish and animal bones into the soil up to 2,500 years ago and they are amazingly still fertile. While most famous in the Amazon area, similar soils seem to have been cultivated across other parts of South America, and in Africa, in what are now known as Benin, Liberia, and South Africa.

Many believe the secret to the long-lasting fertility and benefits of *terra preta* is, in part, the stability of the carbon in biochar. Scientists have only recently begun to examine and understand how people could have created these remarkable soils. Biochar lasts a long time—potentially “forever”—conceivably providing soil benefits long into the future. While the process is fascinating and has many potentials in and of itself (energy production, waste management, etc.), the end product of this process, the biochar, is what is really intriguing communities, climate and soil scientists, local governments, entrepreneurs, and more. Biochar is regarded by many to be an incredible force for environmental and climate improvements through everything from regenerating soils, supporting plant life and growth, isolating or cleaning toxins, increasing the water absorption capacity of land, cleaning water, food additive for livestock, construction materials amendments, and absorbing (“sequestering”) carbon almost every step of the way.[13]

There is fierce debate about whether or not biochar is a powerful environmental, agricultural, pollution, water, and climate, solution, or whether it is ineffective or worse, causing long-term harm to communities, lands, soils, etc., with researchers and experts on both sides.

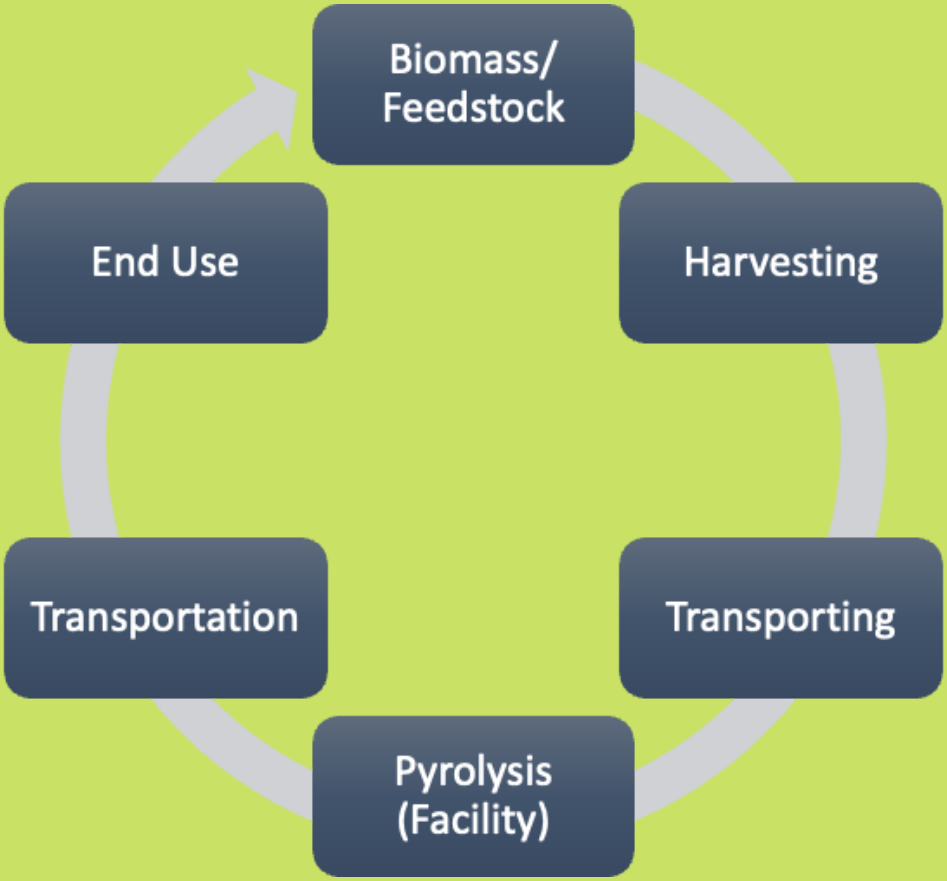
Biochar is still made throughout the world in variety of drastically different scales. Many systems are small home- or farm-scale systems made in barrels that can be mobile, or even in pits in the ground. Recently, much larger, industrial facilities have come online that can process up to 150,000 tons of dry wood per year.[14]

Along with the solutions-oriented menu, it is useful to look at the principles and ideas behind "appropriate technology." **Appropriate technology** helps us think through how to solve for our local and global environmental and cultural issues in the simplest most low-tech, long-term ways possible and in ways that consider social and environmental impacts. Mahatma Gandhi is often considered the father of appropriate technology, even though he did not use the term (and deeper examination reveals that it is something practiced by Indigenous communities throughout the world). Gandhi believed these elegant, local solutions could help Indian communities become more self-reliant and resilient.[15] Appropriate technology is necessarily site-specific and appropriate to its context ("including the environmental, ethical, cultural, social, political, and economical context"[16]). Some of the principles of appropriate technology include:

- **Small**- Small often means affordable and adaptable, and puts the control in the hands of the users. Small also means local, which offers benefits in resilience. This places more power at the grassroots, in the hands of the users. However, there are also times when the most appropriate technologies are large-scale.
- **Few moving parts** — Less to go wrong
- **Can be built locally**
- **Made with locally available materials**
- **Easily repaired** — By local people with locally available equipment
- **Affordable**
- **Suitably disposable** — Local disposal that does not pollute
- **Gentle or supportive of the environment** [17], [18]

All of these principles reflect what climate justice advocates are calling for as well as, to some extent, many biochar champions.

Biochar has ecological, economic, and equity impacts throughout its lifecycle. These are important to consider in community-based biochar conversations.



