



BIOCHAR & THE UN SUSTAINABLE DEVELOPMENT GOALS

Beyond carbon sequestration



International Biochar Initiative

www.biochar-international.org

About the International Biochar Initiative

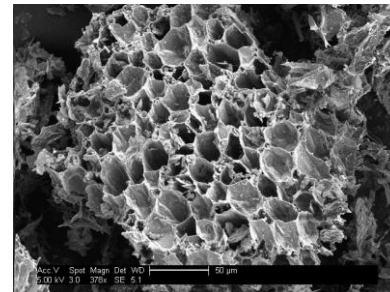
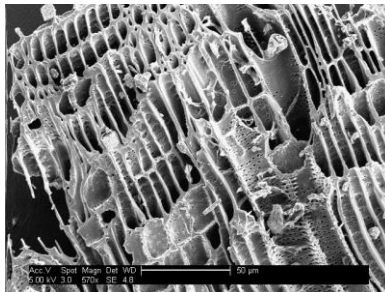
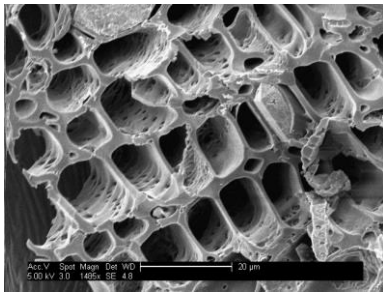


The International Biochar Initiative provides a global platform for fostering stakeholder collaboration, good industry practices, and environmental and ethical standards to support biochar systems that are safe and economically viable.

Learn more: <https://biochar-international.org/>

Biochar & Carbonization

BIOCHAR: organic matter (e.g. crop residues, invasive species, manures, woody biomass, etc.) heated in an oxygen limited environment at high temperatures. Converts up to 50% of original carbon content into stable carbon which, when buried in soil or embedded in other long-lived products, does not return to the atmosphere as it would normally during decomposition.



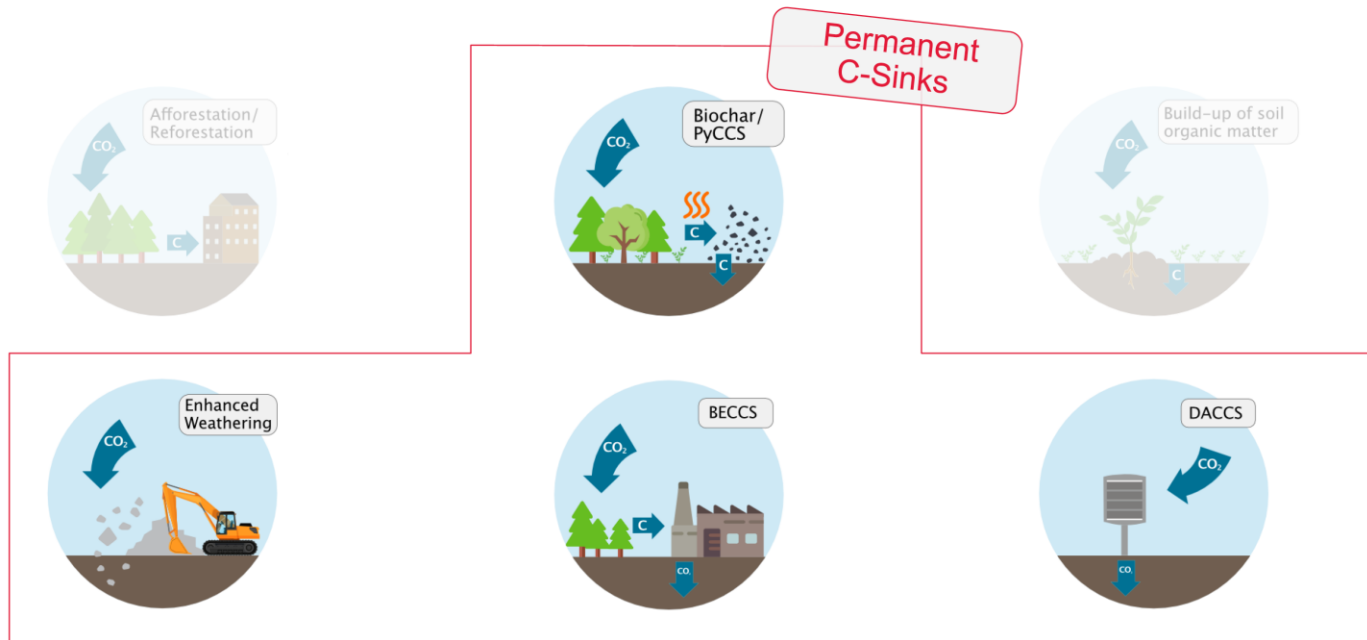
CARBONIZATION: thermo-chemical conversion of organic matter heated in oxygen limited environment (pyrolysis or gasification). Depending on the technology, the co-products generated include: heat, biochar, bio-oil, wood vinegar and/or syngas.

