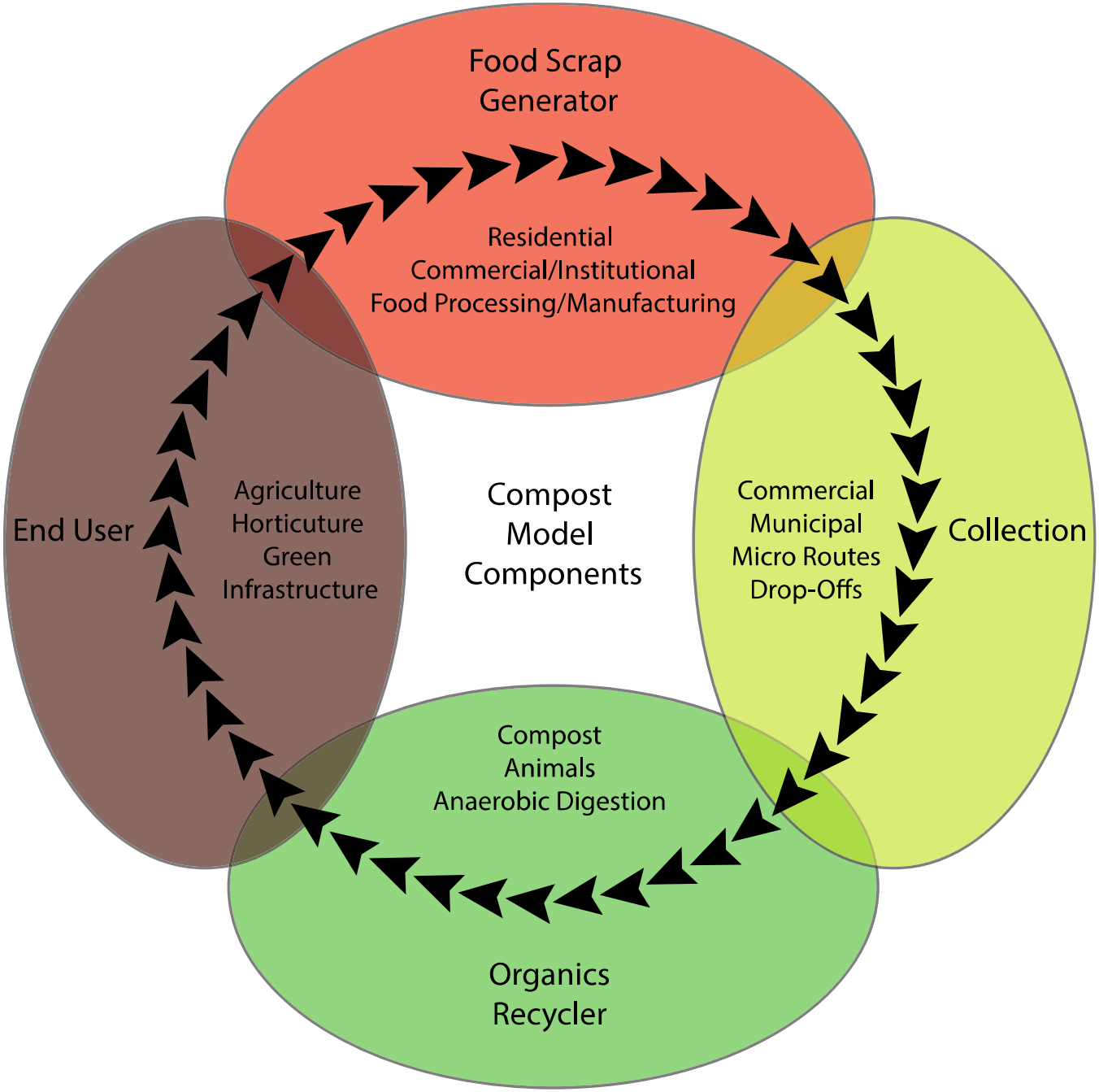
Compost Site Planning

James McSweeney •
Compost Consultant
& Educator

Compost
Technical
Services


SEWER
NO 4
WILLIAMSTOWN MASS


N.O.K.
MASS.


Food Scrap
Generator
Residential
Commercial/Institutional
Food Processing/Manufacturing
Collection
Commercial
Municipal
Micro Routes
Drop-Offs
Organics
Recycler
Compost
Animals
Anaerobic Digestion
End User
Agriculture
Horticuture
Green
Infrastructure
Compost
Model
Components

Fundamentals of Managed Composting

Composting done intentionally:

- Speeds up the decomposition process
- Improves conservation of nutrients
- Mitigates potential pollution from the concentrated nutrients and pathogens in the raw organic materials being processed
- Has global impacts in terms of returning carbon, nitrogen, and other nutrients to the ecosystem

Fundamentals of Managed Composting

- Planned compost system with adequate capacity
- Knowing your raw materials
  - Character
  - Volumes
- Using a recipe
- Blending materials
- Containing putrescible materials

Fundamentals of Managed Composting

- Pile monitoring
- Turning and aerating
- Heat treatment
- Preventing nuisances
  - Odors
  - Vectors
  - Pollution
- Maturing compost and ensuring product quality

Site Planning Overview

- **Discover**
- **Define**
- **Design**
- **Develop**
- **Deploy**

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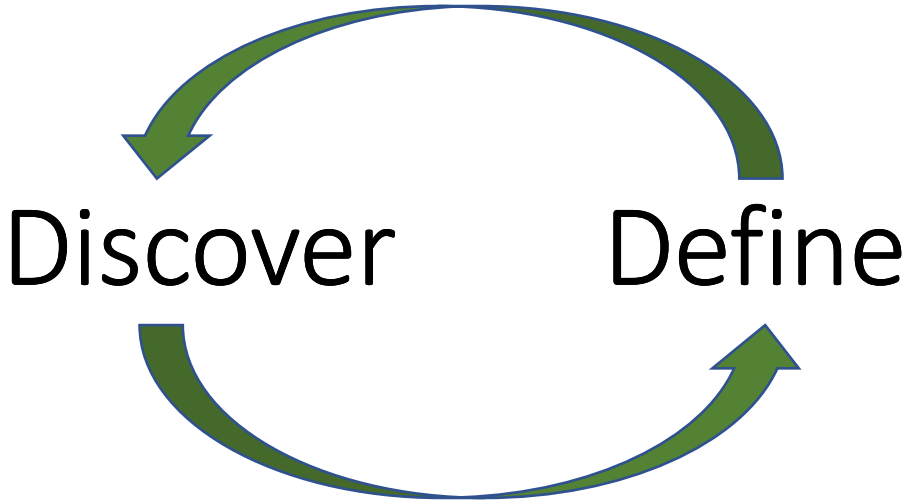


Entity
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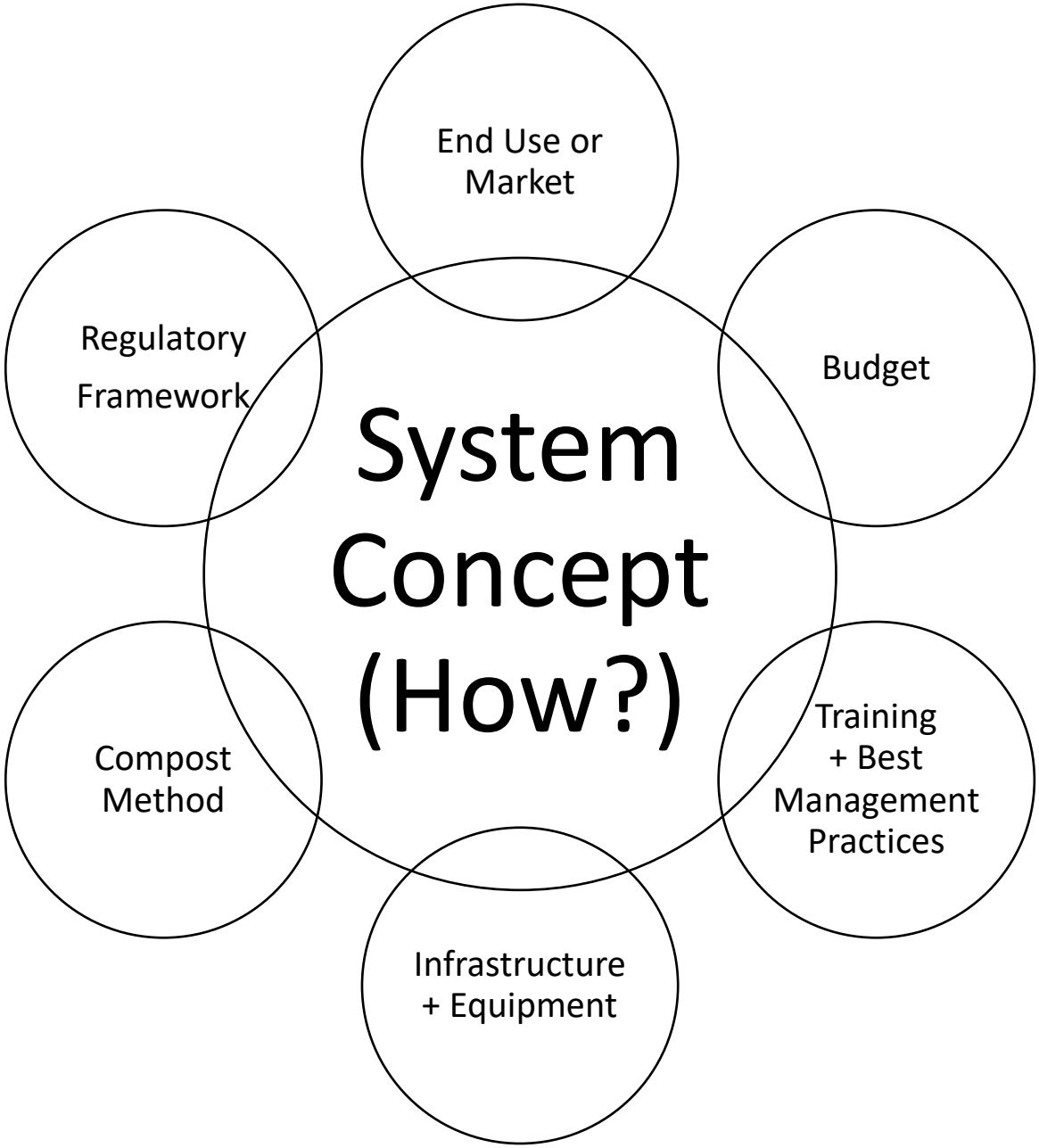
Feedstock
+ Scale
(What?)
Goals
(Why?)
Timeline
(When?)
Location
(Where?)


End Use or Market
Regulatory Framework
Budget
System Concept (How?)
Compost Method
Training + Best Management Practices
Infrastructure + Equipment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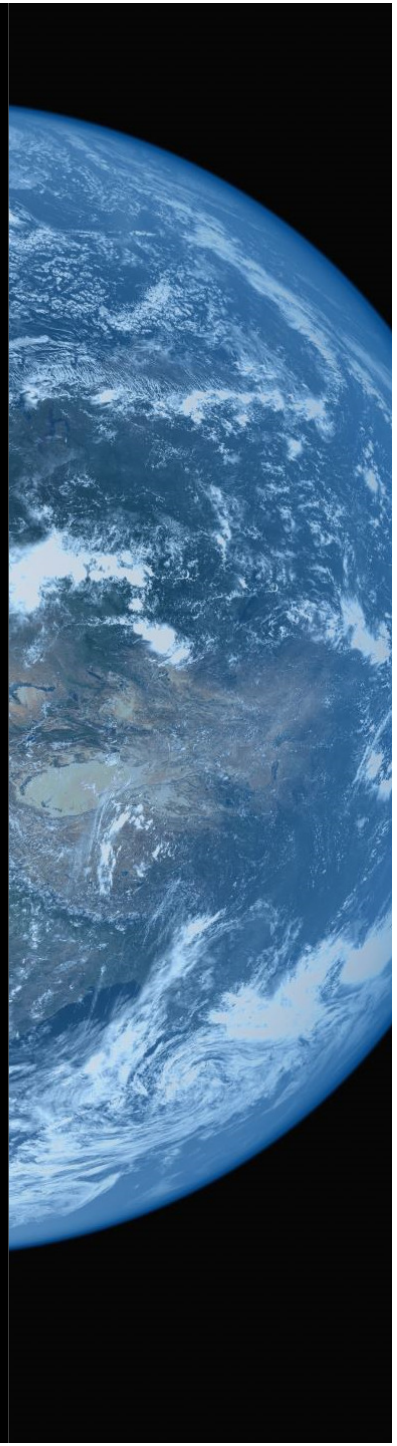
Think Big. Start Small.

Behavior change through education

People don’t understand that the impacts of their waste has dramatically unequitable impacts

Environmental justice – both local and global



Missoula Compost Collection

Locally owned and operated company on a mission to improve Missoula's waste management.

Our Mission

Provide a local compost collection service that's affordable, reliable, and accessible to everyone.

Tailor composting services to fit your needs.

Educate our community.

Carbon Emission Reduction.

Create a nutrient dense compost available to our community.

By reducing your waste, you can help maintain open spaces!

LA COMPOST

Our Mission & Vision

Grow. We want to grow our capacity to support more neighborhoods and kitchens.

Sustain. We work to sustain our current programs, with an educated composting task force.

Regenerate. We believe in a regenerative business, to amplify and support the work happening in communities.