Important places within the biochar process to ask environmental justice questions

To consider environmental benefits throughout the lifecycle, Table 1.1 provides a brief list of the benefits and uses of biochar that proponents claim, including forestry waste and CO2 reduction, waste management, soil fertility & plant health, compost improvement, water retention, bioremediation, water remediation and stormwater treatment, livestock health, construction materials, carbon sequestration, and soil quality.

BRIEF LIST OF BIOCHAR BENEFITS AND USES PROPONENTS CLAIM:

Table 1.1

Forestry waste and CO2 reduction	Many tree professionals don't have a place for tree trimmings and forestry cuttings, especially during acute situations like the Pine Beetle infestation in the western US that killed millions of trees very quickly.
Waste management	Much of the biomass that is used for biochar would otherwise be going to landfill (volume) or other waste facility, generally creating methane & other greenhouse gasses. (See above).
Soil fertility & plant health	The unique shape of carbon and biochar creates an incredible environment for beneficial microorganisms which are the cornerstone of soil health. Biochar is not like other fertilizers/soil amendments which bring elements to the soil, it creates the *conditions* for increased soil fertility. It also supports plants' resilience and abilities to photosynthesize[19].
Compost improvement	Proponents claim it can reduce pathogens in compost, accelerate the process, bind toxins, reduce compost's emissions (absorbing methane and ammonia, for ex[20]).
Water retention	Biochar may increase soil capacity for retaining water[21], reducing the need for irrigation, and/or supporting dryland ecosystems.
Bioremediation	Proponents claim it is able to bind with toxins and heavy metals. It has been used as part of an amendment around landfills to remediate copper, arsenic, zinc, cadmium[22].
Water remediation & stormwater treatment	Biochar is claimed to be able to reduce stormwater contamination (from pollutants and pathogens) in a variety of ways-from remediation at soil sites and eventually makes its way to stormwater, to "biochar barricades"[23] for stormwater, to gray water and black water treatment.
Livestock health	Biochar has been added to livestock feed with great reported results. It can replace pharmaceuticals in supporting animal health and is being used in Europe, Australia, and Canada as a feed additive[24].
Construction materials	Biochar has been proposed as an additive to construction material such as concrete to strengthen the materials, utilize waste products, as well as create processes for some of those materials to sequester carbon throughout their life.[25]

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BRIEF LIST OF BIOCHAR BENEFITS AND USES CONTD:

Carbon sequestration	The estimates for the carbon sequestration potential of biochar are enormous, at least one gigaton of carbon per year[26]. There are claims that biochar sequesters carbon every step of the way-- from development to usage. "The [UN] IPCC rates biochar application as having high global mitigation potential[27]."
Soil quality	·enhancing soil structure ·increasing water retention and aggregation ·decreasing acidity ·reducing nitrous oxide emissions ·improving porosity ·regulating nitrogen leaching... ·improving microbial properties ·beneficial for composting—both processes and product[28]

Because biochar can be such a contentious subject and is often talked about as an individual and highly technical solution in highly specialized ways, it can be difficult for communities to feel they can meaningfully engage in learning about biochar and biochar facilities without specialized expertise. It is important to help make biochar and its possible benefits and drawbacks clear for communities. The following lists concerns.

Photos from a FLOWS community biochar workshop in Colorado, 2019
Photo credit: KGNU

Biochar Concerns and Risks

For all of these potential benefits, **not everybody agrees that biochar is a good solution** or even a solution at all. Even many proponents of biochar speak to limitations, especially economic viability, and that it can be misconstrued as a "one size fits all" solution. Communities and practitioners need to be aware that "…not all biochar is the same and not all char is biochar.[29]" Its usage and efficacy need to be looked at on a case-by-case basis. There has been alarm and pushback from impacted communities in several places across the United States[30] and Canada.

Environmental justice advocates such as Mike Ewall with the Energy Justice Network, claim that biochar is no different than incineration, which is known for its heavy impacts on local communities. Incineration is infamous for toxics and negative health impacts on local communities with most communities preferring not to have those facilities cited in their communities, or fighting against those that already are.

This pushback is especially notable in communities where the biomass being incinerated is a waste product including manure and sewage biosolids. In those cases, it may be useful to think about not just the process of biochar, but everything surrounding the siting of a facility such as **traffic, storage of materials, smells, etc**. Often waste produced in high income communities goes to lower income communities for treatment, processing, burial, etc., which are perfect examples of environmental injustice. Clearly communities and cities should avoid these situations and cities looking for long-term climate progress must ensure other interests do not take precedence. Community concerns are also more notable against facilities that are focused on the bioenergy production[31] with biochar as a seeming by-product*.

Additional misgivings about biochar come from experts and researchers, like Will Brinton, formerly of Woods End Laboratories who are concerned that biochar may not only fail to live up to the benefits often touted about biochar, but believe it can do harm[32]. For example, Brinton's research found very high PH levels in biochar which he claimed could do long-term damage to soil, obstruct plants' ability to uptake trace elements, and limit plant growth. He and other researchers claim that biochar amendments to the soil can actually ***decrease* plant yields**. Along with others, he is also concerned about **high energy demands** for creating biochar. He

**Note: bioenergy, even from biochar facilities, is seen as a different field by many with entirely different sets of research, and much larger organized pushback globally, such as from GAIA (the Global Alliance for Incinerator Alternatives). This guide can only act as a beginning, does not adequately cover the issues cities and communities may face with attempts at bioenergy facilities. This warrants further investigation.*

Biochar Concerns and Risks Contd

believes that compost is ultimately a better option as a soil amendment or climate solution. In 2010, the late Dr. Mae-Wan Ho proposed that biochar is just charcoal and worse, that it acts as an oxygen sink, which “could deplete atmospheric O2 [oxygen] fairly rapidly if massive amounts are produced in a hurry[33]”.