Pyrolysis with Carbon Capture & Storage (PyCCS)

PyCCS: Many pyrolysis technologies produce solid, liquid and gaseous pyrolysis products. To date most of the sequestration focus has been on the solid fraction (i.e., biochar) which leads to 20 – 30% carbon sequestration depending on many factors. However, the liquids (i.e., bio-oil) can be injected into deep wells elevating carbon sequestration potential to >70% of the original biomass.

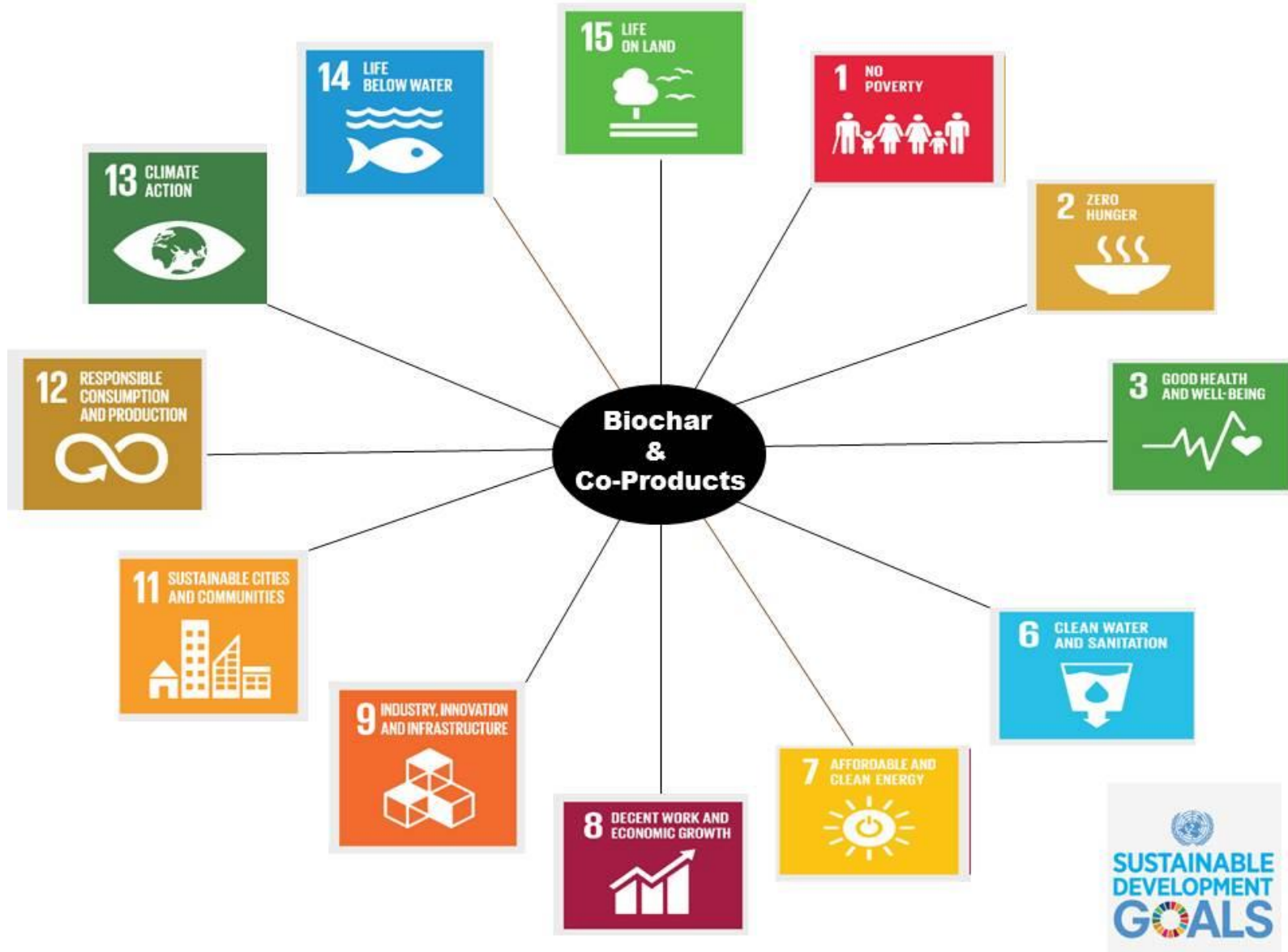
Options for negative emissions (NET6)