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Food Recovery Hierarchy

Upstream diversion to people and animals

Start Small

Make goals that are:

- realistic and achievable
- Clearly defined
- Revisit and revise


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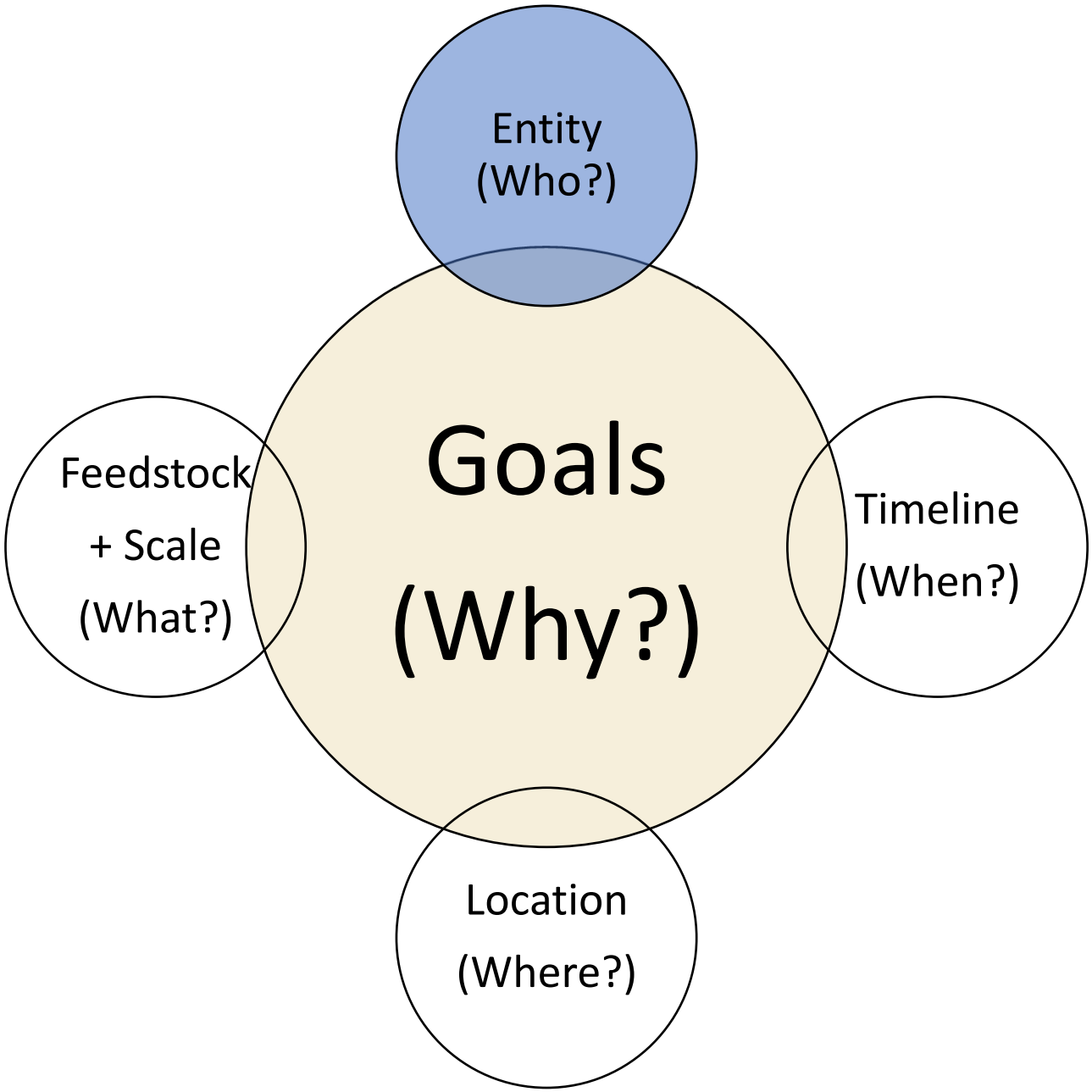
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Models & Entities

- Commercial
- Municipal
- On-farm
- Community gardens and farms
- On-site at schools and other institutions
- Demonstration and educational sites

Models & Entities

Cooperatives

Worker owner

Producer/marketing

Multi-stakeholder (hybrid)

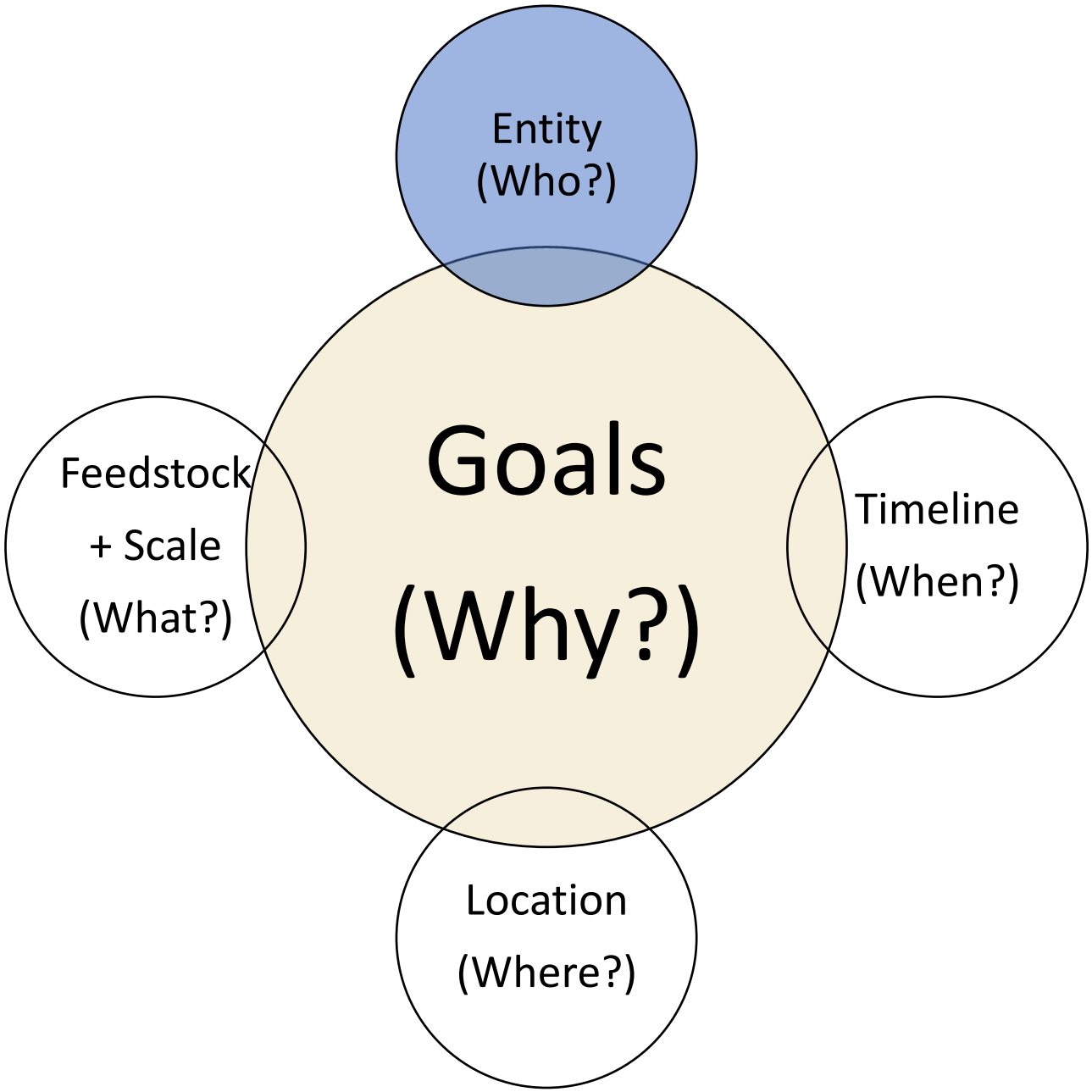
Partnerships

Public/Private/non-profit

Composter networks (formal and informal)

Who are you serving?

Market, stakeholders, partners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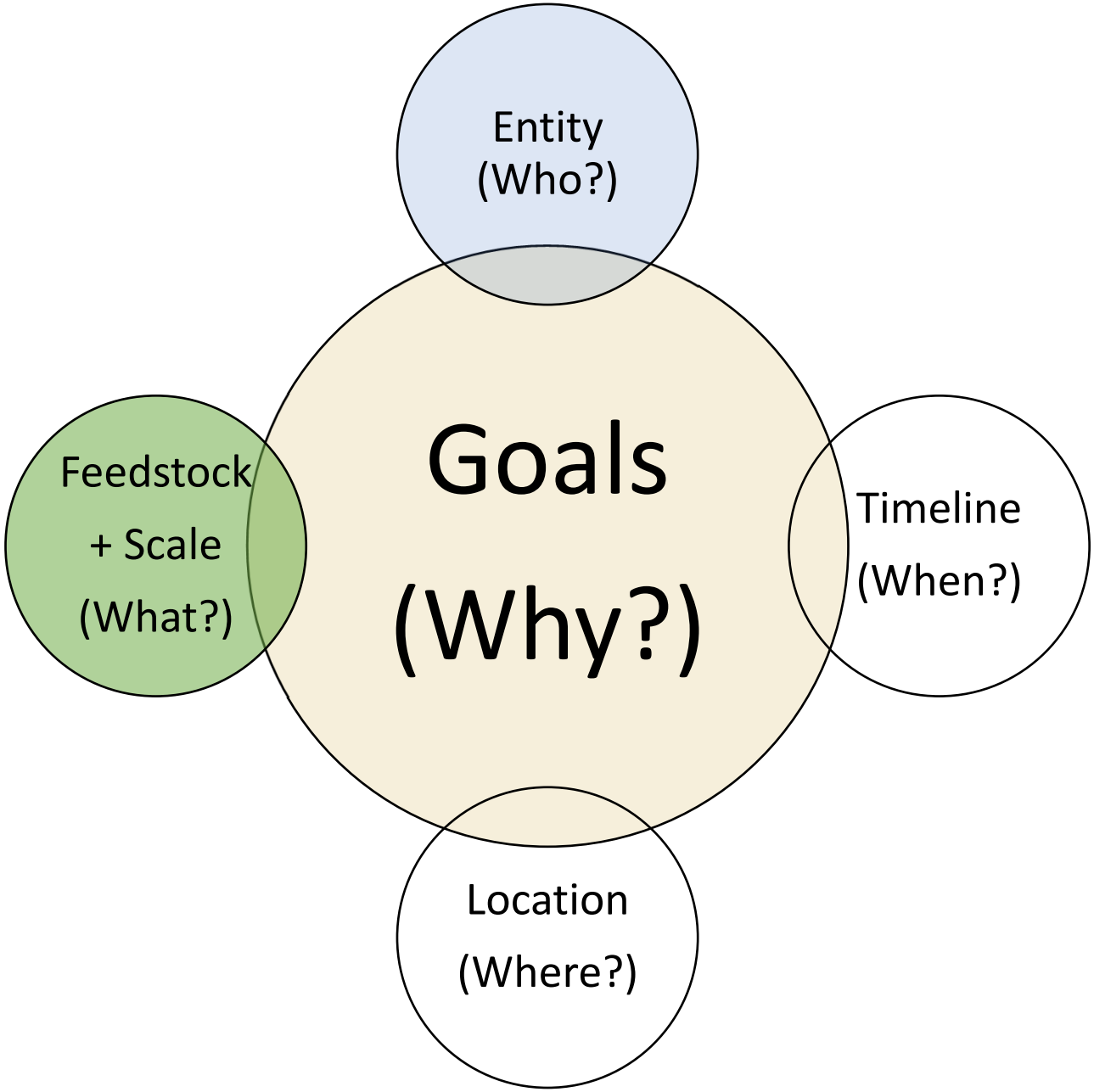
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Choice of Feedstocks (Examples)

Primary (Problem feedstock)

- Mixed Food scraps
  - Residential
    - Curbside collection
    - Drop-offs
  - Commercial/ Institutional
    - Restaurants
    - Grocery stores
    - Schools
- Food Processing Residuals

Additional Feedstocks

- Leaf and yard trimmings
- Wood chips
- Animal bedding

Factors Affecting Feedstock Value and Handling

- **Control over source**
- *Do you anticipate this being a consistent (and clean) feedstock source?*
- *How much education will it require you to provide the generator? (to get a clean material?)*
- *Will the generator commit to supplying (a clean) the material to you?*
- *What factors affect consistency in the feedstock?*

Factors Affecting Feedstock Value and Handling

Odor Potential

Based on the presence of volatile compounds and low pH in materials such as **food scraps and food residuals**

Factors Affecting Feedstock Value and Handling

Pre-processing requirements

Ease of handling

Post-processing requirements

Cost or revenue $$$?