Video via Permaculture News with Will Brinton[34]

In Table 1.2, the environmental risks of biochar are summarized, including: public health concerns from toxins in the process of creation, Risk of facilities shifting from natural biomass to waste products, Ecological concerns from toxins, risk of fires, risk of smoke, poor management, umbrella term for radically different purposes, expense & time, overlooking other relevant, effective. accessible solutions, and the need for more research.

POTENTIAL RISKS OF BIOCHAR CLAIMED BY OPPONENTS

Table 1.2

Public health concerns from toxins in the process of creation	Possible toxins of concern include VOCs[35], PFAS ("forever chemicals"), dioxins[36], and toxic metals[37]. Larger scale biochar is regulated as incineration in the US and Europe with strict health and safety standards. If toxics may be present, facilities must employ "emissions control systems". These safety measures make up the bulk of cost for biochar facilities (up to a third)[38]. In the majority of the world, there are no regulations to speak of, especially on small scale biochar facilities.
Risk of facilities shifting from natural biomass to waste products	In an effort for economic viability, some biochar facilities may start out using local excess biomass as feedstock can end up transitioning to using waste materials that could be toxic or more undesirable for the community such as construction waste, treated lumber (like railroad ties), biosolids, manure, etc.[39].
Risk of fires	Working with fire, biochar facilities do have a risk of unintended accidental fires. This is understood in the industry, and it's something cities and communities should be aware of as well.
Risk of smoke	Whether due to a system still working up to optimal functioning or system failure, there is a risk of unplanned smoke escaping the facility along with whatever contaminants might be in the smoke. Advocates say there is no issue with lingering smells.
Risk of mismanagement	As with any industrial facility, management practices can vary. Proponents of biochar acknowledge facilities must be well-run in order to mitigate risks, ensure benefits, and quality.
Umbrella term for radically different purposes	Again, communities looking at biochar should be aware that there can be significant variation in both materials going in and materials coming out of biochar facilities So many of the purported benefits are the same, yet the term biochar is essentially referring to a multitude of products (and processes).
Expense & time	In the Us and Europe, facilities could cost $4MIL-$12MIL and the permit process can take exceedingly long. The permitting process alone can take years, and that's before construction (or even testing) can begin[40].
Overlooking other relevant, effective. accessible solutions:	"We need to start restoring local ecosystems and build not burn biomass. [41]" Just Transition advocates call for looking at what needs to be rebuilt in a local region and finding other ways to restore those functions (carbon sequestration, water capacity, fertility, etc.) before turning to burning biomass.

Contd.

POTENTIAL RISKS CONTD

Ecological concerns	There are additional concerns for ecosystem pollution and degradation that could come from various parts of the biochar process. Beyond concerns of toxins, there are risks of ecosystem degradation, acidity of soils, and that it could even hamper plant growth, all long into the future.
Need for more research	It is difficult to find clear, decisive research on biochar, to gauge benefits and pitfalls. There is vast diversity in feedstock that may be used (trees, trimmings, biosolids, animal waste, etc.), processes/facilities, and applications. More research is needed including regional research considering local variables. If a facility is initiated or piloted, research such as continual air quality monitoring would be recommended/warranted, especially in a pilot phase.

There is no one climate solution and many have potential benefits and risks. Communities often are well-aware that there is no silver bullet. Top-down decisions that exclude community voice are notorious for political blowback and failure on the ground. To weigh options, then, it becomes vital to incorporate communities in planning.

Procedural Justice Considerations for the Potential Adoption of Biochar

As noted previously, an environmental justice framework requires an investment in not just what a community is doing, but how. Any technology or solution being presented to a community should involve community voices. The below chart notes some problematic risks to adoption biochar without a thoughtful design process for public participation (Table 1.3).

COMMUNITY RED FLAGS FOR BIOCHAR PROJECTS

Table 1.3

Not community-driven	If frontline communities are not part of decision-making processes about biochar as part of a solutions strategy, that in and of itself is a form of environmental injustice, and can act as a catalyst for further environmental injustice. It also leads to rushed processes with worse outcomes. Social equity should be a part of the entire process, and not an afterthought on plans already underway. Please see Community-Driven Climate Resilience Planning Framework[42] and the Spectrum of Engagement[43] for more.
Not part of an integrated whole systems approach	Like with any process, inputs and outputs need to be considered in implementing biochar solutions. Where will the biomass come from, how will it be transported, how will the facility reflect community values, where will the end product be used, and how will it get there?
Not local/community-owned	Economic benefits going to business, industry or others besides the impacted community. This is especially problematic when government (community) resources are being allocated to support the project in any way.
Shifting from natural biomass to waste products, etc.	Even biochar facilities that start out using local excess biomass as feedstock can end up transitioning to using waste materials that could be toxic or more undesirable for the community such as construction waste, treated lumber, biosolids, manure, etc.[44] Proposed feedstocks matter to the impact of harms and benefits.
Lack of research	Is there clear accessible research within the local area or analogous research that can be used from other similar sites and bioregions? Are there plans for air quality monitoring, soil testing, or testing of the final biochar product?
Focus on profit	If a biochar facility is for commercial profit, climate justice advocates warn their fruitfulness for the community or local ecology would be at risk. The market would "distort any benefits," which would be especially important to investigate if a public investment (tax dollars, grants, bonds, etc.) was involved.
Focus on bioenergy	According to environmental justice advocates, it can be very different to run a facility to make biochar and then utilize the excess energy vs generating energy and then utilizing the leftover biochar. Bioenergy is considered problematic for a number of reasons: health and toxicity, inappropriate inputs, and because wood and biomass have low caloric value for burning and are nowhere near as effective as fossil fuels (high caloric value but very destructive)[45].