Six options currently considered promising, four of them being mainly technical/industrial



Biochar & Carbonization

Beneficially impact 12 of the 17 UN SDGs



1. NO POVERTY

- Increase yields & revenues
- Carbon credit payments to carbon farmers
- Decrease reliance on off farm purchases



2. ZERO HUNGER

- Increase crop yields
 - Resist disease
 - Regenerate poor soils

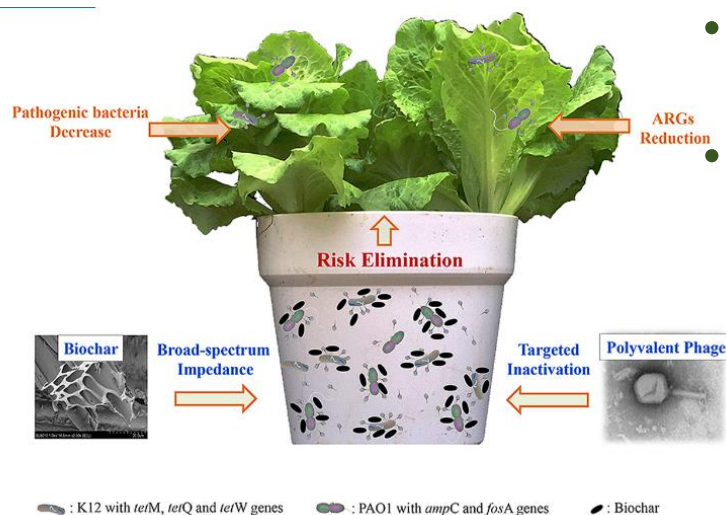


B4SS demonstration site in South Sumatra

3. GOOD HEALTH AND WELL-BEING



- Improve food safety
 - Immobilize heavy metals, toxins in soils
 - Reduce bacteria (e.g.. E.coli)
- Reduce air pollution from crop burning



- Eliminates need for antibiotics in animal feed
- Reduces plant uptake of heavy metals (e.g. cadmium, lead, etc.)