Contamination

- **Chemical:** *PAH's, PFAS, persistent herbicides, pharmaceuticals*
- **Physical:** *Trash, Large Non-organics (Rocks)*

Understanding Scale

See site flow in both space and time

Raw Organics In

Time & Space

Stable Compost Out

Raw Organics In

Time & Space

Stable Compost Out

Raw Organics In

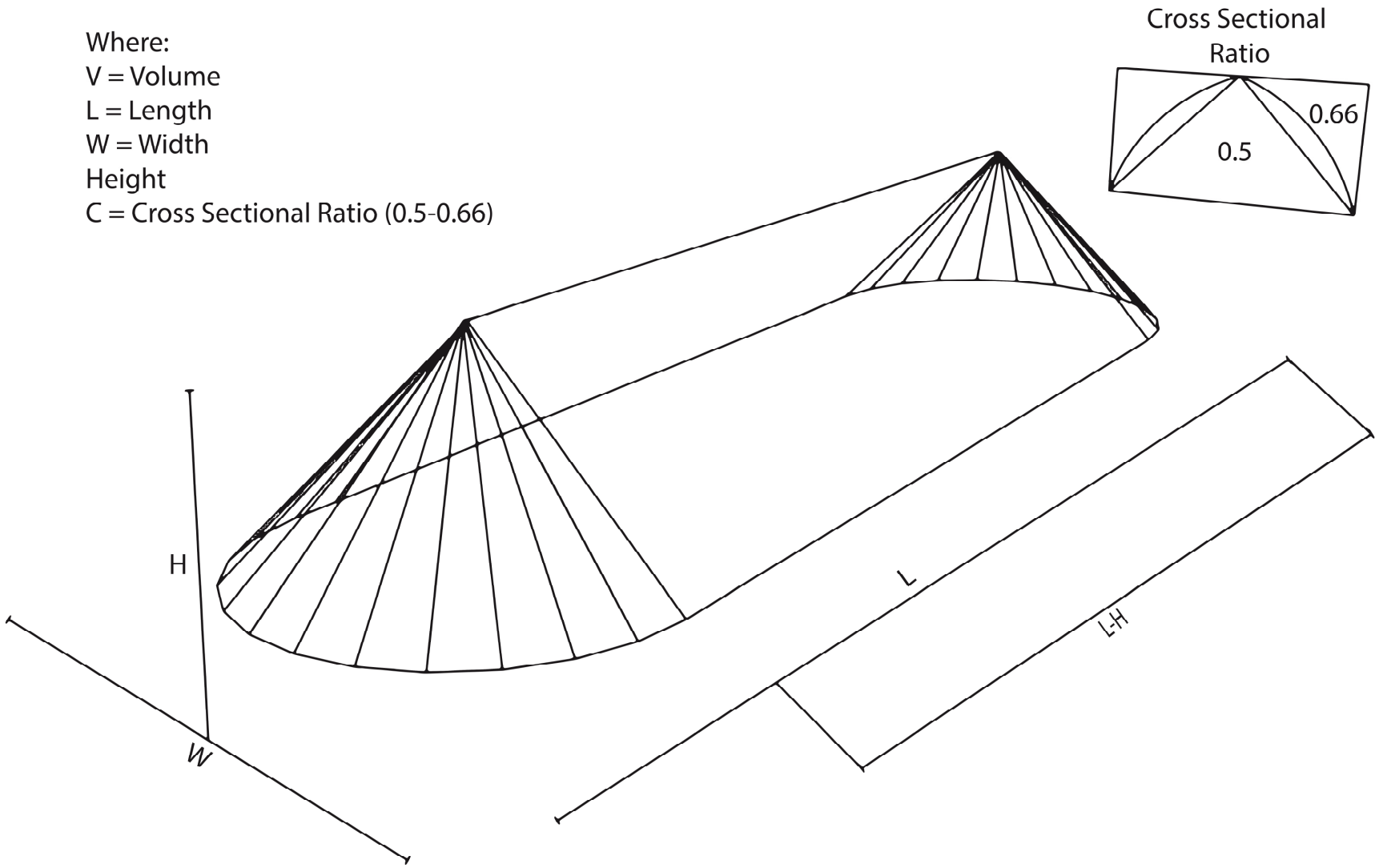
Less Time
Or
More Space
(More Labor)

Stable Compost Out

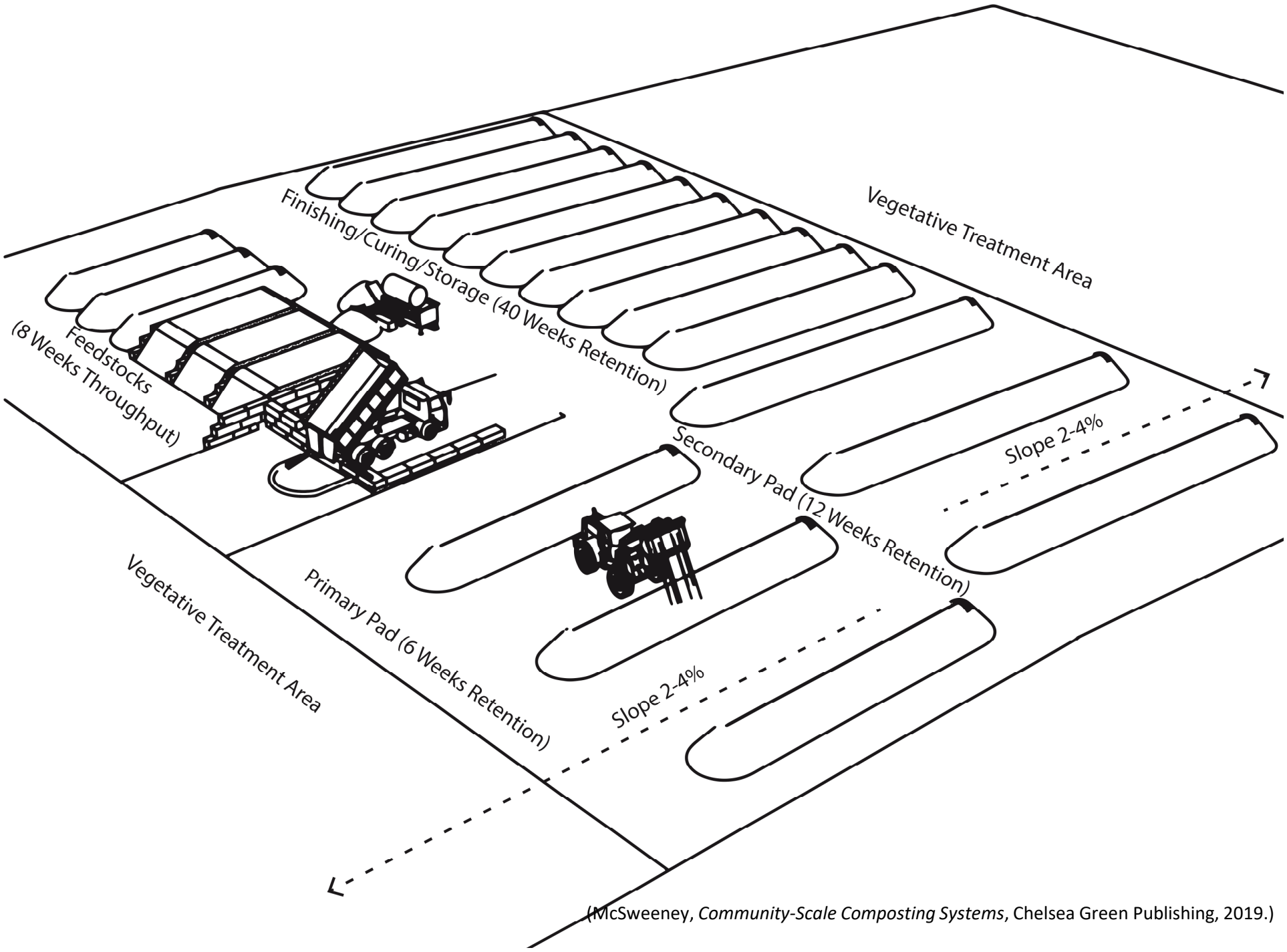
Volume of a Windrow

$V = (L-H) \cdot W \cdot H \cdot C$

Where:
V = Volume
L = Length
W = Width
Height
C = Cross Sectional Ratio (0.5-0.66)



(McSweeney, *Community-Scale Composting Systems*, Chelsea Green Publishing, 2019.)



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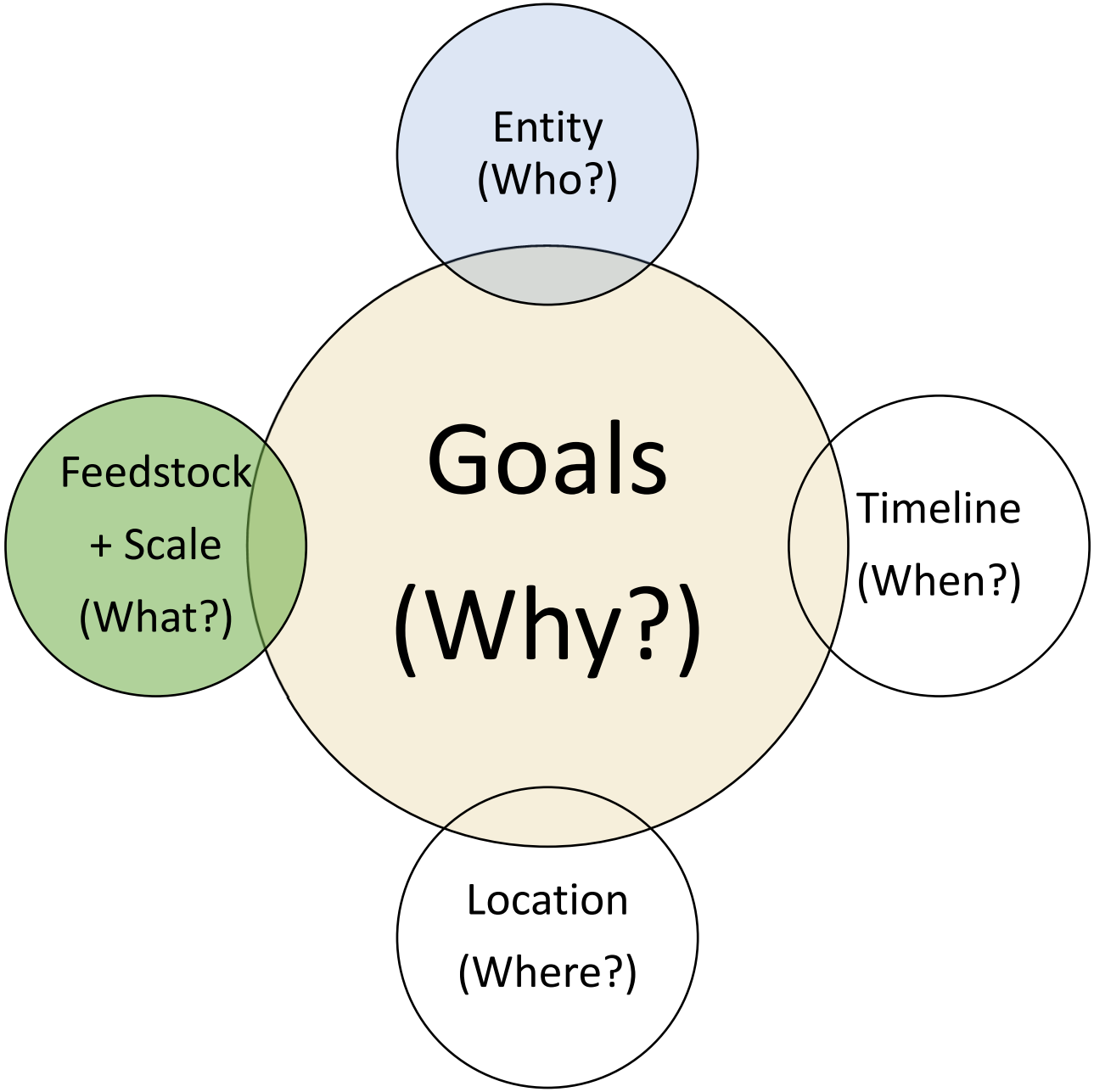
Volume reduction

Finished compost is generally 35-40% of inputs by volume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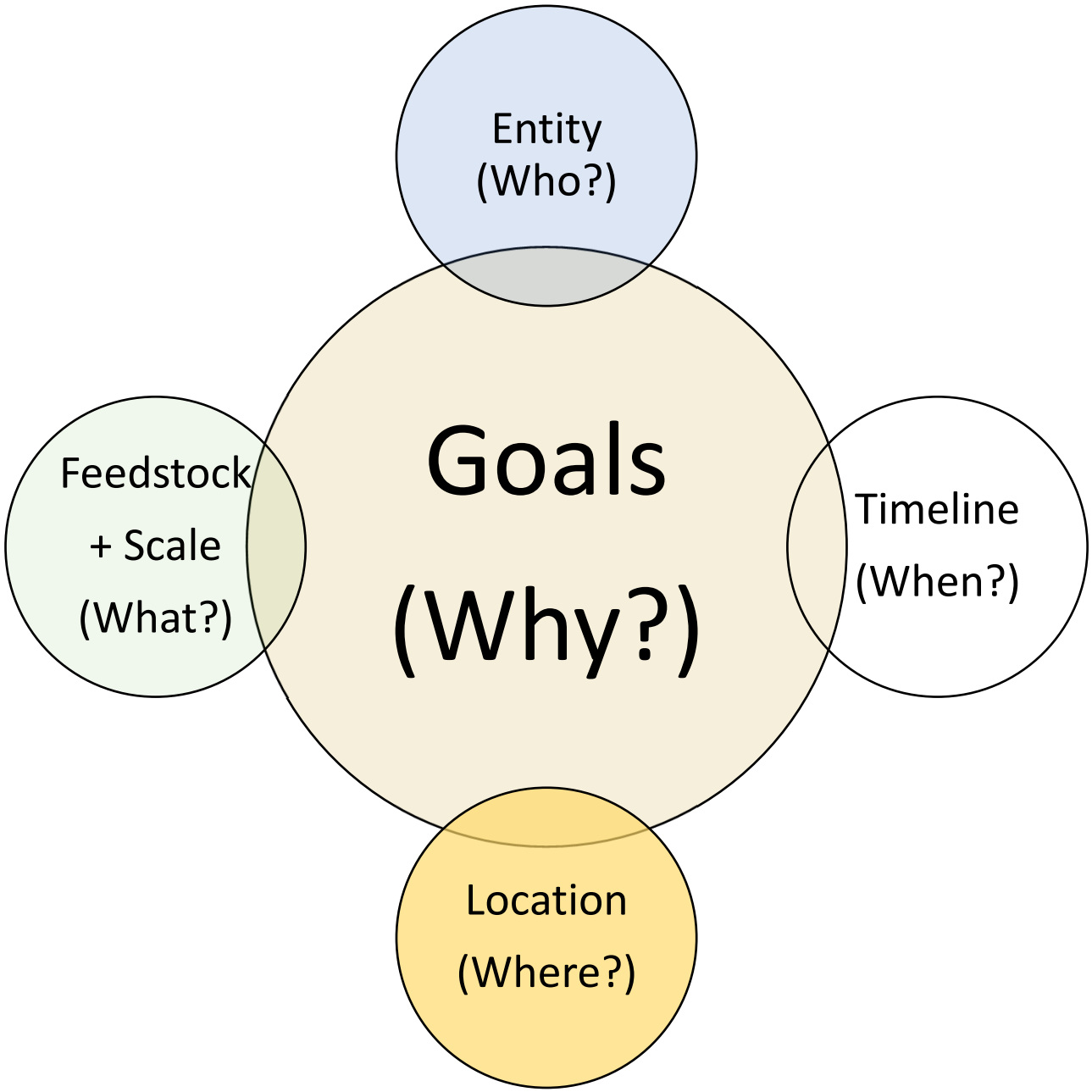
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Finding suitable location is a major challenge (especially in urban areas)

