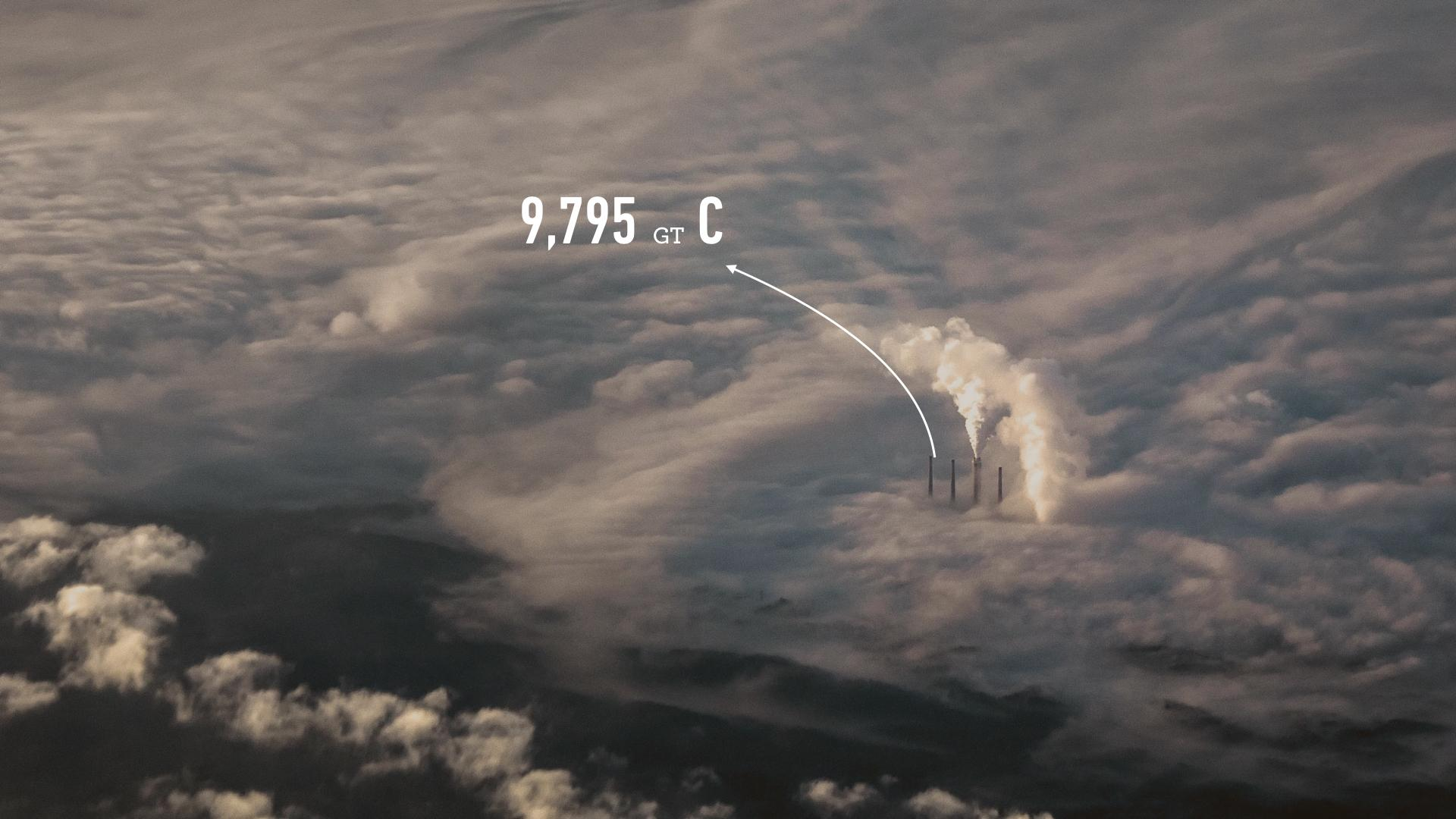
Compost Basics

Some Considerations for Policy & Practice


9,795 GT C

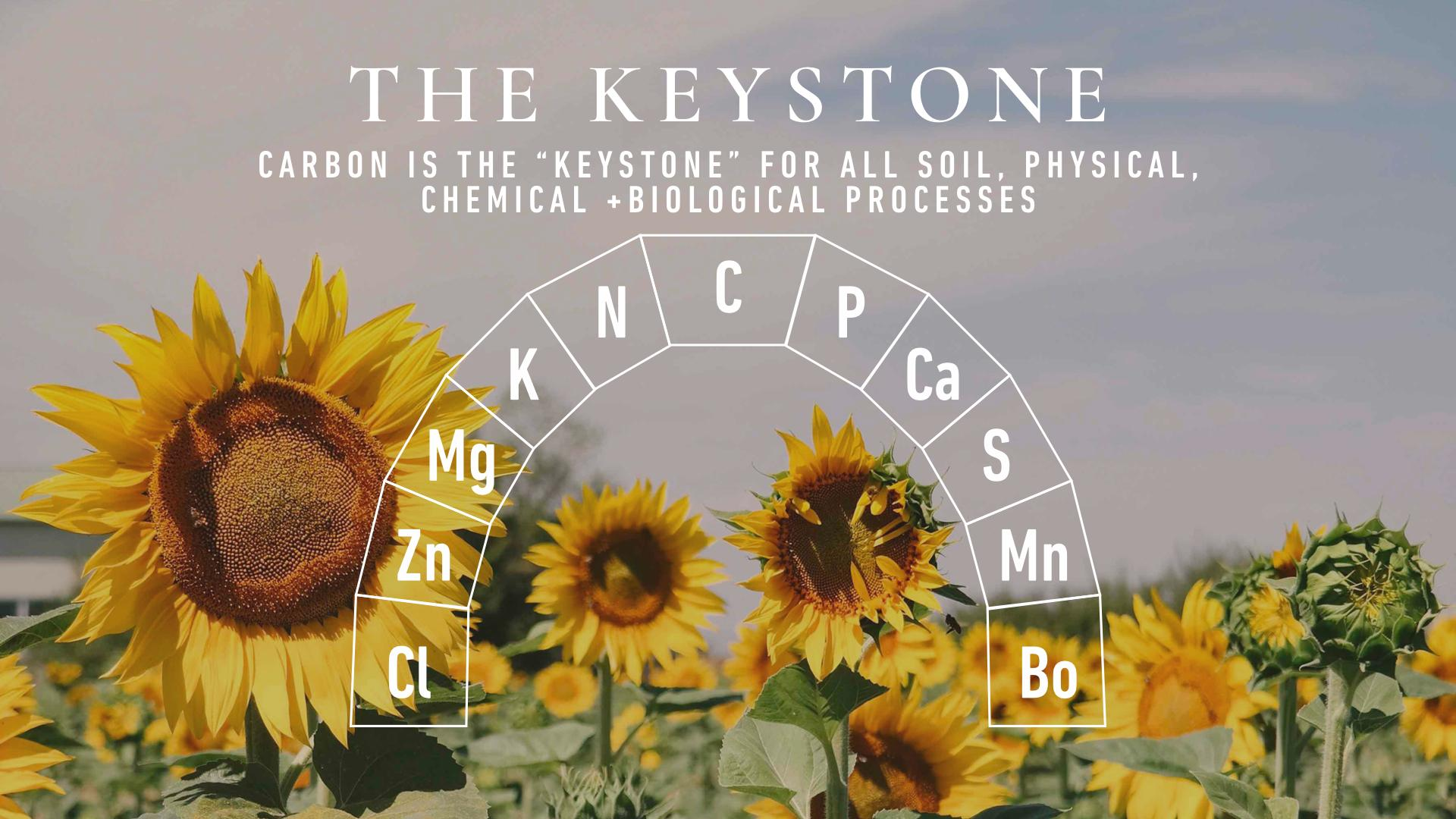
2,546.7 GT C
2,938.5 GT C

= 44%
LEFT IN ATMOSPHERE

“ AGRICULTURE IS THE BUSINESS OF MOVING CARBON BETWEEN CARBON POOLS TO PRODUCE FOOD, FUEL, FIBER, AND FLORA ”
–JOHN WICK

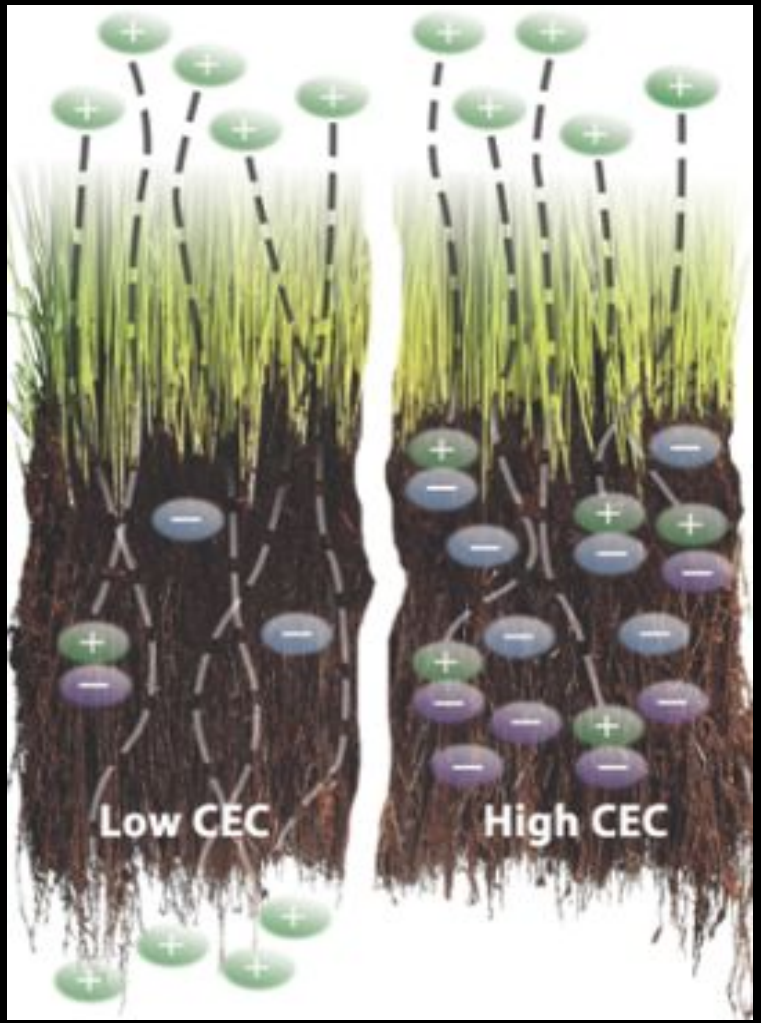
THE KEYSTONE

CARBON IS THE "KEYSTONE" FOR ALL SOIL, PHYSICAL, CHEMICAL +BIOLOGICAL PROCESSES



WATER FOLLOWS CARBON

"Increases in total soil organic matter of 3% increased the soil water holding capacity by up to 4.7 million acre-feet across all working lands in California"-Flints et all California 4th Climate Assessment,