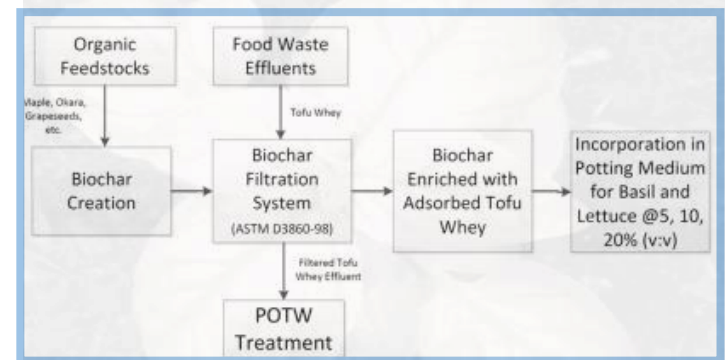
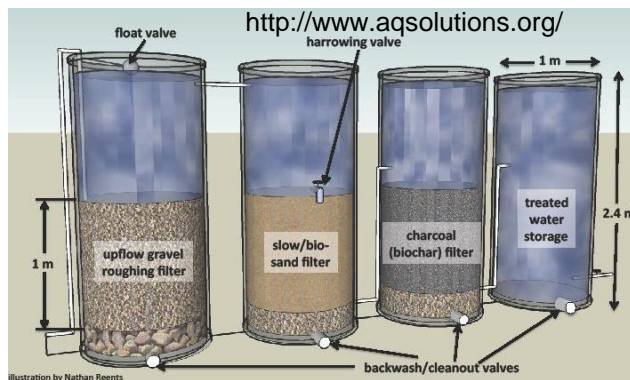
SOURCE: Ye, Mao, Mingming Sun, Yuanchao Zhao, Wentao Jiao, Bing Xia, Manqiang Liu, Yanfang Feng et al. "Targeted inactivation of antibiotic-resistant *Escherichia coli* and *Pseudomonas aeruginosa* in a soil-lettuce system by combined polyvalent bacteriophage and biochar treatment." *Environmental Pollution* 241 (2018): 978-987.



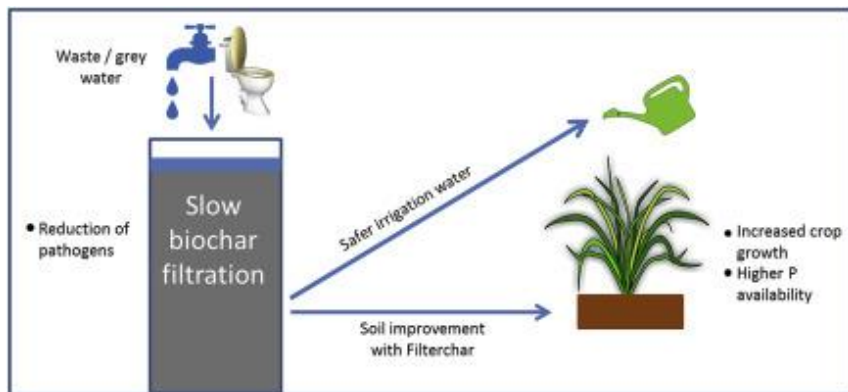


6. CLEAN WATER AND SANITATION

- Filter heavy metals, emerging contaminants of concerns, antibiotics
- Harvest nutrients that might cause eutrophication
- Reduce sewage & toxins



Barber, Steven T., Jingjing Yin, Kathleen Draper, and Thomas A. Trabold. "Closing Nutrient Cycles with Biochar-From Filtration to Fertilizer." *Journal of Cleaner Production* (2018).



Werner, Steffen, Korbinian Kätzl, Marc Wichern, Andreas Buerkert, Christoph Steiner, and Bernd Marschner. "Agronomic benefits of biochar as a soil amendment after its use as waste water filtration medium." *Environmental Pollution* 233 (2018): 561-568.

7. AFFORDABLE AND CLEAN ENERGY

- Generate remote, renewable carbon negative electricity
- Create heat for use in cooking, drying, water purification, etc.
- Boost quantity & quality of biogas CH₄



Running a micro gasifier with coffee pulp to roast coffee beans and make biochar in Laos.