Contd.

RED FLAGS FOR BIOCHAR PROJECTS CONTD

Huge investments leveraged, needed, or required	Climate justice advocate Ananda Lee Tan warns if huge investments are needed for a facility, it should be considered a "fatal flaw." He and Mike Ewall point to high costs seen in incineration facilities which have bankrupted several US cities[46]. When such large financial investments are utilized, economic priorities often take precedence over community needs/priorities. As Eric Toensmeier puts it "we want to avoid extremes of wealth concentration and excessive foreign ownership. What technologies best lend themselves to decentralized democracy with a fair balance of wealth? Probably not extremely expensive ones.[47]"
Scale	As above, scale is a big part of the equation for biochar and for so many environmental and community solutions. Just transition advocates remind us that there are solutions that may be beneficial on a small scale, but once they become industrial or commodity scale can become problems. There may be biochar solutions that could benefit a community, but once scaled up to industrial size, maybe moving into being regional, state, or nationwide, begin to contribute to the problem.
Risk of biofuels being grown for biochar	Much of the pushback and harm caused by biofuels globally, has been around the economic scale needed for viability—namely that agricultural land ends up being used to grow biofuel materials rather than food for people or ecological benefits. In that process, not only are lands harmed with more industrial processes, but more people have gone hungry. This and the related land grabs[48] have not been a large in biochar equation, but it is something that advocates caution communities to be watchful for.
Carbon markets & scale	A new growing edge for biochar has been its inclusion in carbon offset and carbon market schemes for its economic viability. Climate justice and indigenous rights advocates have thoroughly articulated the risks of large-scale carbon markets on local communities and the environment, seeing them as an ineffective, harmful shortcuts for climate action that allow polluters to continue to pollute[49].
Avoid "plantation forestry"	Note: If trees used for biochar will be replanted, care should be taken to not create monocultures of trees in both type and age. These types of forests increase risk for mega fires and decreased overall forest resilience[50]. Native trees and plants should be prioritized. This especially important where biochar facilities are only feasible with this type of forestry.

Biochar initiatives involve many potential partners: government, philanthropy, investors, biochar experts, potential buyers (such as farmers), and water treatment managers.They also may involve industries beyond agriculture, including experts, owners, and workers in: mining remediation, concrete (as fly ash substitute), steel mills, forestry, and animal farms/dairies.

Following is a menu with the positively-frame approaches to procedural justice (Table 1.4), as sometimes that language and thinking helps communities consider public participation as a community-based opportunity to address crises, such as climate. These values are not an exhaustive list, and each community might prioritize or add their own solutions. This table, however, was created to provide a framework for communities in partnerships with cities to begin to address the ground rules or values of public engagement.

Photos from a FLOWS community biochar workshop in Colorado, 2019
Photo credit: KGNU

PRIORITY SOLUTIONS-ORIENTED MENU

Community-driven

“The more residents participate in their own community solutions, the more effective those solutions will be.[51” Frontline communities are experts on their lives and community needs. This is a fundamental premise to community-driven planning and a cornerstone of environmental justice and should be resourced.

Integrated Whole Systems Approach

Biochar should only be one piece of a larger group of solutions and actions within a community, region, or beyond. Ecological design practices like permaculture and agroforestry can help communities think through and create solutions for whole systems including water, food, building, waste management, resource conservation, and economy, etc., that build on each other.

Indigenous and BIPOC legacies

In any region, it is wise and imperative to look to Native management practices of that place. There is a wealth of innovation and know-how that can be applied whether the community is still Native-led or has been colonized. Communities can also look to native management practices of similar ecosystems and environments for guidance and best practices.

Build community capacity

With the backdrop of highly technical sustainability solutions, we must build frontline skills, and support engagement and ownership. Research or information about sustainability should be made accessible to frontline communities, who have the most expertise about their communities, needs, and wanted solutions. This often means supporting local community-led groups and organizations.

Asset-based

Communities of color and frontline communities are often seen as the sum of their problems (deficits). It is crucial to shift to seeing, appreciating, encouraging, and building upon the gifts, wisdom, and strengths (assets) of these communities (including cultural, technological, spiritual, artistic, environmental, historical, etc.).

Local/community-owned

Economic benefits should go to the community (rather than a corporation or outside business). This can include co-ops and community-led entrepreneurial projects, or apprenticeship and mentoring projects. At a minimum, decision-making processes should be made by or overseen by community.

Better government-community partnerships

As communities develop solutions and priorities, effective partnerships with local government should help to provide technical expertise, resources, and business, research, and philanthropic networks, etc.

Engaging environmental justice

Communities and cities should be revisiting environmental justice questions consistently throughout the process and in the development of their relationships and partnerships.

Sometimes, this vocabulary is less known in a particular community, and it is helpful to carry the values in the explanations forward in more approachable ways. One way would be for policymakers to pose (even to themselves), the following questions.

Some Policymaker Questions:

- How can policies support community-driven solutions?
- How can policies prioritize frontline communities and environmental justice?
- How can policies support right-size solutions that may be less economically viable, but more environmentally and socially beneficial?
- How can policy support community engagement and understanding of research on solutions that may seem overly technical like biochar?
- How can policy support locally-oriented site-specific solutions development?
- What is the holistic approach of the community? How can policies contextualize biochar as one part of a larger set of holistic considerations?
- Is the approach prioritizing healthy soils and ecology through permaculture and other whole systems ecological design practices?
- Are there opportunities for communal ownership? How are the benefits, including profits, being shared with the community?