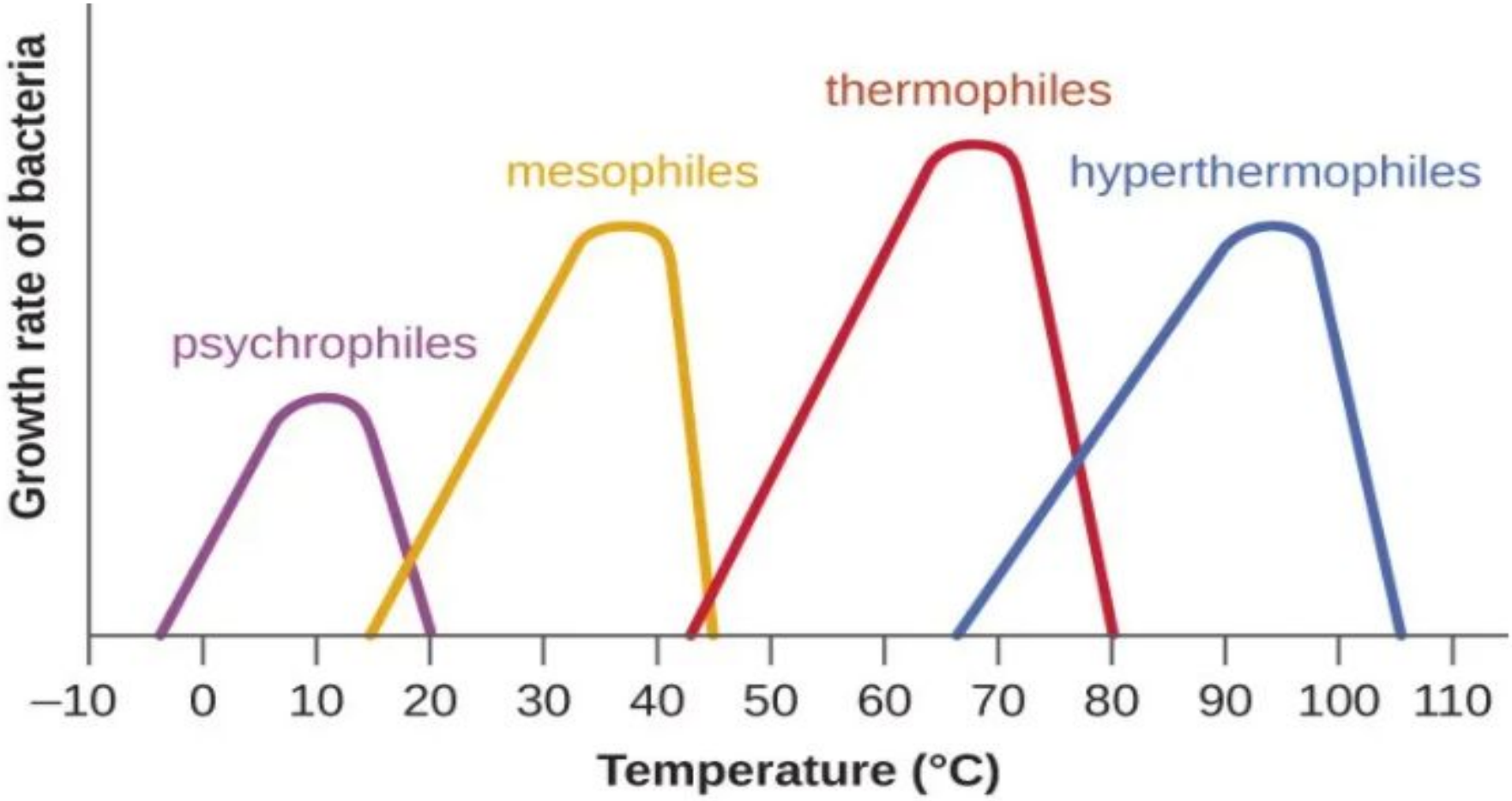
When there is more carbon and more water the electrical charge of the soil changes. This helps make more nutrients naturally available and also helps hold onto added nutrients.

The life cycle on Earth is a stacking, synergistic function.

Compost helps us transition from death back to life

Compost is the product manufactured through the controlled, aerobic biologically decomposition of organic materials.

The product has undergone mesophilic and thermophilic temperatures, which significantly reduces the presence of pathogens and weed seeds and stabilizes the carbon such that it is beneficial to plant growth.



The following ranges of permissive growth temperatures are approximate only and can vary according to other environmental factors.

What Compost is NOT

Manure
Rotting food scraps
Leaves and branches
Bisolids

These things can be composted. But they are not compost!

Before and After

Anything that was ever alive can technically be composted. What comes out looks pretty similar from a biochemical standpoint.

Compost is a biologically stable form of broken down organic matter that has been reshaped via microbial digestion into sometime new! The great majority of the nutrients that were in the feedstocks are now bound up with Carbon, meaning they are relative immobile- it takes the interaction of soil microbes and plants to break them apart and make them available to plants.

The two biggest variables to be aware of are:

1) **Quality-** was this a finished product, did it go through all stages of microbial processing (or another form of digestion), has it been cured so it has cooled down or is it too hot? Were the feedstocks free from toxins that do not break down, or has the product been tested to show safety?
2) **C:N** The Carbon to Nitrogen ratio tells you how nutrient rich the compost is. Higher nutrient compost tends to come from humanure, chickens and pigs. Cow manure is slightly less nutrient rich and horse and goat even less. Commercial compost should be labeled with its C:N ratio.

Compost is a unique human/microbial gift! A way of giving back to Nature.

There are only two known places in nature where compost occurs without human support

1) In river deltas where repeated and regular flooding builds up piles of organic matter (very rare)
2) In Australia where a bird called a Brush-Turkey builds up piles of organic matter to incubate its eggs

How Compost is Made

MAKE: There are many ways to make compost and the “right choice” has to do with space, climate, feedstocks, environmental regulations and market consideration.

Ex: Small pile, biodynamic pile, small windrow, large windrow, covered areatated static pile, in vessel, vermi compost, larva compost, etc

Vermicomposting: Commercial and Home Scales

Three Bin Composting: Community Scale

Biodynamic Pile: Small Farm Scale

Static or Turned Pile: On Farm Scale

Aerated Static Pile: Commercial Scale

Extended Aerated Piles in Bunker: Municipal Scale

Turned Windrows: Commercial Scale

Certifications & Courses

The US Composting Council, ILSR, the California Alliance for Community Composting, Extension Master Gardeners and Master Composter programs all teach classes and or provide compost certifications and certification courses for practitioners. Many biodynamic practitioners also offer training and education.

How Compost is Used

USE: There are a variety of ways to use compost. Appropriate application requires understanding the needs/limitations of the landscape or crop and the land manager's desired outcomes.

Ex: Application rates will vary from ½” of a low N high C compost on rangelands/non irrigated pasture to 2” of a high N compost on nutrient intensive, irrigated crops such as corn.

Corn

Potatoes

Irrigated Pasture

Non Irrigated Rangelands

Soil Characteristics Are Important

NPK: “N” Nitrogen, “P” Phosphorus, “K” Potasim

Compost is adding the “C” back into the NPK formula. Compost add the C alongside NPK.

Ex: Areas with high potassium levels may not want to use composts created with cow or pig manure that can carry salt with it. They may benefit instead from a green waste based compost with low to no potassium.

Starting with a soil test is a good way to go when assessing how to use compost in a particular farm.

The Soil Health Benefits of Compost

Adds natural fertility without risks to water or air quality

Increases soils ability to absorb and hold water (infiltration, porosity and water holding capacity)

Increases how much photosynthetically derived carbon comes into the soil and the soils ability to store it

Feeds and houses beneficial microbial populations

Increases availability of minerals and other micro and macro nutrients to plants

The Benefits of Composting Organic Materials

Climate Benefits:

a) Emissions Reduction: Compost organic materials greatly reduces the production of methane at landfills and in manure management activities.
b) Sequestration: Increases sequestration of atmospheric carbon via photosynthesis and enhances soils carbon storage abilities.
c) Resilience: Enhances soil and plants ability to withstand extreme weather. Healthy soil maintains a more stable temperature, it absorbs water better, and holds it longer making the land more resilient to both heat and drought and freezing and flooding.