Pyrolysis machine designed by Okozentrum, carbonizing coffee husks and generating energy in Vietnam



8. DECENT WORK AND ECONOMIC GROWTH

- Create new local job opportunities to upcycle waste, generate new products,
- Support small farmers via carbon economies

POTENTIAL BENEFITS OF BIOCHAR

SUSTAINABLE FEEDSTOCK

The feedstocks for producing biochar include agricultural and forestry residues, animal manures, sewage sludge, and sustainable purpose-grown crops.

FOR BIOCHAR PRODUCTION

Biochars are produced by heating biomass in the absence of oxygen in ovens ranging from cookstoves to biomass management plants

TO SUSTAIN SOILS,

Biochar formulations applied to soil can increase crop yields, immobilise heavy metals, and reduce nutrient leaching, irrigation and fertiliser inputs

MITIGATE CLIMATE CHANGE

CARBON sequestration

Biochar stores carbon sequestered by plants and can reduce greenhouse gas emissions from soils. Making biochar can generate Renewable energy.

AND ENHANCE LIVELIHOODS

Biochar can increase food security. Switching to biochar-making stoves can also improve rural livelihoods by reducing air pollution and deforestation, while increasing opportunities for agricultural

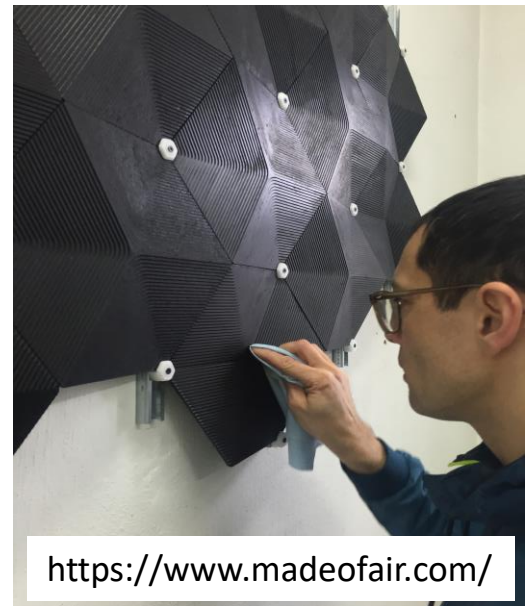
9. INDUSTRY, INNOVATION AND INFRASTRUCTURE



- Create new carbon negative products: building materials, composites,
- Construct biochar based green roofs
- Harvest nutrients in effluents for reuse & lower water requirements



Biochar plaster used to improve humidity control and electro magnetic shield in Valais, Switzerland





11. SUSTAINABLE CITIES AND COMMUNITIES

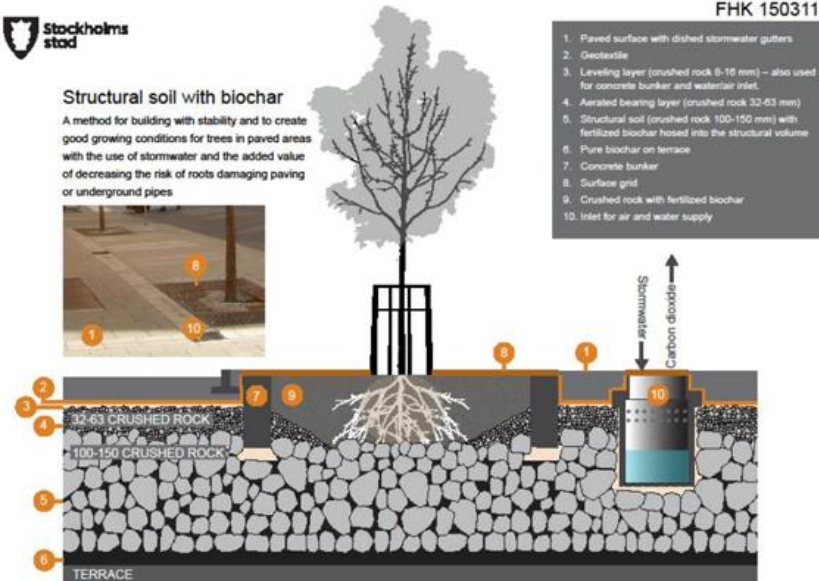
- Divert organics from landfill to pyrolysis
- Generate renewable district heat
- Manage storm water using biochar