CASE STUDIES

Case studies can help illustrate how every community is unique. While this guide offers general background, frameworks, and advice, the best approaches and outcomes will be worked out on a case-by-case basis.

Unfortunately, the case studies we found seem to be examples of biochar gone wrong. They are almost an industrial co-optation (or perhaps greenwashing) of what most biochar enthusiasts, especially those from the environmental movement and the permaculture community, believe biochar to be. They act as warnings of what can happen when communities are not involved and the scale or ultimate purpose is off. More time and research are needed to expand upon the case studies included here; they aim to indicate a few examples about when biochar has made headlines.[52]

Newark New Jersey: Aries Biochar Production and Ironbound Community Corporation

In the Ironbound neighborhood of Newark, New Jersey, environmental justice advocates and neighbors have been horrified by a proposal and now facility to bring regional sewage, or "biosolids", into their community for conversion into biochar for use in concrete and fertilizer[53]. **Aries Clean Technologies** boasts that the facility is the "largest facility of this type in the world.", and being the lowest cost option for biosolids disposal in the area[54].

The facility is "opposed by community groups and environmentalists who argue the plans would bring more pollution to a place that already has more than its fair share.[55]" Community-based organization, **Ironbound Community Corporation (ICC)** has been fighting the facility every step of the way. They highlight how clearly environmental racism plays in to the proposal. Waste facilities in the area, essentially part of the largest metropolitan area in the US, are predominantly placed on minority Black and Brown communities[56]. The concentration of these facilities is staggering and ICC has been fighting for their cumulative health and standard of living impacts to be acknowledged According to ICC and others, this is a clear case of environmental racism and environmental injustice. Their outreach campaign (#NoMoreCrap) include messages like "We know that the color of your skin and your income pretty much determine how close you're going to live to pollution.[57]"

In the process of converting the waste into biochar, ICC claims over 285,000 pounds of air pollutants will be released. This brings up an important ongoing point of contention about climate justice—even if a technology or a process is ultimately

CASE STUDIES CONTD

"carbon neutral," there can still be detrimental impacts on communities who bear undue burdens of those processes, projects, or technologies. This is especially egregious in frontline communities such as Ironbound, that are already dealing with industrial facilities, especially as cumulative impacts are rarely considered, regulated, or researched. It also speaks to the importance of local, small-scale, possibly democratically controlled facilities of all types and communities of cross the world. ICC asks why they should have to deal with and smell the sewage from wealthier nearby neighborhoods. Why don't those neighborhoods have to deal with their own biosolids... especially if the technology is as clean and safe as it is being claimed to the community and local governments?[58]

Photo from Ironbound Community Corporation website showcasing their connection to the historical roots of their environmental justice struggles

AltEn Facility, Mead Nebraska

Even though biochar advocates by and large seem to be relatively small-scale individuals and groups, many actual biochar facilities are much larger scale which can come with its own set of problems. In Mead Nebraska, one such plant, a facility that was primarily a bioenergy facility but seems was also selling biochar, was plagued with controversy, and might be considered a nightmare of industrial biochar gone wrong. The facility, which has been called out for poor management, had been burning contaminated seeds that were coated with pesticides, fungicides, and insecticides, including "neonics" (neonicotinoids)[59], which are famously harmful to bees. Their processes contaminated soils, water, and air. State regulators intervened in a sale of the biochar from that facility that a farmer was buying in Topeka Kansas. The farmer

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owner of B. Cole Agriculture, was planning on spreading the biochar in corn and soybean fields around his home (and his three children)[60]. When testing showed the biochar was contaminated, a company representative denied the claim and insisted the results were a mistake[61]. AltEn did spread some of its product around the facility, and neighbors in the area recounted multiple health impacts, like "trouble breathing, coughing, sneezing and sinus pain, and ... pus oozing from the eyes of [a] neighbor's daughter.[62]" Downstream, "the Sierra Club received subsequent reports of raccoons and dogs dying."[63]

In the end, the biochar, seen as toxic waste[64], had to be treated as solid waste and was not allowed for "land application"[65]. This story gives biochar a bad name. Of course, it does not reflect the intentions or values of the proponents of biochar, but it is a good example of how corporate interests, and economic imperatives, and irresponsible management could do great harm in a community even under the banners of green energy or climate-friendly practices. It shows how biochar cannot be considered in a vacuum, but that many other factors need to be considered. The source of the biomass going into the facility, for example, especially as biochar facilities are designed to utilize waste. Environmental justice advocates like Mike Ewall and Ananda Lee Tan worry that with calamities like these, communities are often saddled with the environmental and economic fallout that is often the case with incinerator projects. Often the managing businesses (or even governments) file for bankruptcy and leave the community to manage the burdens[66],[67].

Researching the facility, it is clear that it was not a community-driven project, and the local people and ecosystems were victims of its poor, non-local, corporate management. It helps us understand why some opponents of biochar (such as Mike Ewall of Energy Justice Network or the organization GAIA) are against any form of incineration. Big green organizations, like the Sierra Club in the case of Mead, may also be pulled in to support communities that may not have political access, legal support, or research capacities.

This example illuminates the problem of scale, and that it is difficult if not impossible, to have facilities of that size centering communities or prioritizing their health. Unfortunately, this case is also a good reminder of the scale of the problems that we are facing from agriculture, to fuels, to climate and health beyond most people's imagination or understanding. In nearby Lincoln Nebraska, a government-run facility was recently selected by Bloomberg Philanthropy for support and expansion and will maybe redeem the idea of biochar for the region.