The Benefits of Composting Organic Materials Continued

Farmer Profitability: Decreases the need for chemical pest control and synthetic fertilizers, saving on input costs. Can help to manage excess organic materials in a low-cost way, can add a valuable product for sale

Human Health: increases nutrient density in foods, decreases farmers exposure to toxic chemicals and synthetic fertilizers, increases ground and surface water quality near agricultural operations

Educational: Learning about nature's life cycle is a fundamental building block to understanding how the living world works

Economic development: Incentivizing compost production can support community access to fresh food, add a value add product for farmers and build part and full time jobs collection, making and selling that will be there as long as people continue to eat.

Community well-being: Compost can help agricultural and urban communities reconnect to the soil and to each other - LA Compost Connecting People to Soil and One Another.

Closing the Loop: What do you have, and what do you need?

Feedstocks: What organic materials are you working with or are in your area?

Nutrient Management: Do you have water quality issues or fertility needs?

Crop/Land Needs: What environmental goals or parameters surround your land/s?

Political Economic Considerations: What formal or informal policies are currently regulating, incentivizing or dis-incentivizing this sector?

Further Resources for Farmers

Farm Basics: Compost vs Manure https://www.youtube.com/watch?v=AmjvmRX5jHI

Living Soil Film https://www.youtube.com/watch?v=ntJouJhLM48&t=852s

On Pasture https://onpasture.com/2014/06/16/should-i-irrigate-my-pastures/

Visual Soil Health Indicators
https://www.noble.org/news/publications/ag-news-and-views/2018/october/look-for-these-soil-health-indicators-in-the-field/

Virginia Ag Extension Composting and Compost
https://ext.vt.edu/natural-resources/composting.html

Making and Using Organic Compost, Farmers Magazine
https://www.farmingmagazine.com/dairy/manure-handling/making-using-farm-compost/

Further Resources for Policy Makers/Advocates

Urban Sustainability Directors Network: Redesigning Organic Material Systems https://urbandrawdown.solutions/resource-database/organics-to-sequestration-2021-process-guide

Urban Drawdown Solutions https://urbandrawdown.solutions/

California Alliance for Community Composting https://www.thecacc.org/

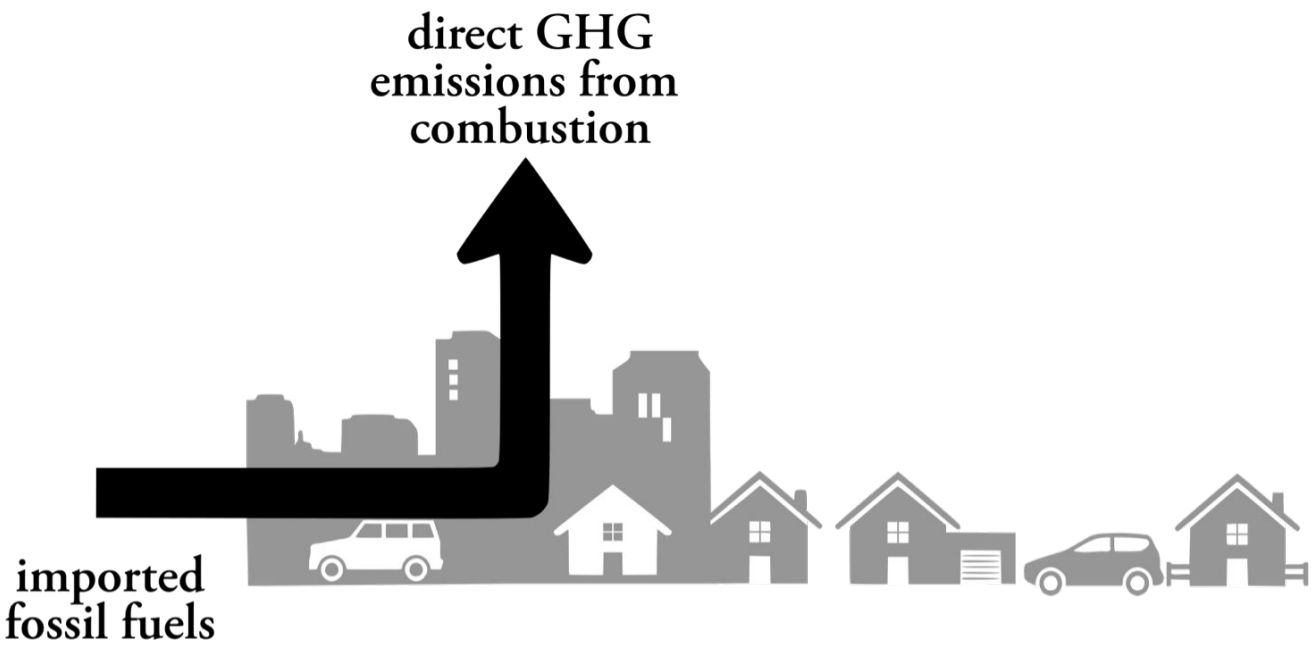
ILSR Community Composting https://ilsr.org/composting/