FHK 150311



Structural soil with biochar

A method for building with stability and to create good growing conditions for trees in paved areas with the use of stormwater and the added value of decreasing the risk of roots damaging paving or underground pipes



Together we fight climate change and make our city greener.

The biochar is used in the city plant beds.

The energy becomes heat for the city's district heating network within "Super District Heating".

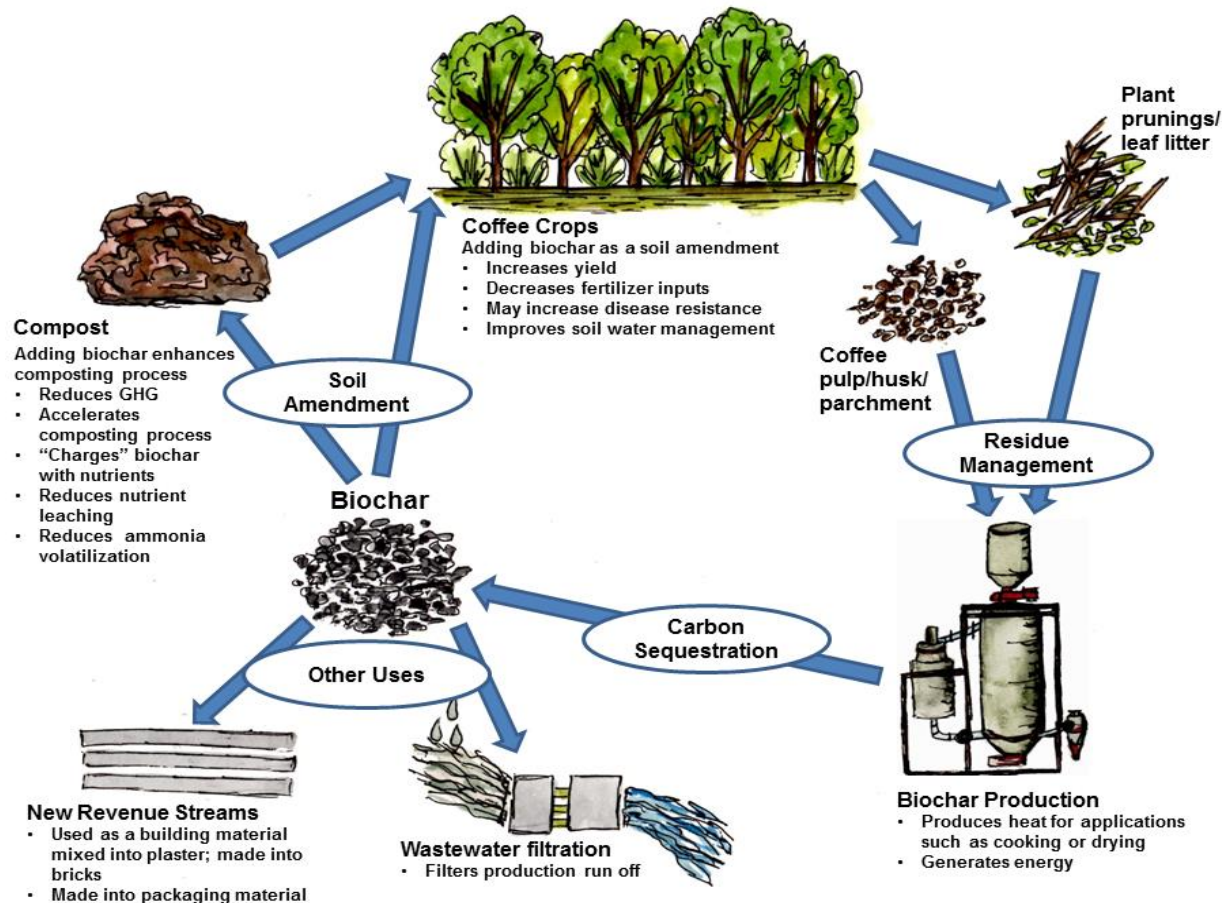
The Stockholmers get biochar to use in their gardens in exchange for their gardenwaste.