CASE STUDIES CONTD

Drax Power Station, North Yorkshire, United Kingdom

The Drax power plant outside of North Yorkshire, is known from having converted away from coal and is a biochar producer. It is interesting in part as a case study because of its large scale— it's the largest power plant and they now claim to deliver "as much as 12% of the UK's renewable electricity"[68] "... DRAX, has converted some of its energy generation from coal to wood pellets which are imported largely from forests in Canada and the southeastern U.S. Pellet manufacturing plants (dirty and noisy) have been established throughout the region – often in low-income communities."[69] The wood comes from the southeast United States, which they claim is the "wood basket of the US"[70] Drax claims that area is especially well-suited to providing the pellets because the land is largely "privately owned.[71" That should raise eyebrows for anyone interested in justice and environmental health.

Though it is hailed by some as a success story to help meet the nations climate action goals, climate justice advocates wonder if this is really a win—in the UK or in the US communities where the wood is coming from. The Dogwood Alliance gives us a sense of some of the community concerns: "Gloster, Mississippi, community members gathered to determine ways to fight back against Drax's wood pellet production facility in their community, which has brought noise, dust, and air pollutants to their town. In fact, this Drax facility emitted 3x the legal level of pollution for several years, leading to a $2.5 million fine—the largest ever biomass fine in the area. Like many communities where biomass plants and pellet production mills are located, Gloster is considered

Children playing in the shadow of the Drax wood pellet facility in Gloster, MS
Photo credit Dogwood Alliance [74]

CASE STUDIES CONTD

an environmental justice community, a community of mainly BIPOC (Black, Indigenous, and People of Color) that has a high percentage of residents that live below the poverty line." The Drax pellet facilities are dangerously close to local residents. The Dogwood Alliance quotes a local who says "[The] community and the plant are so close together I can't tell which one is sitting in the other's backyard.[72]" They also clearly articulate the ways in which the community is not a part of the decision-making processes for the plant. They remind us that harms go beyond the human world, harming local animals, air, soils, and the broader ecosystem.

In contrast to George Washington Carver's vision for the Southern US, the impacts of Drax on this community is especially disturbing. He said it is "necessary to exhaust every means at our command to fill the empty dinner pail, enrich our soils, bring greater wealth and influence to our beautiful South Land, which is synonymous to a healthy, happy and contented people.[73]"

Moving Forward

Einstein is often credited (correctly or incorrectly) with saying “We cannot solve our problems with the same level of thinking that created them.” This may be the crux of figuring out whether biochar, or any other proposed environmental and community solution, is truly a solution. Is it coming from the same way of thinking that created environmental injustice and climate chaos? For example, if biochar is being used to help rebuild climate stability, should the wood or biomass being used be shipped over from another continent (as with the Drax facility in the UK[75])? It seems the only reasons to do so would be for economic viability or to avoid pollution or pollution regulations—to shift around the environmental benefits and burdens, which is at the center of environmental injustice. Isn’t this the type of thinking and the type of business practices that caused the dire problems this guide is ultimately trying to repair?

It is important to shift our mainstream paradigms when looking for solutions to our problems, or maybe even the original framing of our problems. In preparing this guide, the need to get beyond binaries of thinking that a solution is either absolutely right or absolutely wrong was highlighted. Those binary (yes/no, right/wrong, etc.) modes of thinking can entrap us in problems that come from scaling or industrializing solutions that only work when small, or make us oblivious to how a solution might only work in a specific ecosystem, bioregion, or culture/community, or timeframe.

We must go beyond checkboxes and lists of solutions, dig into deeper root causes including our ways of thinking, cultural habits, the structures of our institutions, our design practices, our priorities, etc. We must think in whole systems. Luckily there is a wealth of Indigenous knowledge, diverse cultures and perspectives, unique ecological management practices from around the world, and ecological design thinking frameworks like permaculture and agroforestry that can be leaned on to help ensure that we do not accidentally intensify climate chaos, environmental injustice, or any other problem we are trying to solve.

We can learn from Vandana Shiva’s approach, of being both excited about the site-appropriate potential of biochar, and vigilant about what could happen to biochar if it was used with that same mind-set that got us into an era of extreme disparities and climate chaos. In a foreword to “The Biochar Solution” she speaks to the powerful potential of rebuilding fertile soils in part with biochar and sounds a very relevant alarm:

“I would like to sound a word of caution.

By shifting our concern from growing the green mantle of the earth to making charcoal, biochar solutions risk repeating the mistakes of industrial agriculture. The reductionist NPK mentality is replaced by a reductionist carbon mentality. The false assumption that soil fertility comes from factories is maintained. Earlier it focused on factories producing NPK, now it focuses on industrial production of biochar.

Just as industrial agriculture and the green revolution forgot about life, the biochar solutions are ignoring life with their carbon preoccupation, an example of what I have called the “Monocultures of the Mind” …

“The future cannot be built on the basis of knowledge that comes from a reductionist, fragmented, mechanistic world view. It cannot be built on the external input model of industrial agriculture.[76]”

Though much research and local, site-specific research is needed, the environmental justice and climate justice movements give us effective approaches and frameworks to navigate the many decisions needed for effective climate action, resilience, and environmental restoration in communities across the world. Optimally, communities will be resourced to assess and frame their local issues, with the opportunity to do research, interview proponents and opponents of biochar (or any other solution they are hoping to implement), so that even when they move forward with a project, they do so with an understanding of what potential pitfalls might be, and best practices, especially for the types of regions they are in.