GAIA https://www.no-burn.org/

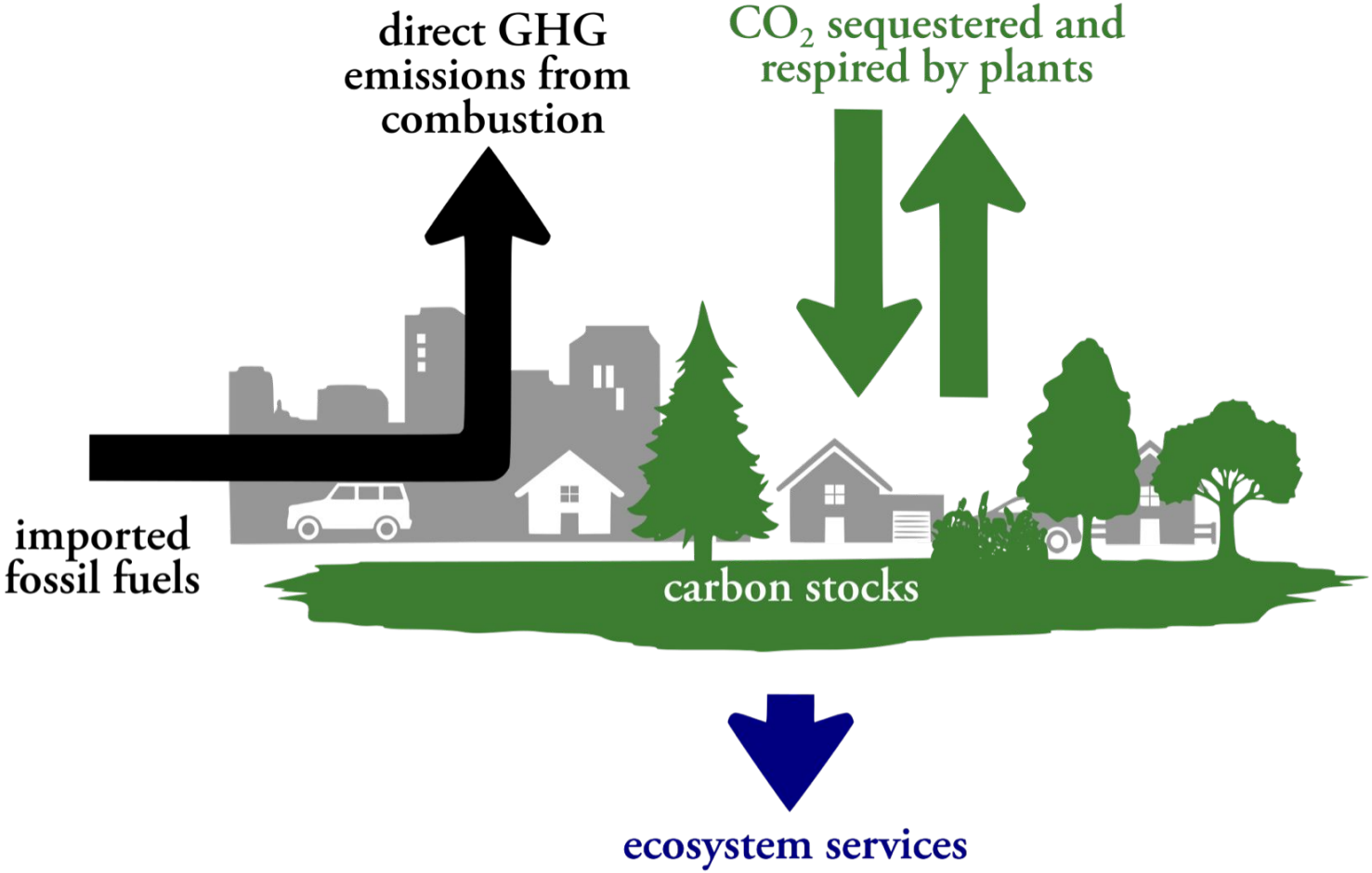
Soil Advocate Training, Kiss the Ground https://docs.google.com/presentation/d/1l_N07otHOqGDUpnhmJLYAkQEDKMnY6oa41nOMTpuCnM/edit

Managing carbon flows in an urban system

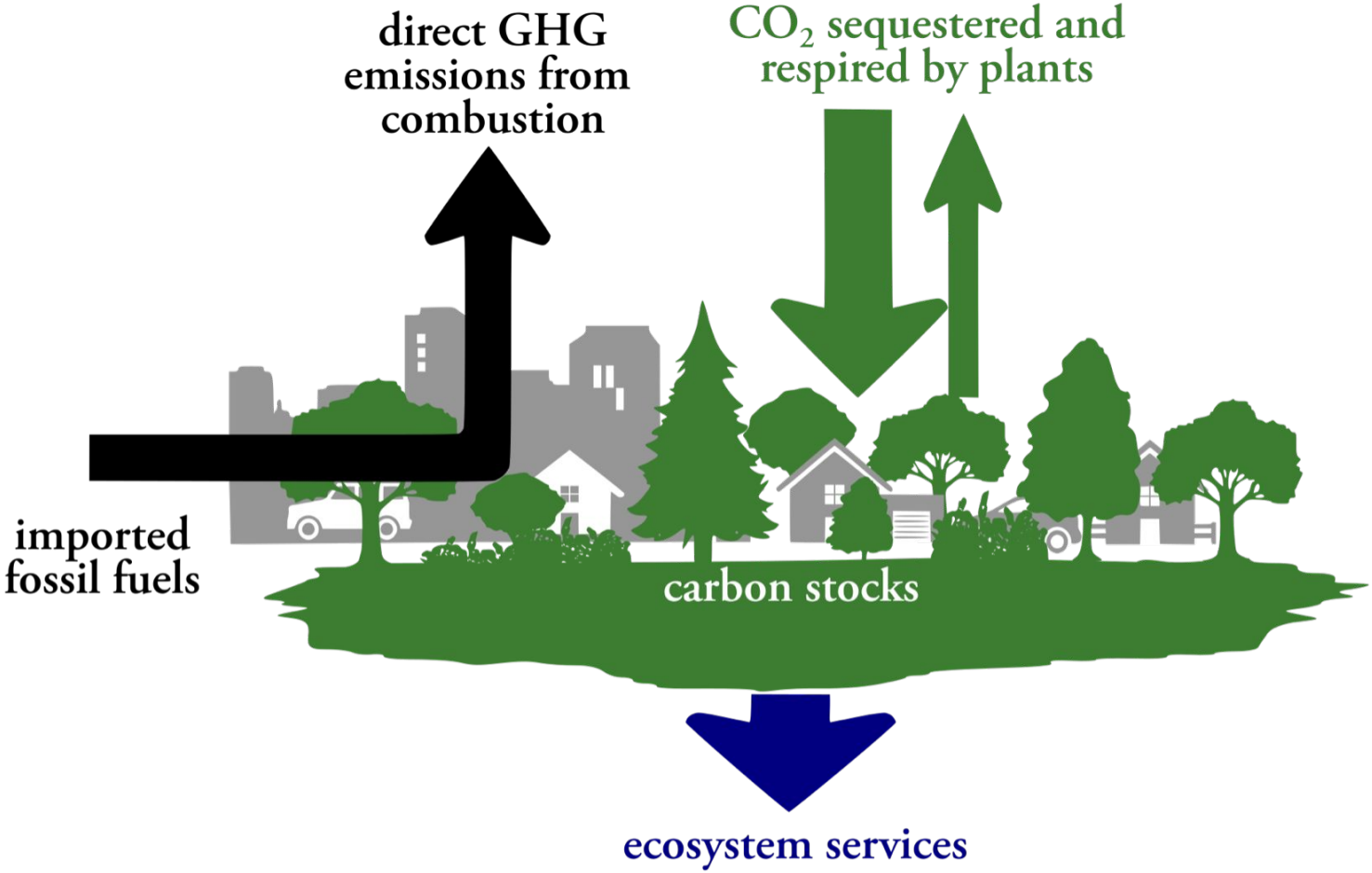
Credit: Jonathan Watcher, Urban Drawdown Initiative