Like farming, composting struggles to compete economically with development

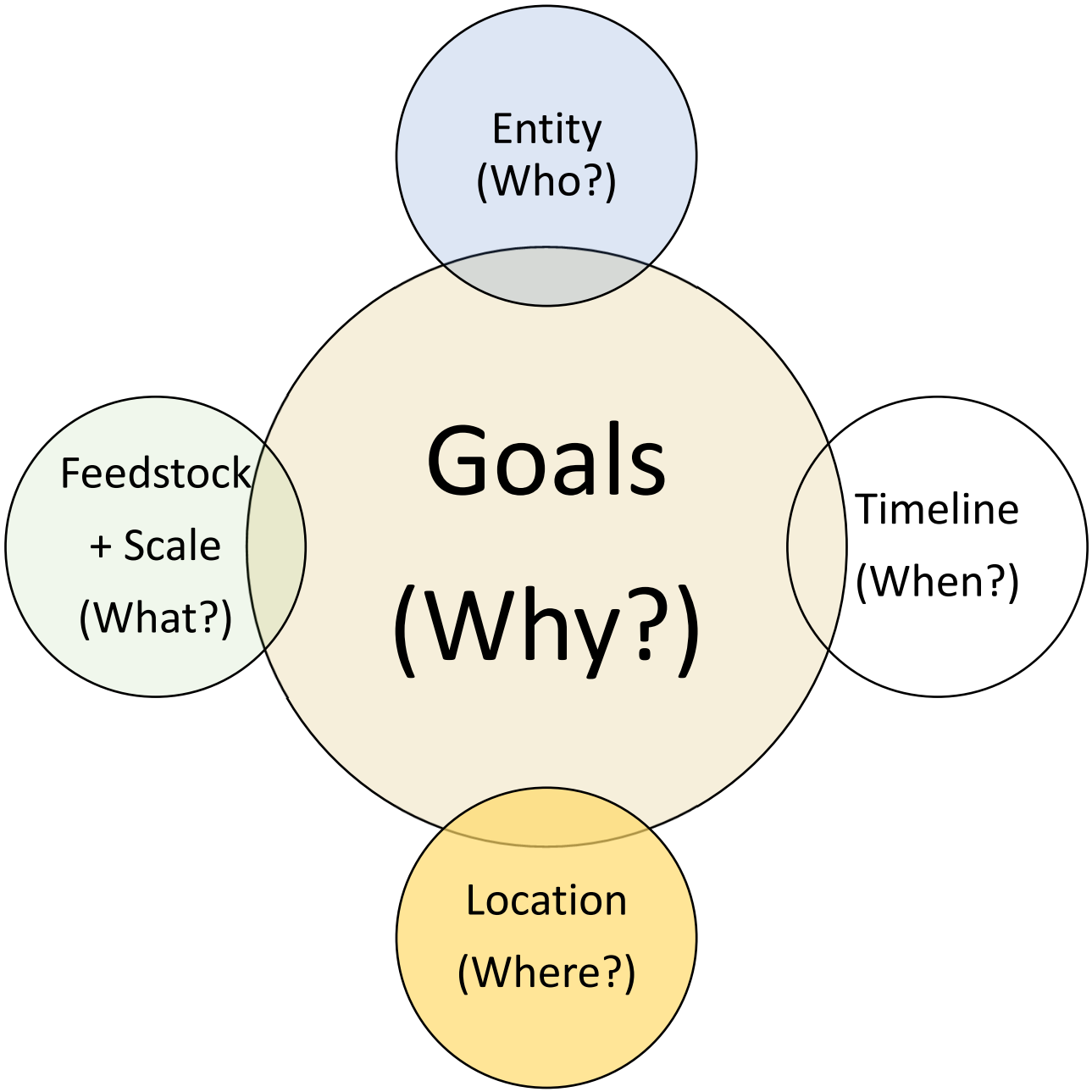
NIMBYism is very real

Minimize Neighbor Issues

Many environmental/nuisance problems associated with composting facilities can be avoided with proper facility site identification, planning, and outreach.

Protecting Water Resources

Maximize distance to surface waters, wetlands, wells, seasonally high groundwater and bedrock (minimum setbacks meet local and state regulations)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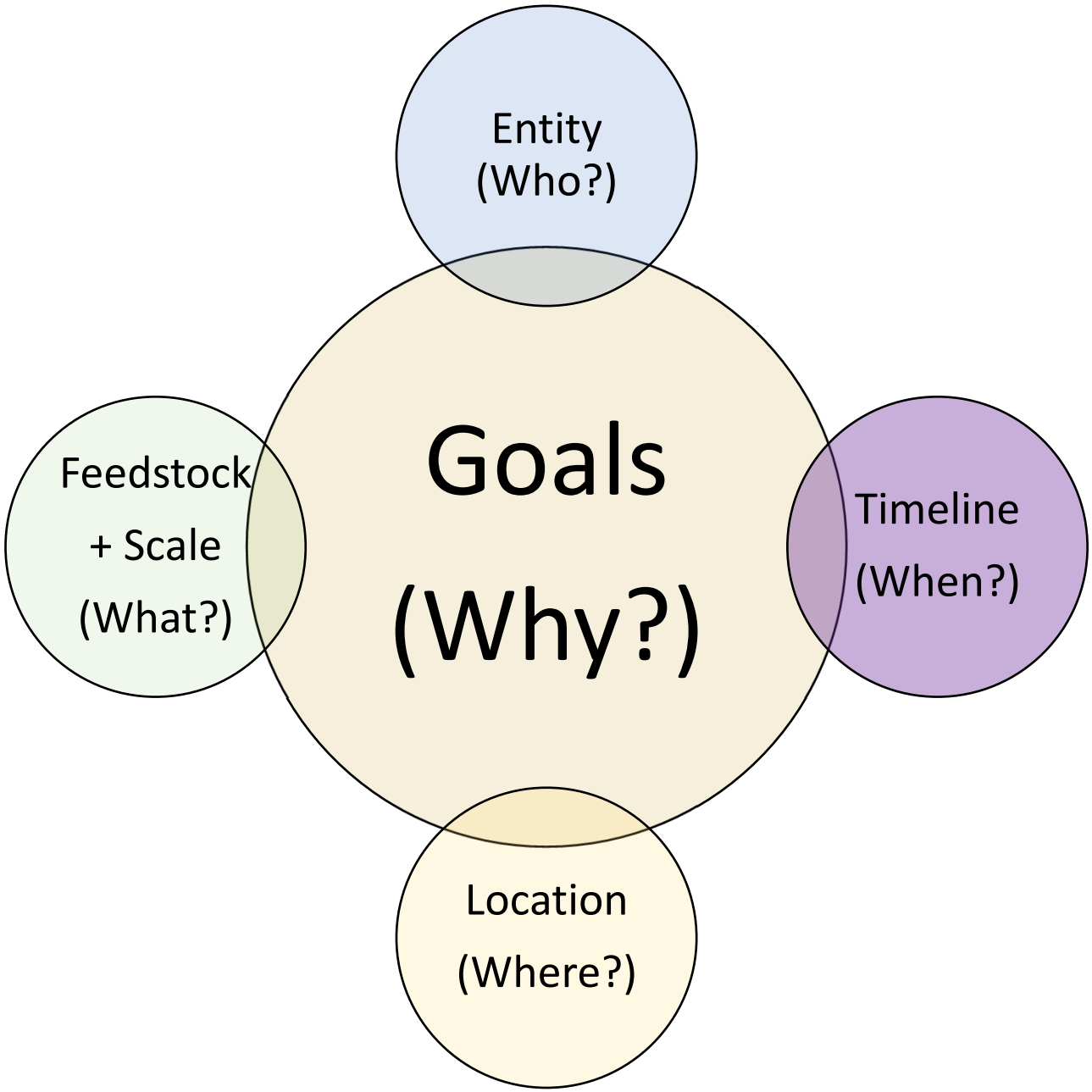
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Project Timeline

Discover <> Define

- Market (demand for products and services)
- Feasibility
- Business planning

Design

- Feedstock research
- Compost system and infrastructure
- Site management
- Community buy in
- Back up scenarios

Develop

- Funding
- Permitting
- Construction

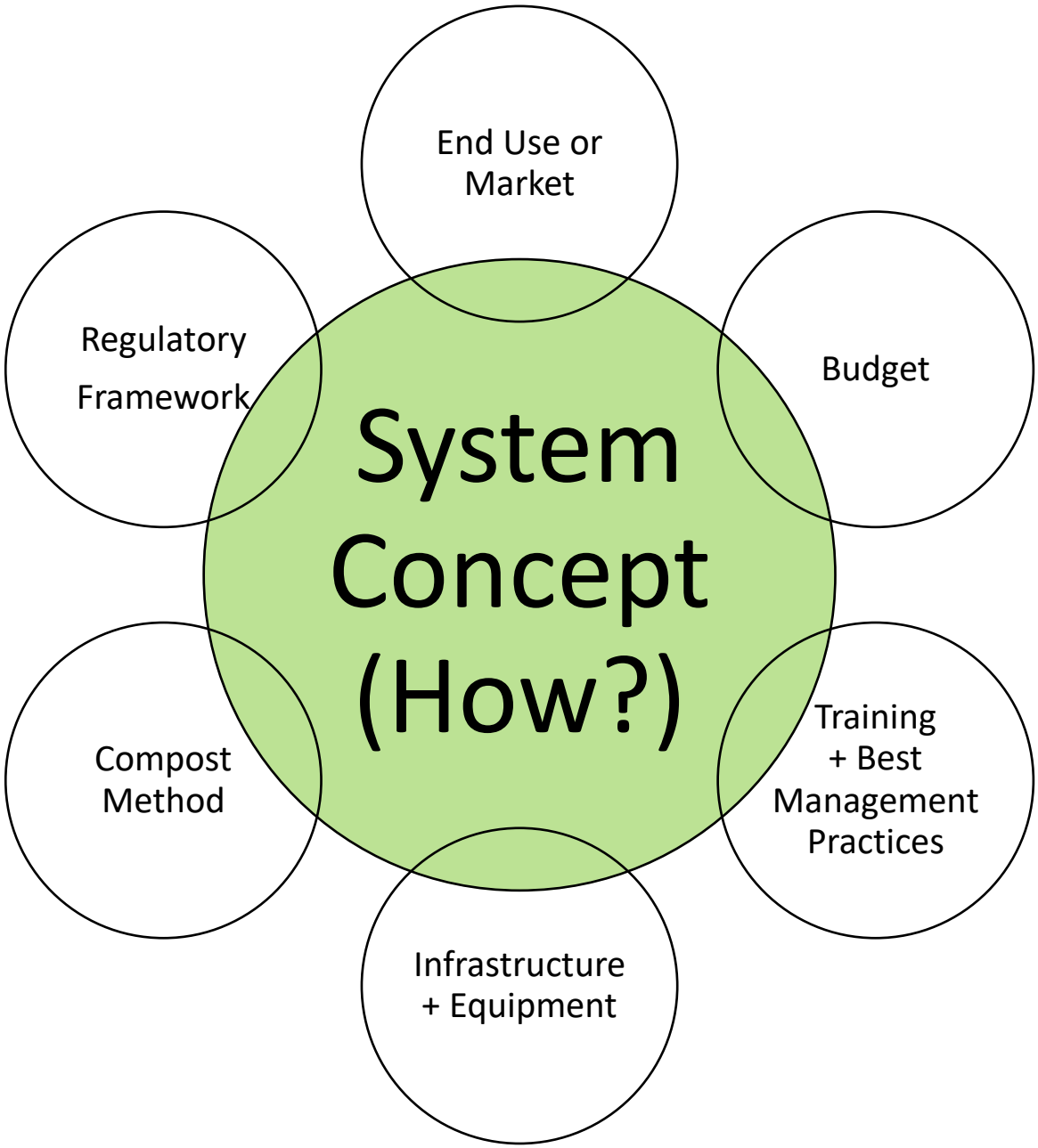
Deploy

- Phased scale up

Seasonality

Is throughput constant, intermittent?