Park and gardenwaste is turned into biochar and renewable energy.

The city and the citizens create the world's first urban carbon sink with biochar.

12. RESPONSIBLE CONSUMPTION AND PRODUCTION

- Reduce organics to landfill by 75%+
- Displace high carbon footprint materials with biochar (e.g. carbon black)
- Lower GHG of food production & processing





13. CLIMATE ACTION

- Sequester carbon
- Replace fossil fuel energy with pyrolysis
- Reduce GHG from landfills, manure management

MITIGATION

ADAPTATION

Carbon Sequestration

Reduced Fertilizer Use

Methane Reductions

- **Livestock:** enteric, manure
- **Landfills**

Renewable Energy

Waste Upcycling

Food Security

Water Efficiency

Building/Infrastructure

Stormwater Management

Vegetation Management

- **Fire Control**
- **Invasive Species**

Disaster Recovery

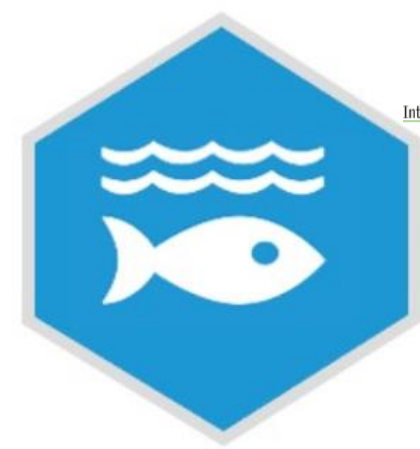
Sustainable Agriculture

Soil Resilience

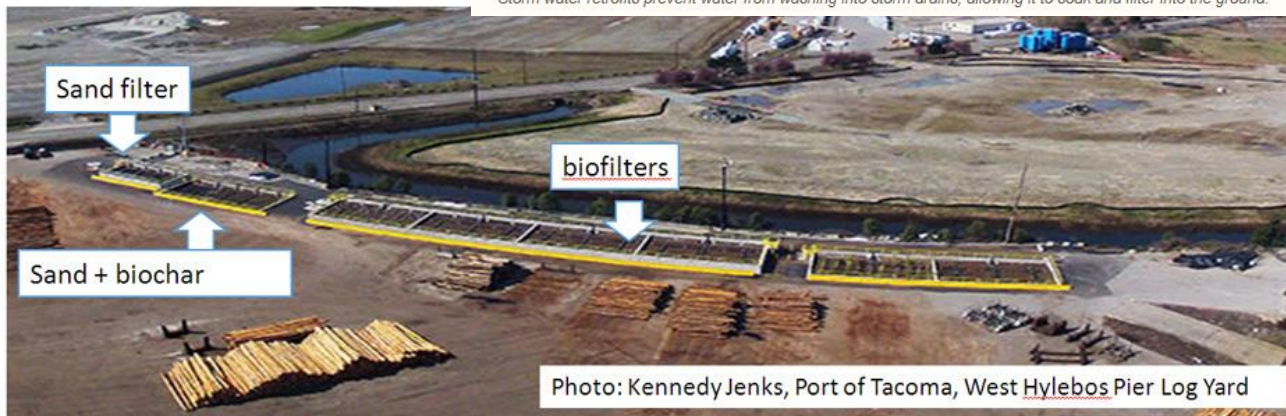
Green Roofs

14. LIFE BELOW WATER

- Manage storm water
- Reduce nutrient pollution
- Clean up spills with biochar
- Carbonize aquatic invasive species



Storm water retrofits prevent water from washing into storm drains, allowing it to soak and filter into the ground.