The interviews referenced and the case studies highlighted in this guide remind us that the work done under the banner of biochar is diverse. Due to tight time constraints, the scope and variety of case studies and interviews that could be incorporated was limited. Our case studies do not include examples from the “global south,” or examples biochar proponents or communities would see as a success. In future studies, more of these could and should be incorporated.

This guide underscores that approach matters, particularly centering frontline and impacted community matters. There may not be any easy answers, but any answer that matters will require partnerships between policymakers and the communities they serve.

Thank you for your commitment to transformation, and the regeneration of our planet and peoples.

Principles of Environmental Justice

WE, THE PEOPLE OF COLOR, gathered together at this multinational People of Color Environmental Leadership Summit, to begin to build a national and international movement of all peoples of color to fight the destruction and taking of our lands and communities, do hereby re-establish our spiritual interdependence to the sacredness of our Mother Earth; to respect and celebrate each of our cultures, languages and beliefs about the natural world and our roles in healing ourselves; to ensure environmental justice; to promote economic alternatives which would contribute to the development of environmentally safe livelihoods; and, to secure our political, economic and cultural liberation that has been denied for over 500 years of colonization and oppression, resulting in the poisoning of our communities and land and the genocide of our peoples, do affirm and adopt these Principles of Environmental Justice:

The Principles of Environmental Justice (EJ)

1) **Environmental Justice** affirms the sacredness of Mother Earth, ecological unity and the interdependence of all species, and the right to be free from ecological destruction.

2) **Environmental Justice** demands that public policy be based on mutual respect and justice for all peoples, free from any form of discrimination or bias.

3) **Environmental Justice** mandates the right to ethical, balanced and responsible uses of land and renewable resources in the interest of a sustainable planet for humans and other living things.

4) **Environmental Justice** calls for universal protection from nuclear testing, extraction, production and disposal of toxic/hazardous wastes and poisons and nuclear testing that threaten the fundamental right to clean air, land, water, and food.

5) **Environmental Justice** affirms the fundamental right to political, economic, cultural and environmental self-determination of all peoples.

6) **Environmental Justice** demands the cessation of the production of all toxins, hazardous wastes, and radioactive materials, and that all past and current producers be held strictly accountable to the people for detoxification and the containment at the point of production.

7) **Environmental Justice** demands the right to participate as equal partners at every level of decision-making, including needs assessment, planning, implementation, enforcement and evaluation.

8) **Environmental Justice** affirms the right of all workers to a safe and healthy work environment without being forced to choose between an unsafe livelihood and unemployment. It also affirms the right of those who work at home to be free from environmental hazards.

9) **Environmental Justice** protects the right of victims of environmental injustice to receive full compensation and reparations for damages as well as quality health care.

10) **Environmental Justice** considers governmental acts of environmental injustice a violation of international law, the Universal Declaration On Human Rights, and the United Nations Convention on Genocide.

11) **Environmental Justice** must recognize a special legal and natural relationship of Native Peoples to the U.S. government through treaties, agreements, compacts, and covenants affirming sovereignty and self-determination.

12) **Environmental Justice** affirms the need for urban and rural ecological policies to clean up and rebuild our cities and rural areas in balance with nature, honoring the cultural integrity of all our communities, and provided fair access for all to the full range of resources.

13) **Environmental Justice** calls for the strict enforcement of principles of informed consent, and a halt to the testing of experimental reproductive and medical procedures and vaccinations on people of color.

14) **Environmental Justice** opposes the destructive operations of multi-national corporations.

15) **Environmental Justice** opposes military occupation, repression and exploitation of lands, peoples and cultures, and other life forms.

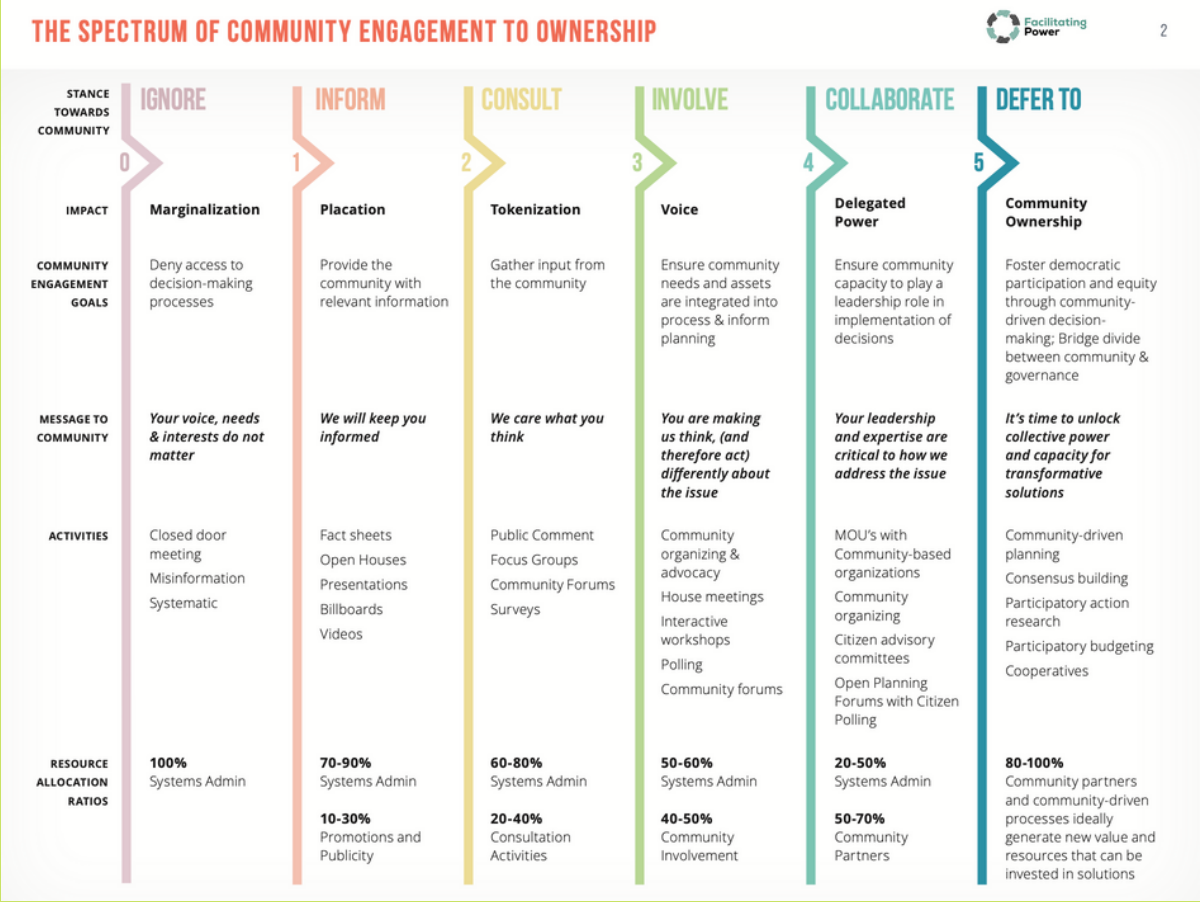
16) **Environmental Justice** calls for the education of present and future generations which emphasizes social and environmental issues, based on our experience and an appreciation of our diverse cultural perspectives.