Do you want to be a year-round composter or do you want to be able to turn off flow?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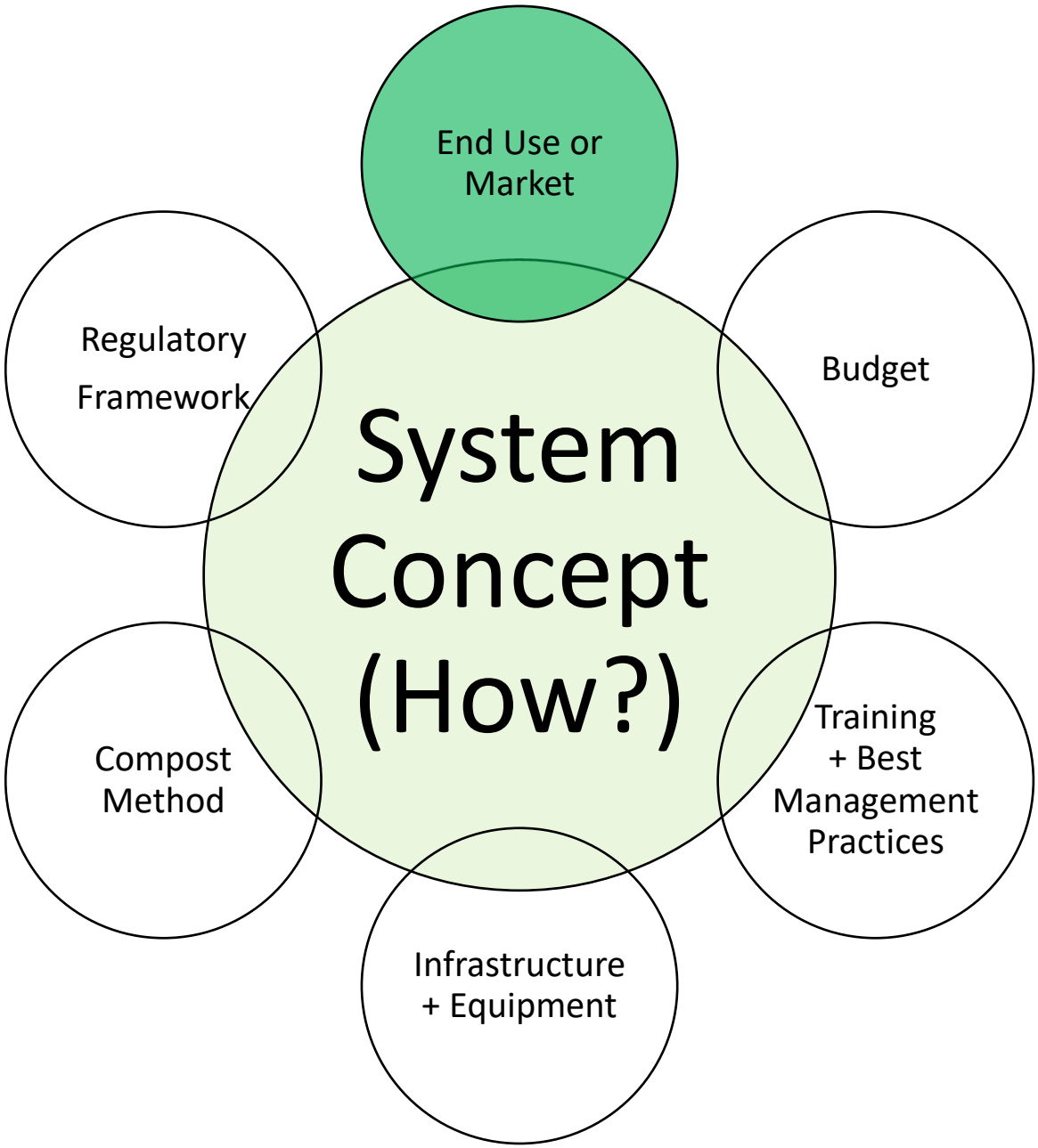
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Define End Uses or Markets

Agricultural

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Landscaping

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Green infrastructure

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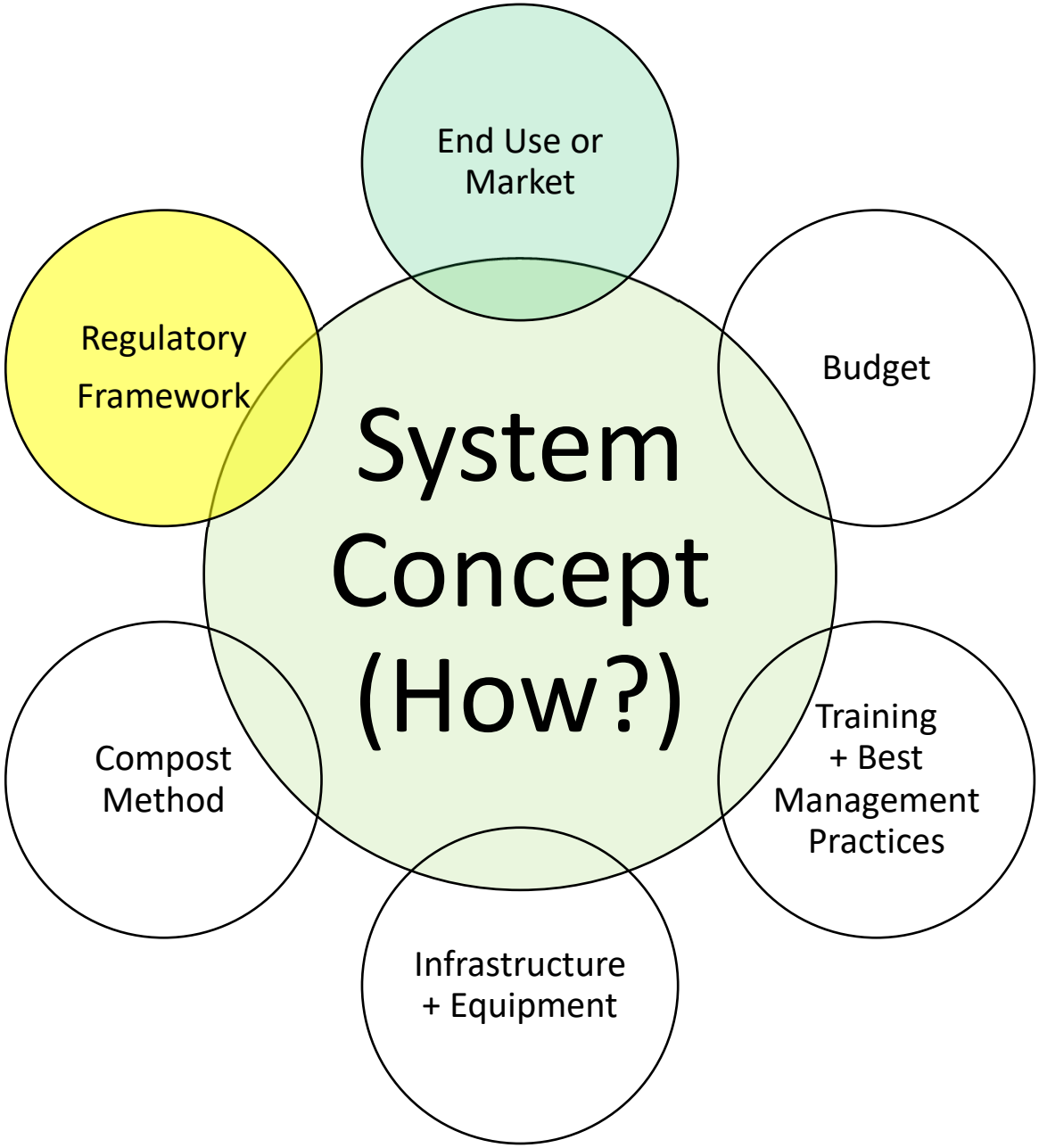
Home gardens

$$$

Value added (bagged products)

$$$$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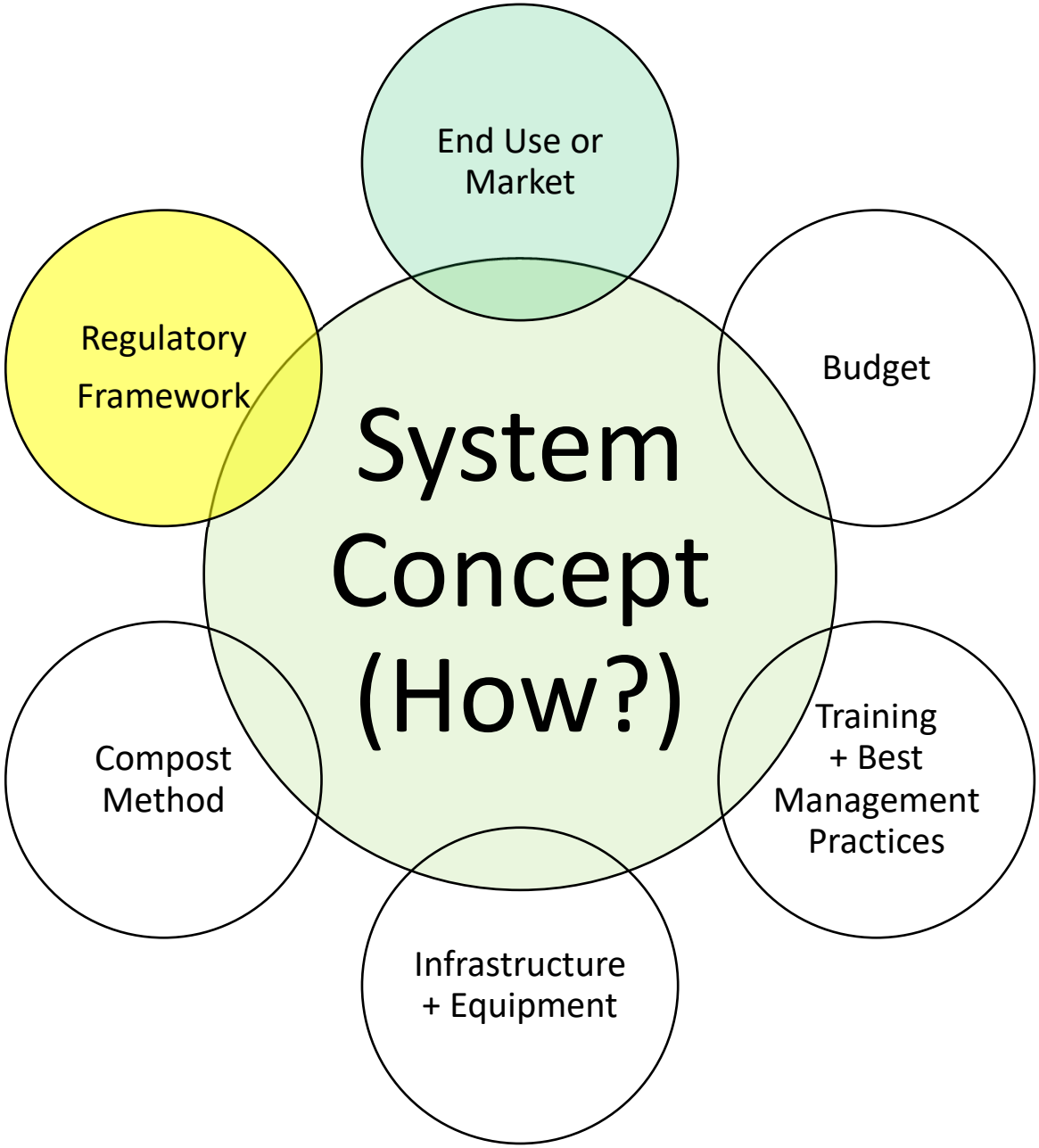
Regulatory Framework

- Local
  - Zoning
  - Boards of Health
  - Conservation districts (setbacks)
- State
  - Solid waste composting
  - Agricultural composting
  - Nutrient management planning

- Federal
  - FDA – Biological Soil Amendments of Animal Origin (BSAAO)
  - Industrial stormwater
- Organic Certifiers (voluntary)
  - ”Approval” for use on organic farms
  - Certified organic (uncommon)