Sand filter

biofilters

Sand + biochar

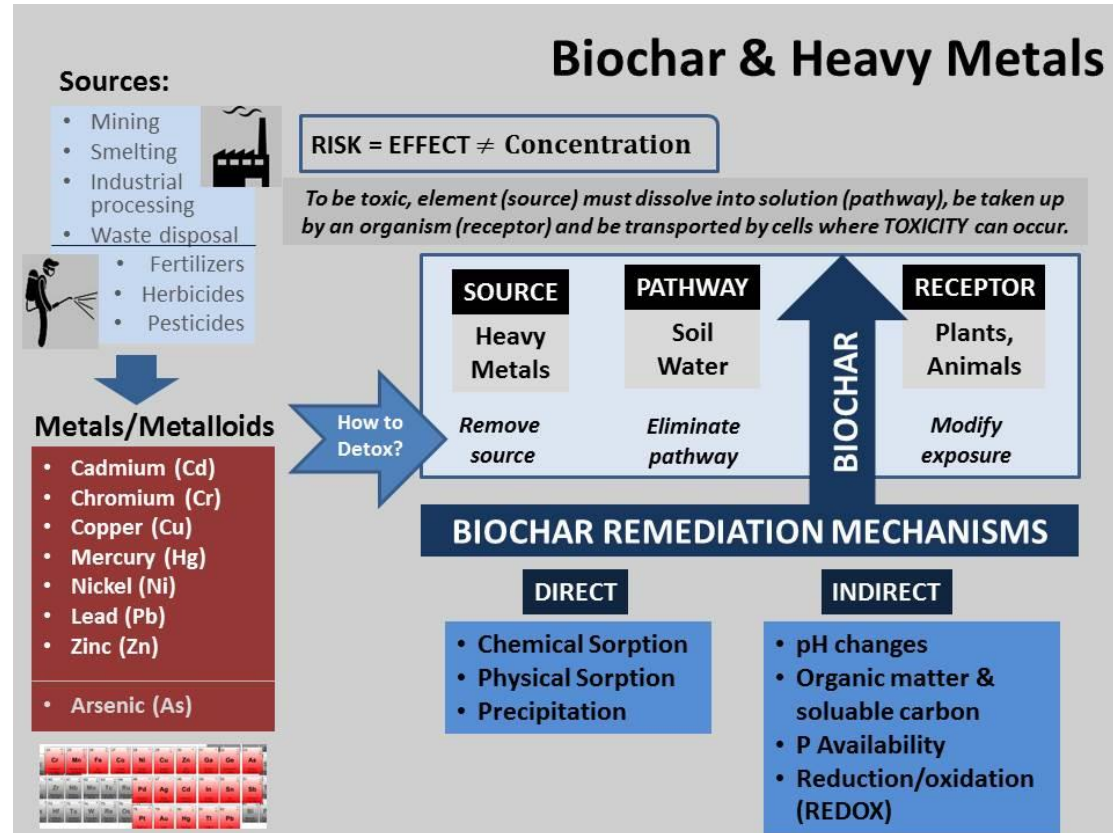
Photo: Kennedy Jenks, Port of Tacoma, West Hylebos Pier Log Yard

15. LIFE ON LAND

- F • Reclaim soil
- F • Remediate soil
- F • Restore: deserts, forests, acidic or saline soils



- Mitigates soil salinization & acidification
- Minimizes bioavailability of contaminants
 - Heavy metals
 - PCBs
 - Antibiotics



To learn more visit:
www.biochar-international.org



Or contact us at:
info@biochar-international.org