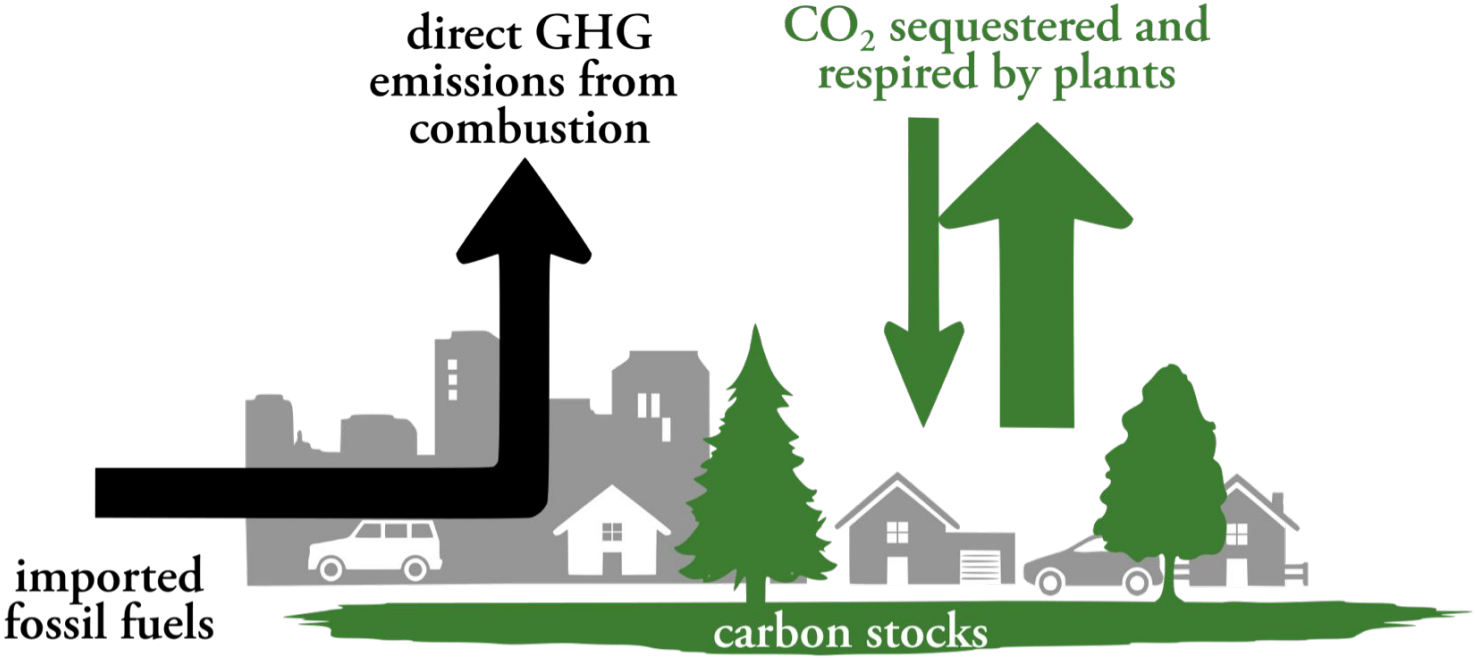
Traditional GHG inventory accounts only for emissions.



New GHG inventory includes sequestration and emissions from urban ecosystems.