Regulatory Framework

- Scale
- Setbacks
- Leachate and storm water management
- Best management practices (heat treatment for example)
- Level of planning (engineering)
- Public involvement and/or review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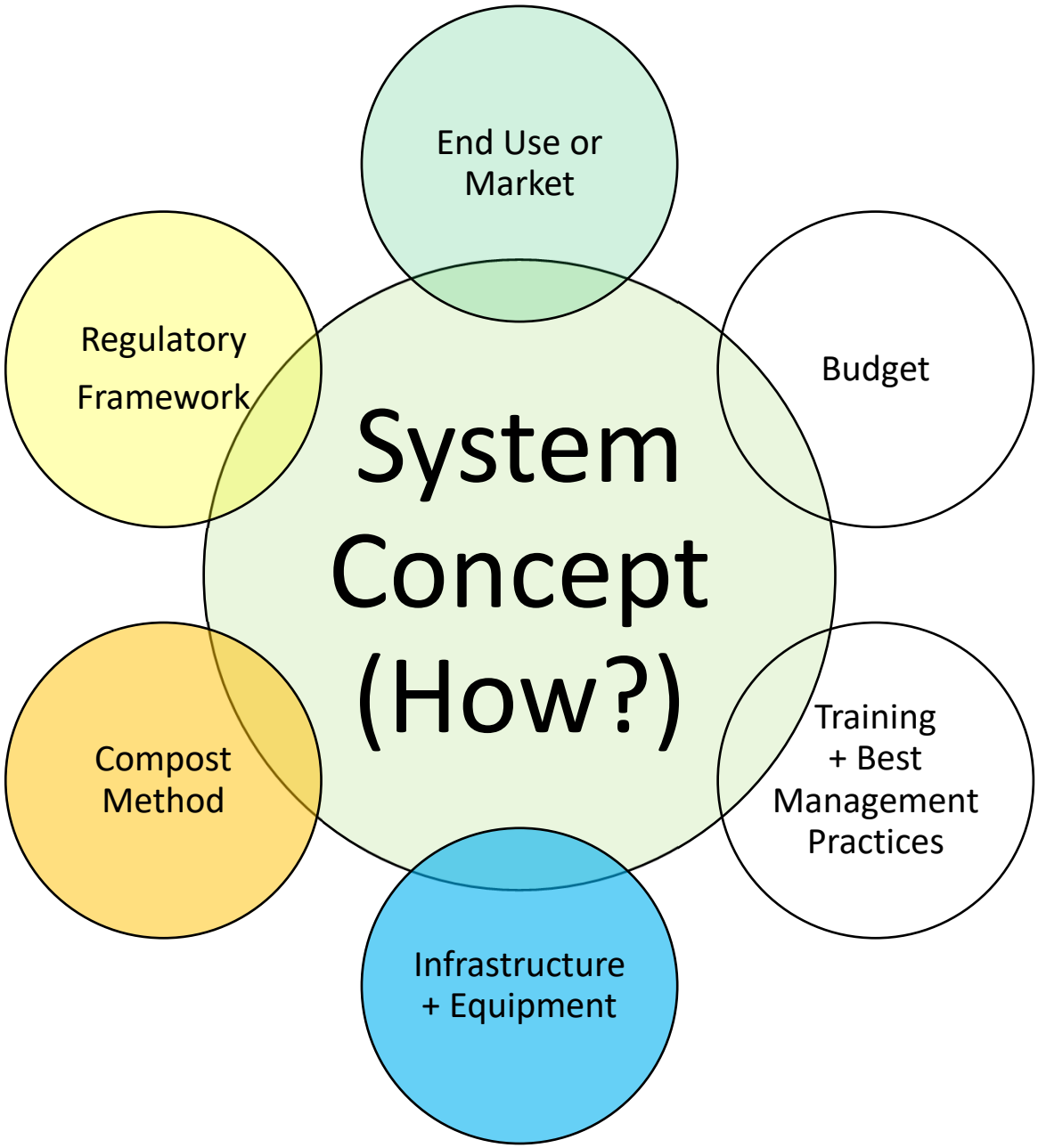
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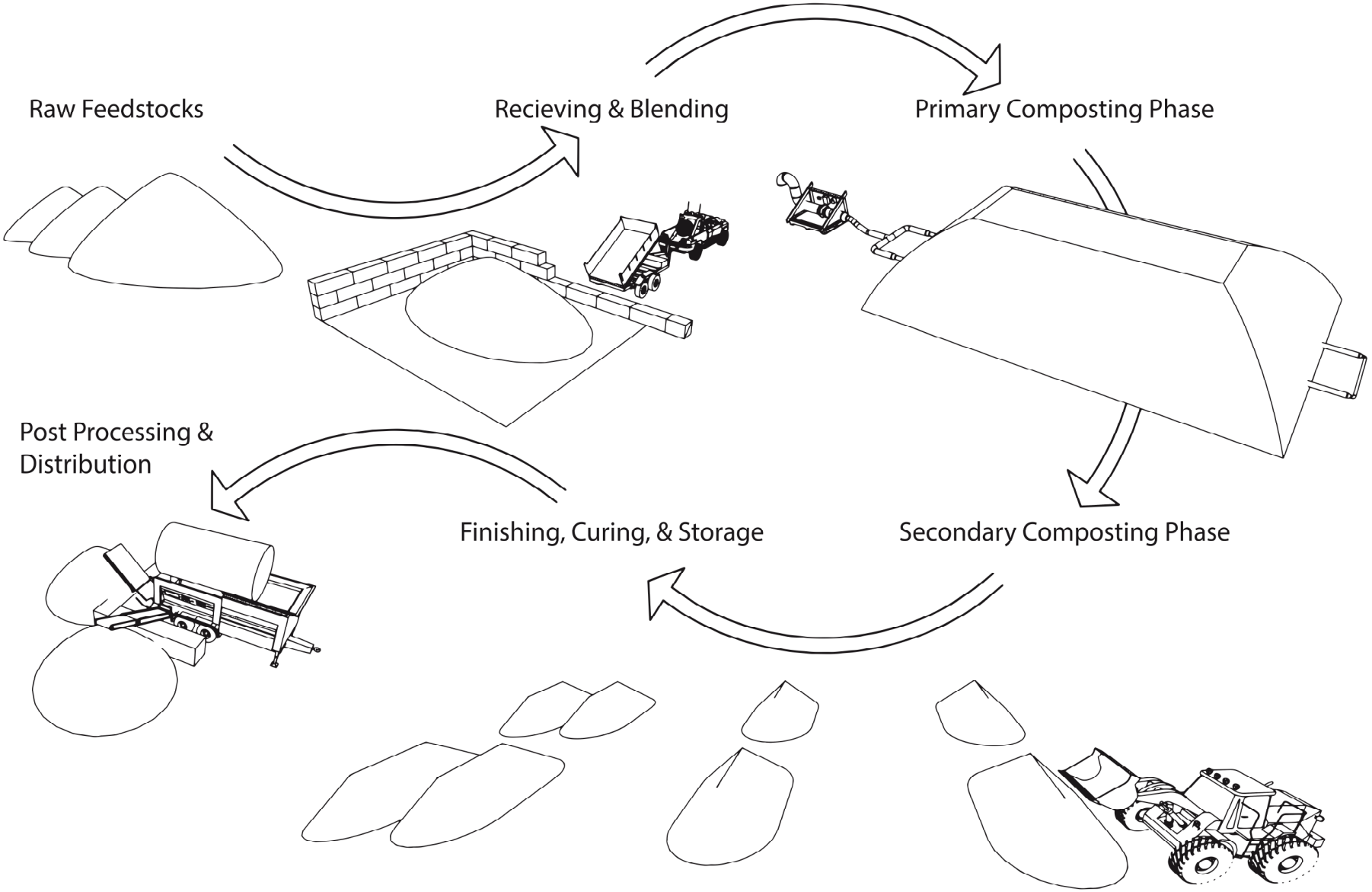
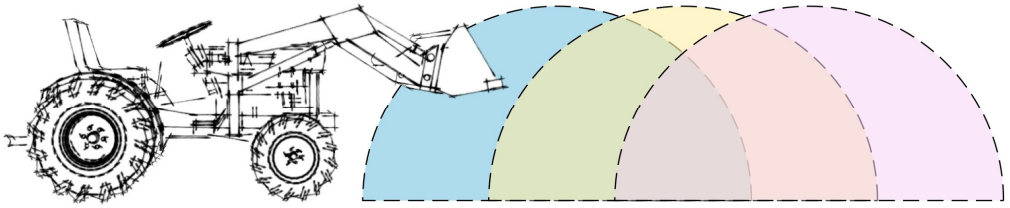
Site Components



(McSweeney, *Community-Scale Composting Systems*, Chelsea Green Publishing, 2019.)

Basic Styles of Aerobic Composting

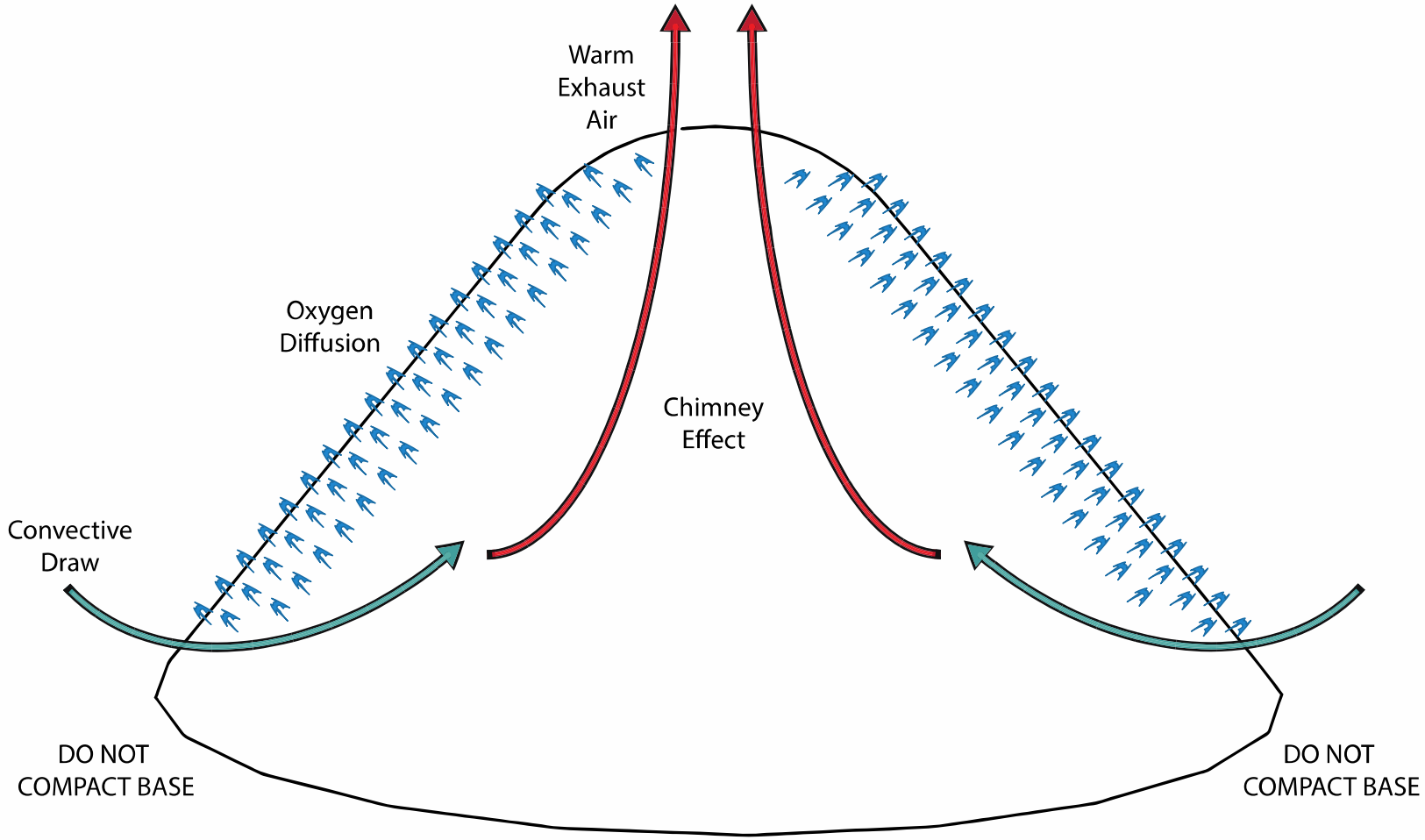


Diverse and overlapping composting options for diverse composting scenarios

Turned Windrow

Involves the formation of composting windrows and the periodic turning of the windrows with a **bucket loader, windrow turner, or excavator**

Passive Aeration in a Compost Pile



(McSweeney, *Community-Scale Composting Systems*, 2019)

TURNED WINDROW

Self-Propelled Windrow Turner

Tractor Pulled Windrow Turner


FARM

Bins/Bays

Forming piles in large bins and turning them periodically, usually from one bin to the other.

Aerated Static Pile (ASP)

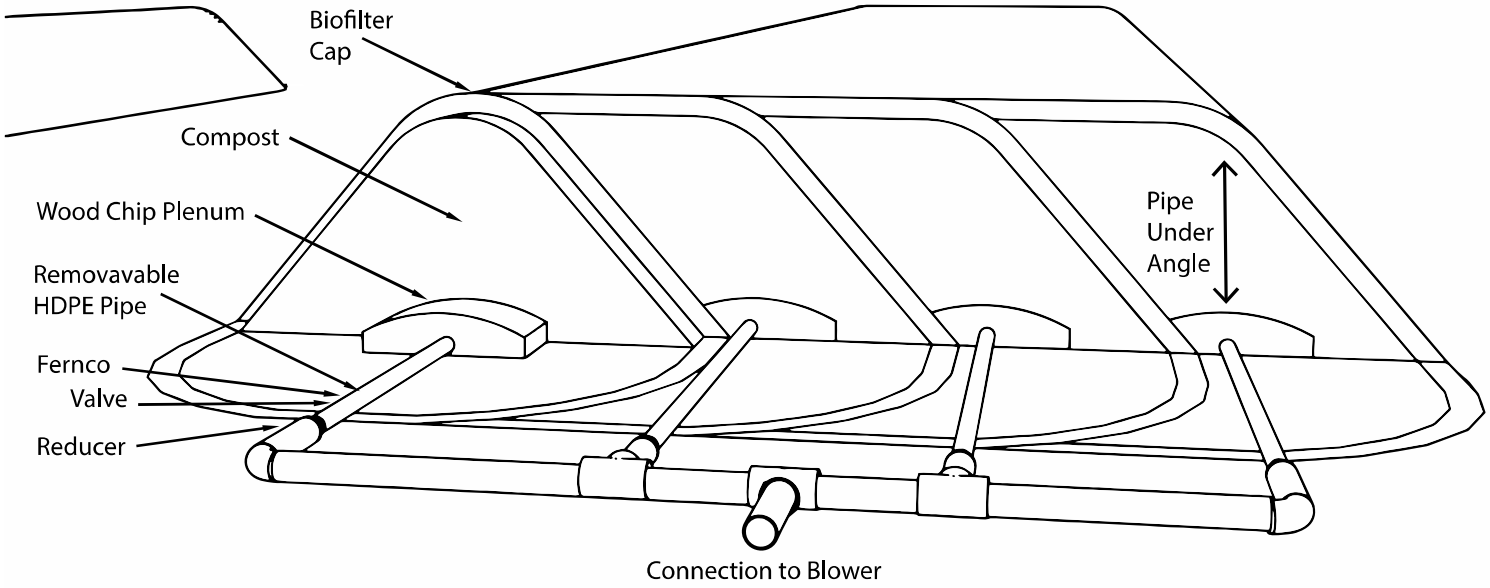
*Also known as **"forced aeration"**, this involves the formation of piles over perforated aeration-channels or ducts that push or pull air through the material in a controlled manner with blowers.*

Aerated Static Pile (ASP)

Positive Aeration is when air is pushed through the composting material

Negative Aeration is when air is pulled through the composting material

Extended ASP
(EASP) Configuration



(McSweeney, *Community-Scale Composting Systems*, 2019)

IN-VESSEL (CONTAINERIZED)

IN-VESSEL (DRUM)

Auger turned

Auger turned

North Country School

(Lake Placid, NY)

Vermicomposting

Worm composting is facilitated by specific species of earthworms that rapidly process organic wastes and produce worms castings.