17) **Environmental Justice** requires that we, as individuals, make personal and consumer choices to consume as little of Mother Earth's resources and to produce as little waste as possible; and make the conscious decision to challenge and reprioritize our lifestyles to ensure the health of the natural world for present and future generations.

More info on environmental justice and environmental racism can be found online at www.ejnet.org/ej/

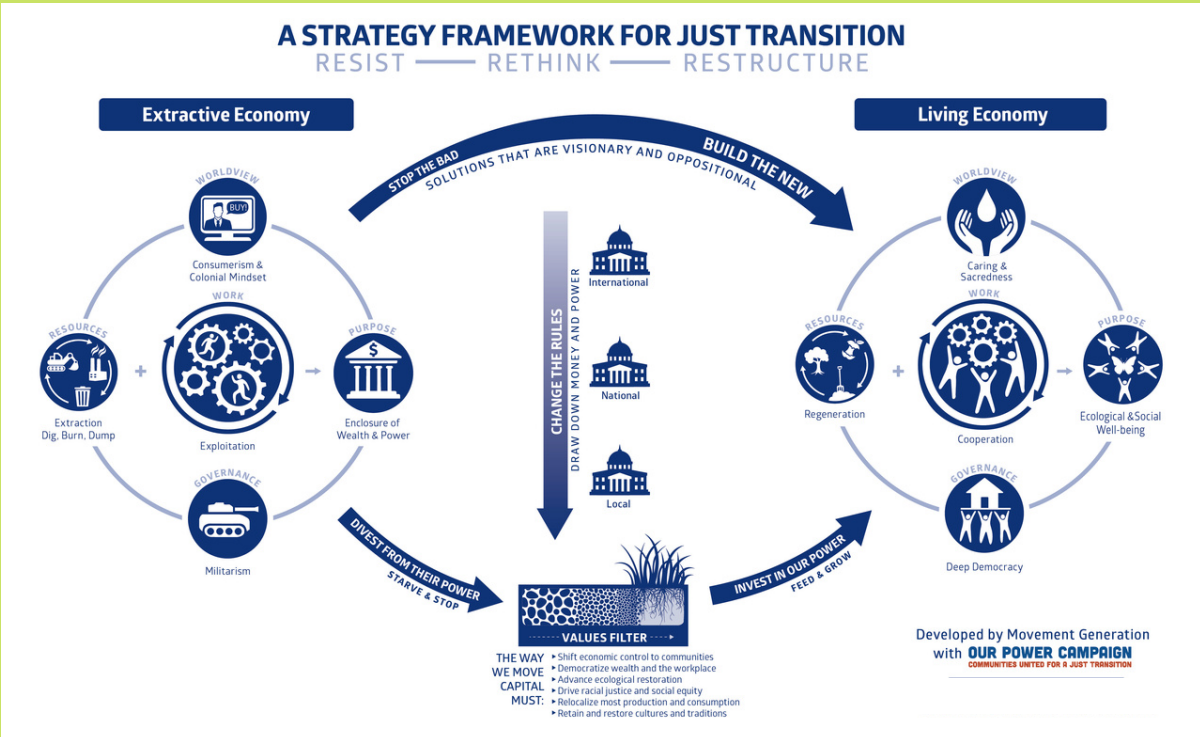
Delegates to the First National People of Color Environmental Leadership Summit held on October 24-27, 1991, in Washington DC, drafted and adopted these 17 principles of Environmental Justice. Since then, the Principles have served as a defining document for the growing grassroots movement for environmental justice.

Spectrum of Engagement: for community-driven planning



By Rosa Gonzalez and Facilitating Power building on the International Association for Public Participation spectrum

Just Transition Framework



See Climate Justice Alliance for an explanation of the Just Transition Framework

Note: More resources found at www.onceandfuturegreen.com

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For glossary and more resources, go to
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BIOCHAR SITING & ENVIRONMENTAL JUSTICE:

A GUIDE FOR CITIES AND COMMUNITIES

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