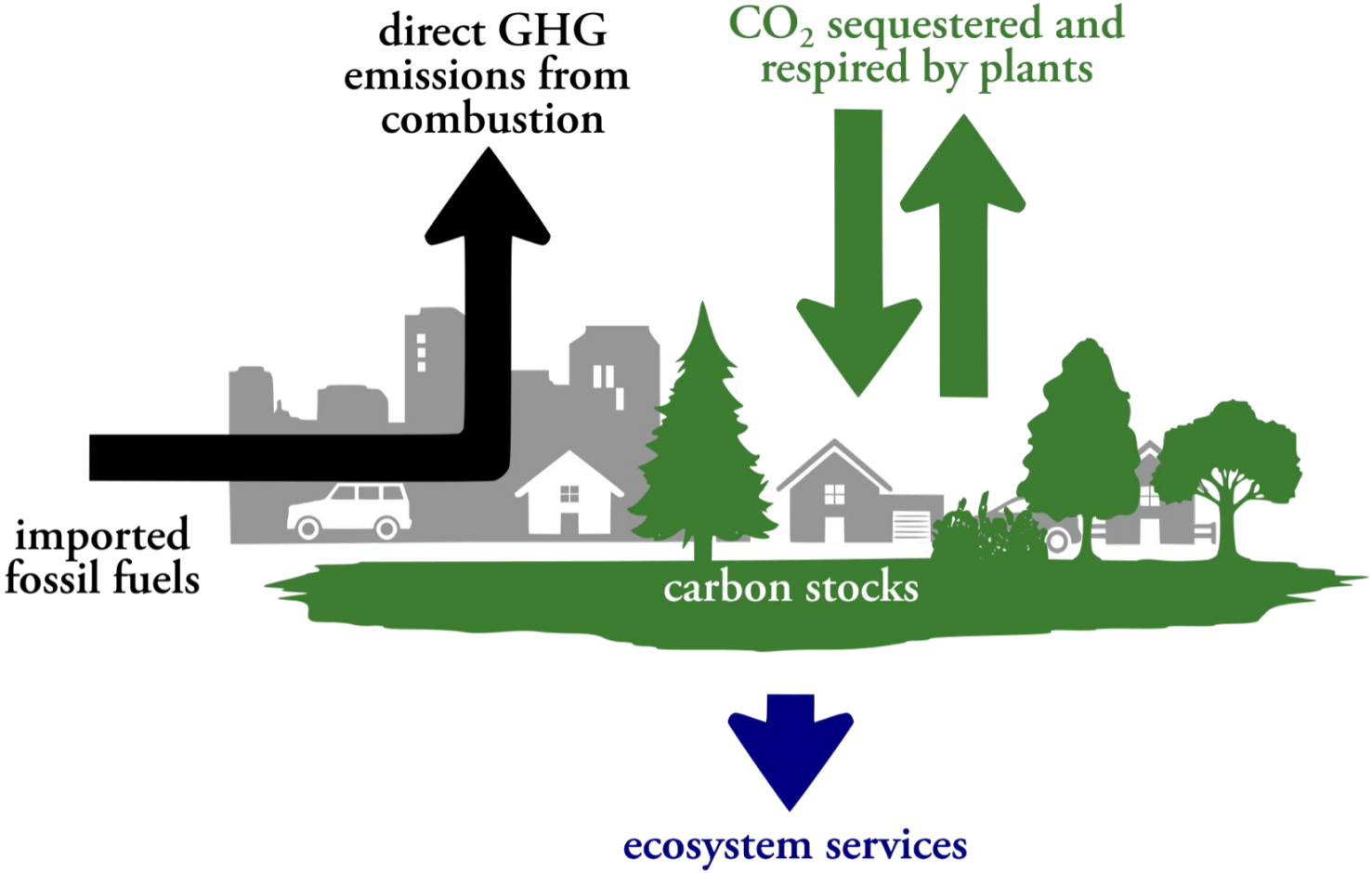


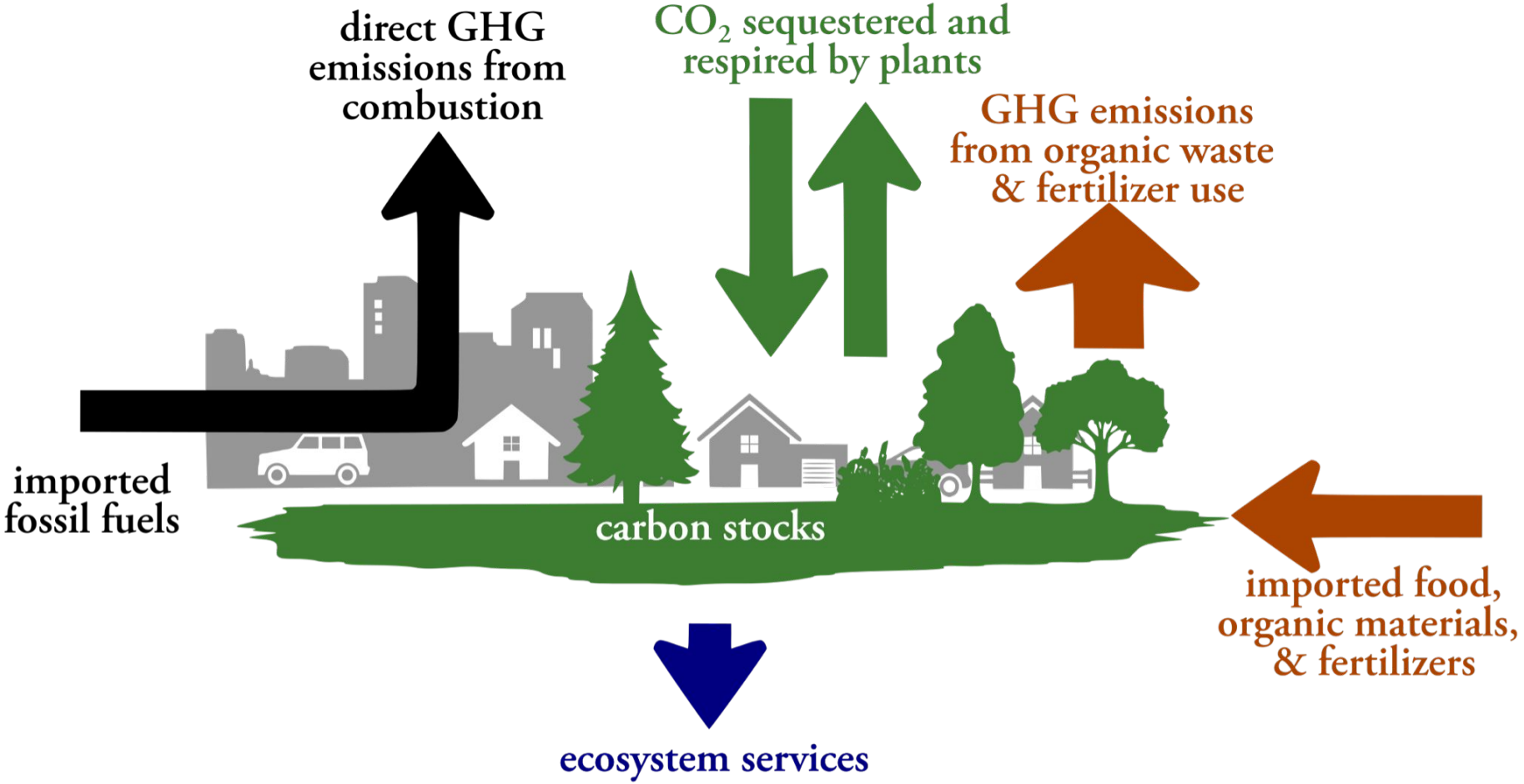
When carbon stocks are increased by strategic management of natural assets, GHG emissions decrease, sequestration increases, and the provision of ecosystem services is enhanced.