- *Pre-composted at thermophilic temperatures*
- *Cured*

VERMICOMPOSTING

Static Pile or "Passive" Composting

Used to describe composting in an unturned pile.

THIS IS NOT RECOMMENDED WHEN HANDLING FOOD SCRAPS FROM OFF SITE AS IT DOES NOT MEET THE INTENT OF THE PATHOGEN REDUCTION STANDARD

Infrastructure Planning

Integrating Operations

- Minimize distances traveled to site
- Taking advantage of existing infrastructure
    - Improved surfaces, storage, sheds, barns, utilities, access
- Taking advantage of natural features
    - Topography, vegetation, buffer strips
- Minimize impact on prime agricultural lands

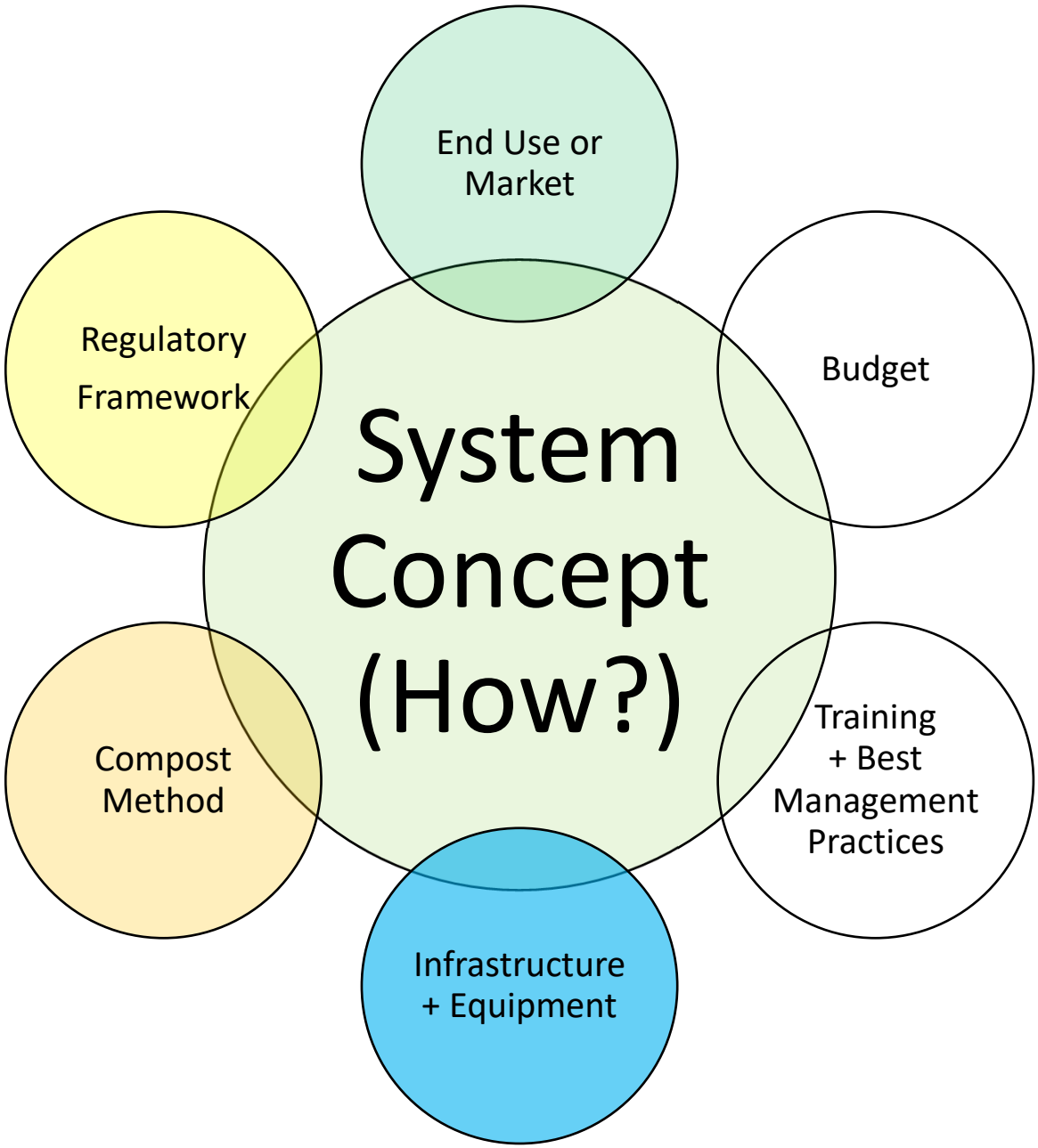
Infrastructure Planning

Site Moisture

- High and dry
- Gentle grade (2-4% ideal)
- Keep clean water clean (upslope diversion)
- Maximize moisture dispersion
  - Minimize down slope distances
  - Maximize treatment area footprint
- Utilize existing vegetation (ideally meadow)
- Observe under wet conditions (during storm)

Design Principles and Layout

- Invest in high use areas
  - Mixing areas
  - Primary composting areas
- Layout according to material flow
- Minimize distances traveled
- Leave room to work
  - Alleys, travel lanes
- Avoid cross contamination
  - Finished compost up slope from raw compost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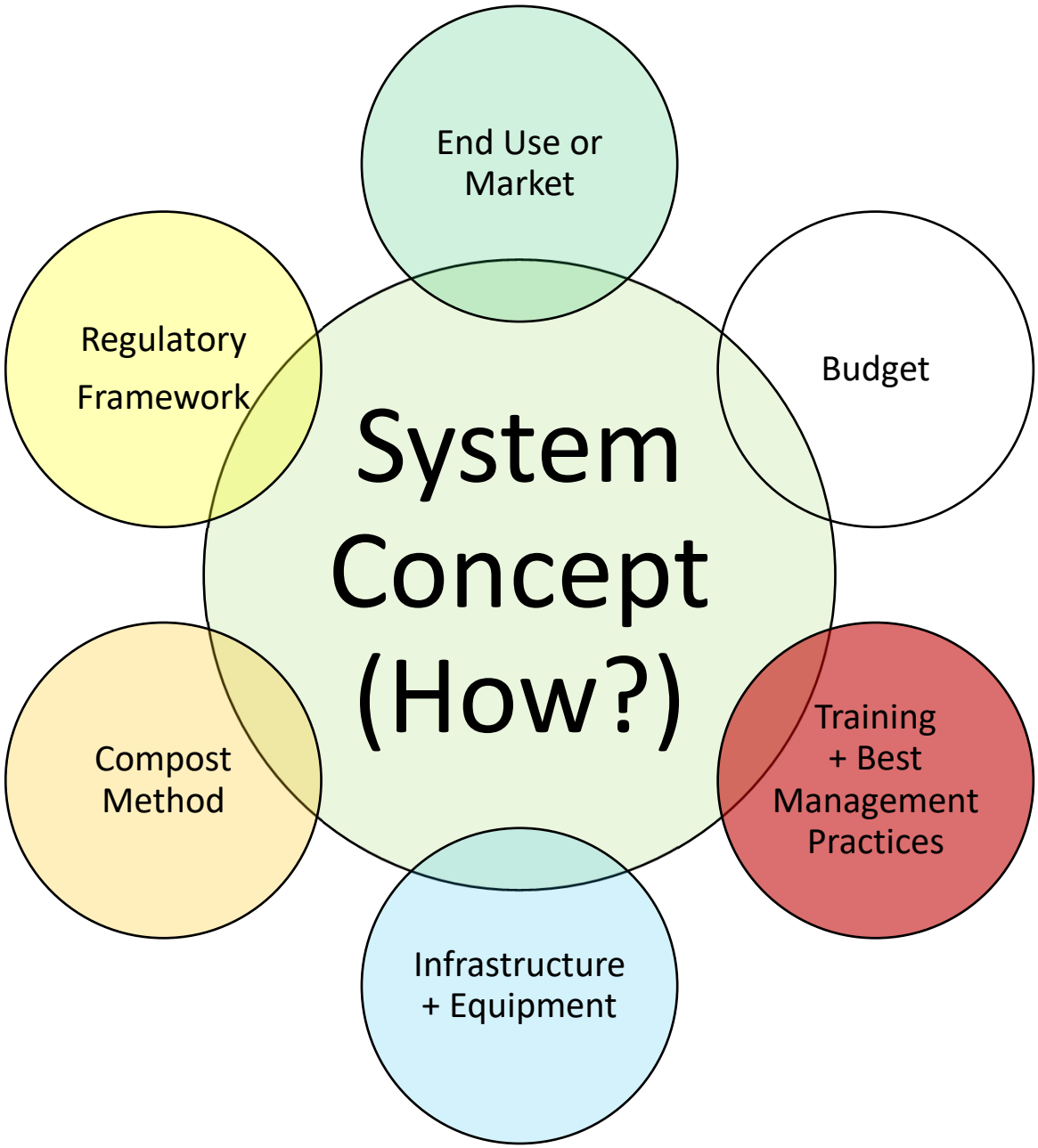
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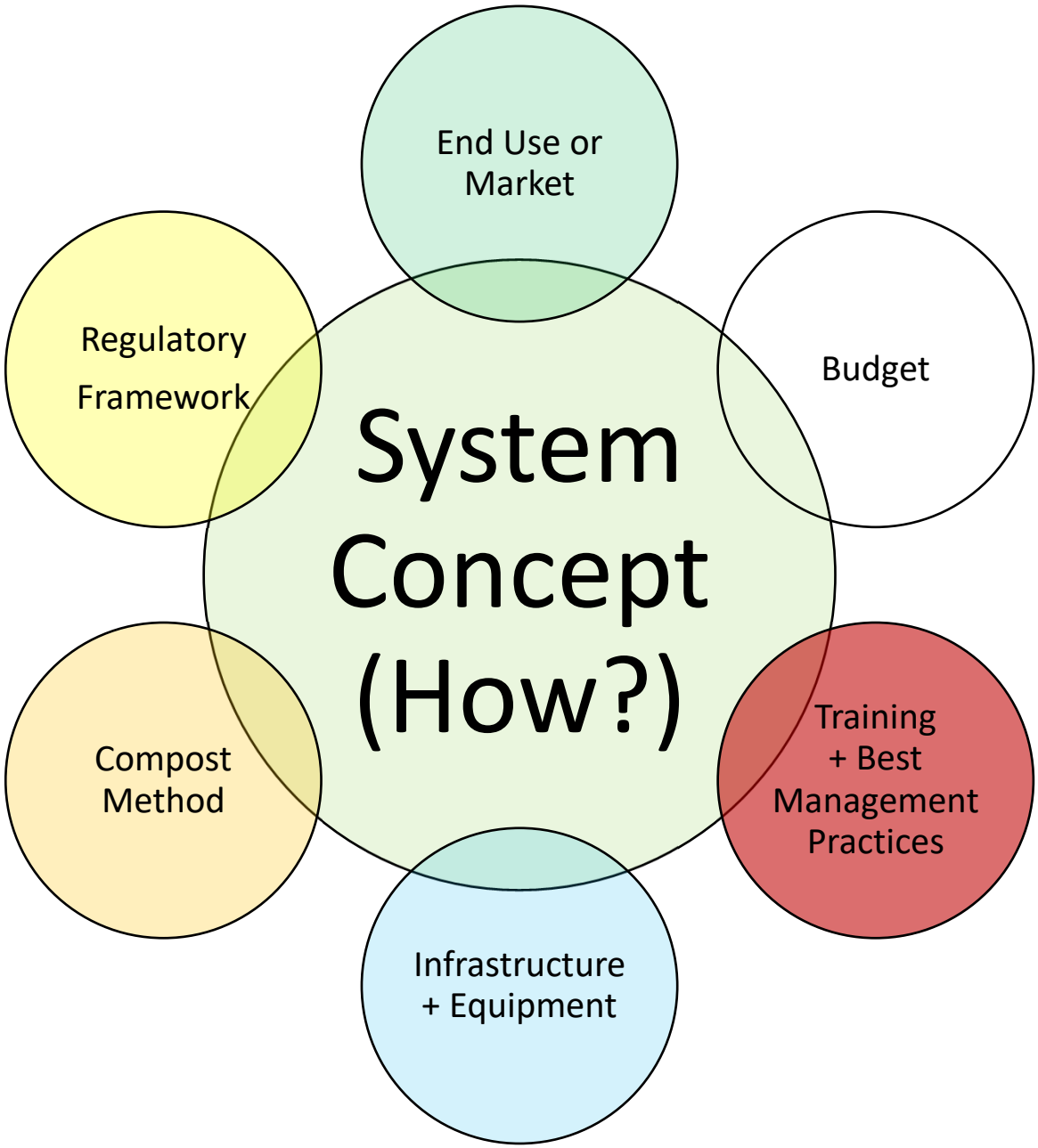
Training and Best Management Practices (BMPs)