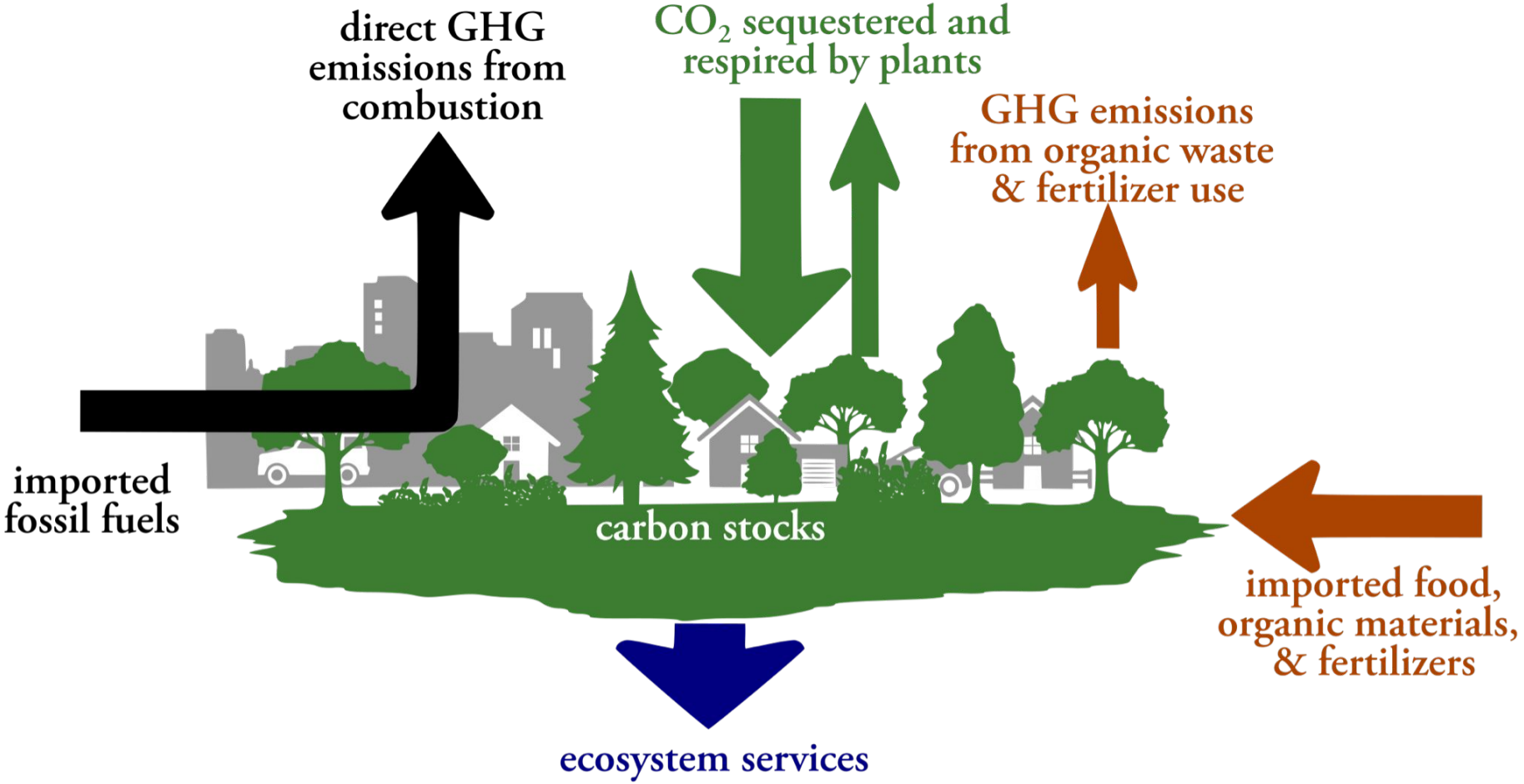
ecosystem services

When carbon stocks are lost (due to development, tree mortality, etc.), GHG emissions increase, sequestration decreases, and the provision of ecosystem services is diminished.

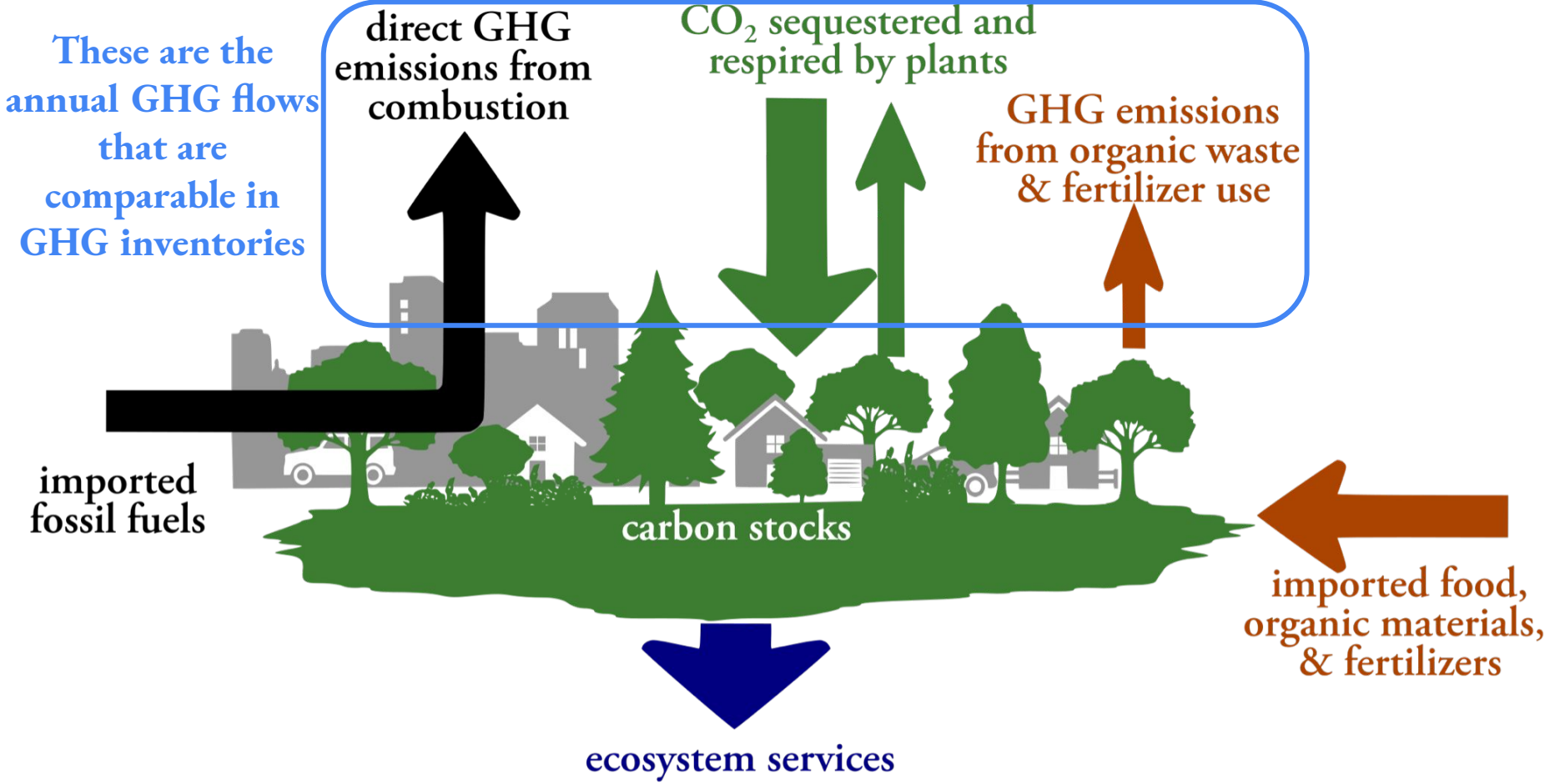

direct GHG emissions from combustion
CO_2 sequestered and respired by plants
imported fossil fuels
carbon stocks
ecosystem services



Organic waste management and fertilizer use are other important sources of GHG emissions.



And if used strategically, organic waste and fertilizers can be used to increase carbons stocks while reducing emissions from their management.


These are the annual GHG flows that are comparable in GHG inventories
direct GHG emissions from combustion
CO_2 sequestered and respired by plants
GHG emissions from organic waste & fertilizer use
imported fossil fuels
carbon stocks
imported food, organic materials, & fertilizers
ecosystem services