- MA RecyclingWorks Compost Site Technical Assistance
- Facility Management Plans
- Intensive trainings
  - Maine Compost School (1 Week)
  - US Compost Council Composter Training Programs
- Safety training (OSHA, equipment)
- Time for research (plan for learning curve)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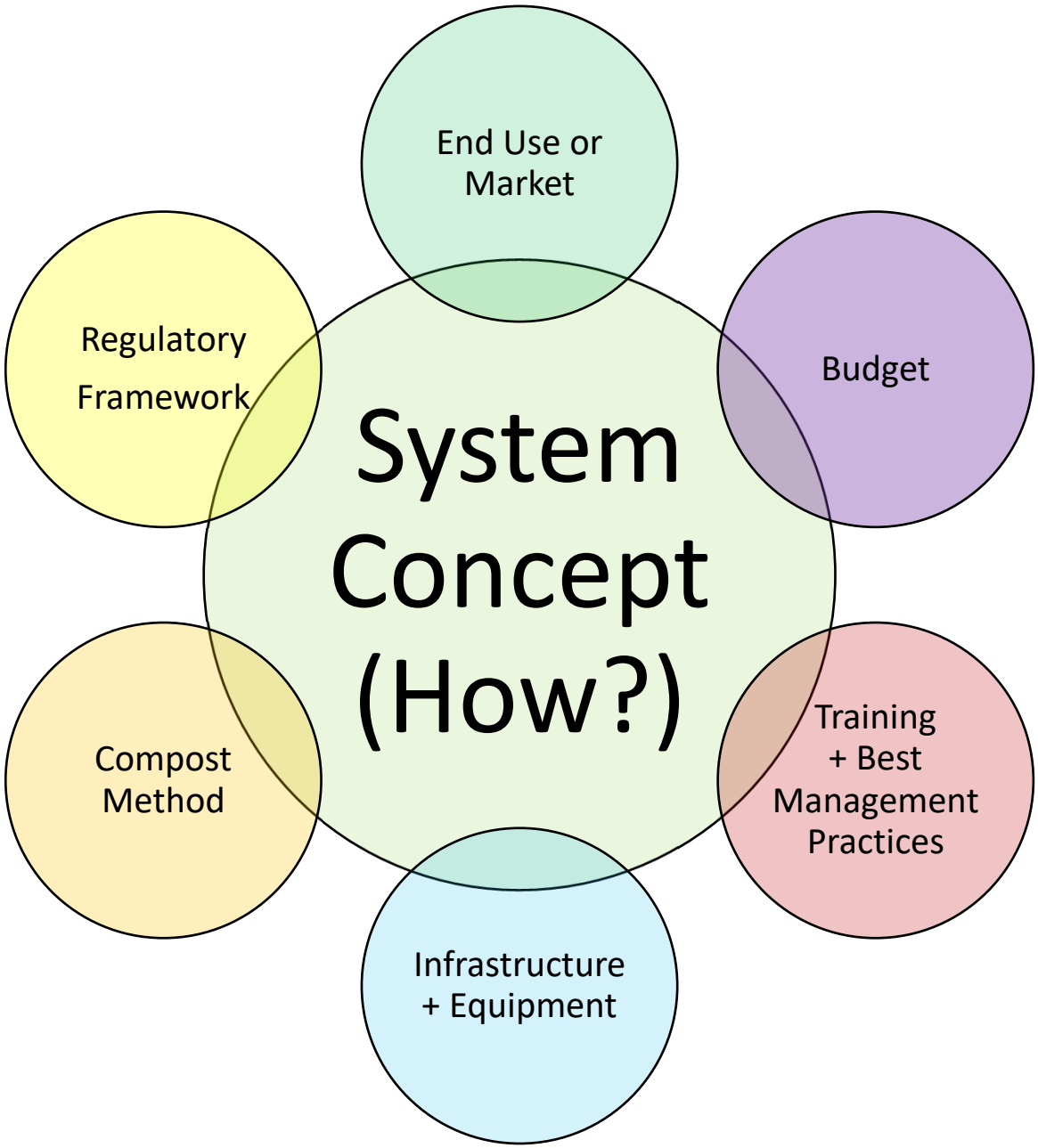
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Defining the Numbers

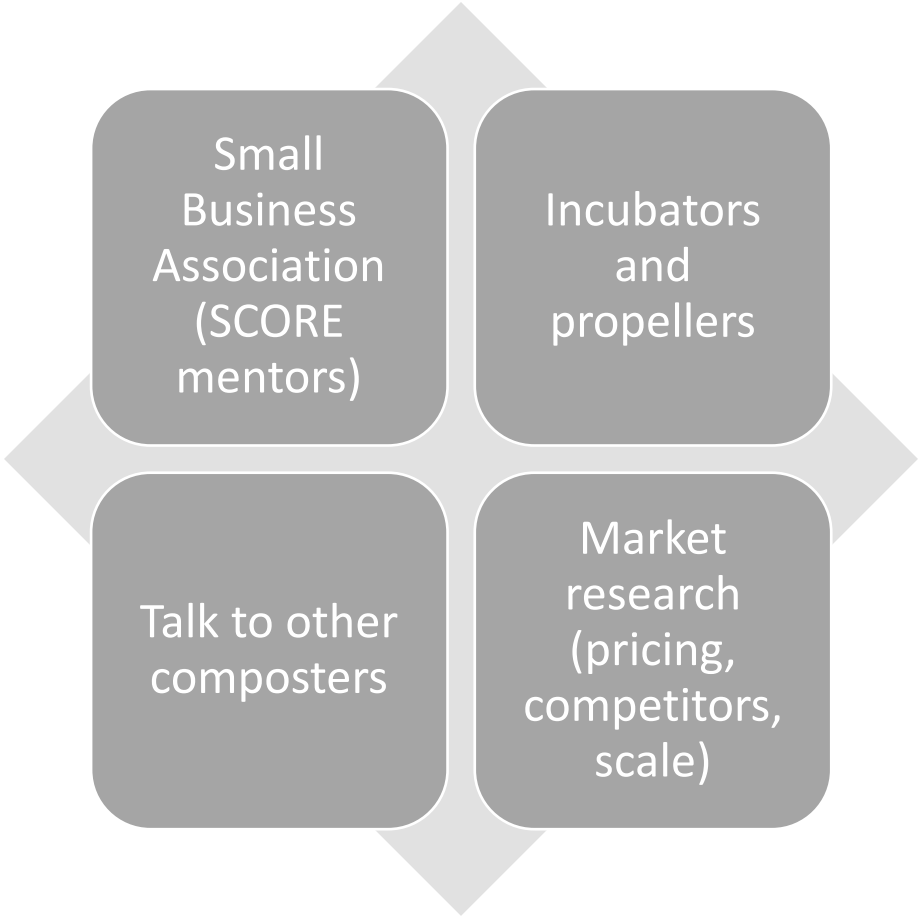
Startup Budget

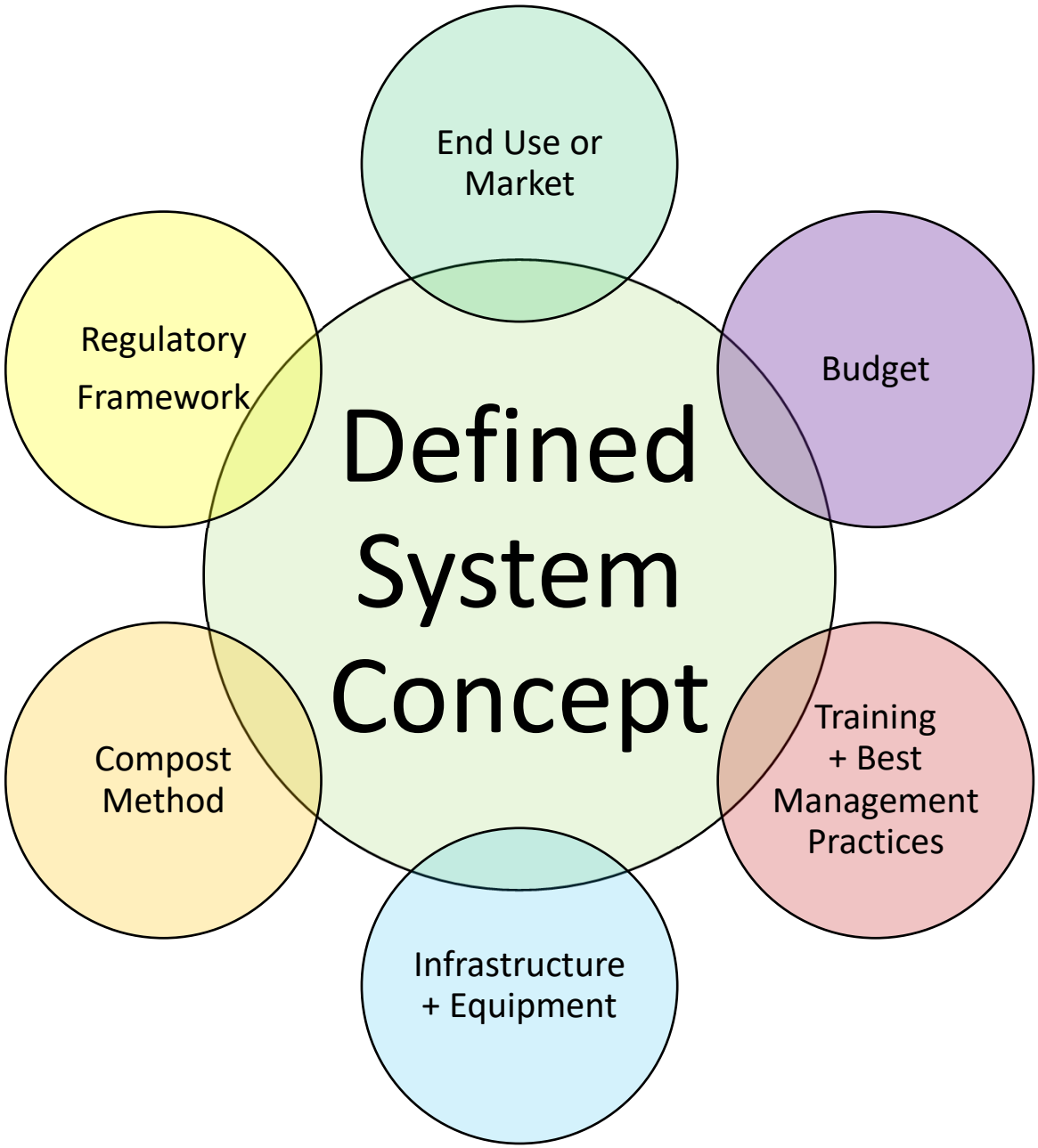
- Design and planning
- Permitting
- Site development
- Equipment
- Marketing (20% of operating)

Operational Budget

- Revenue (sales, services)
- Labor
- Land, infrastructure, & equipment
- Feedstocks
- Insurance
- Marketing

Seek out business planning help

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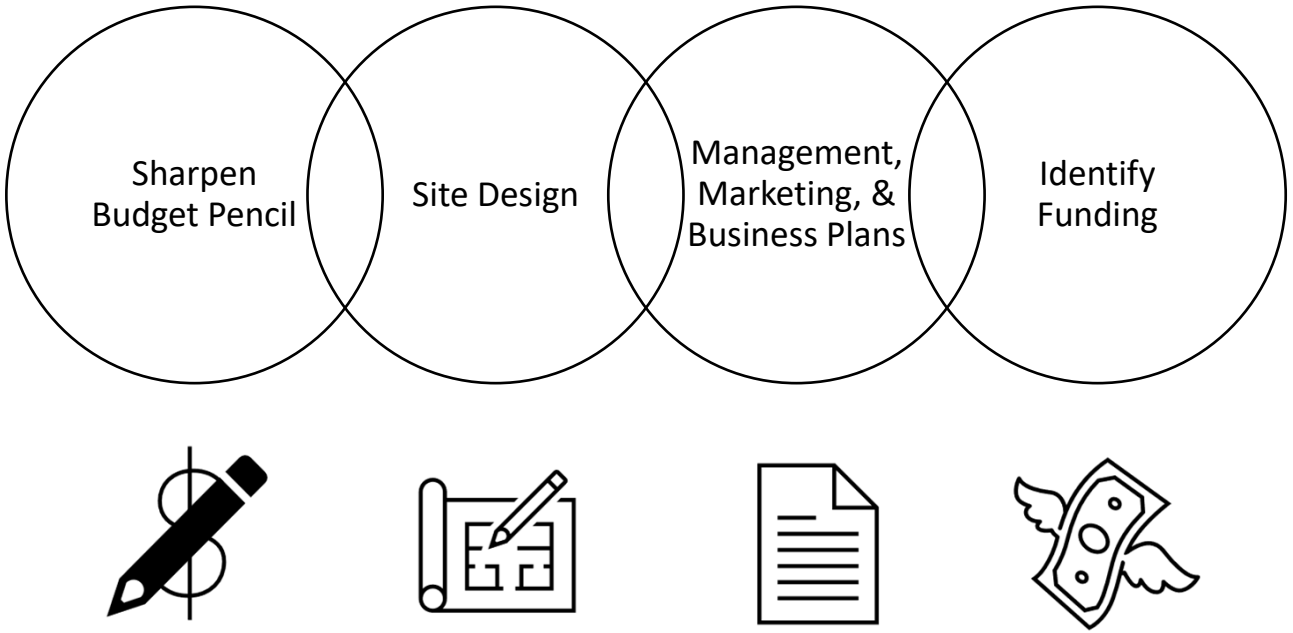
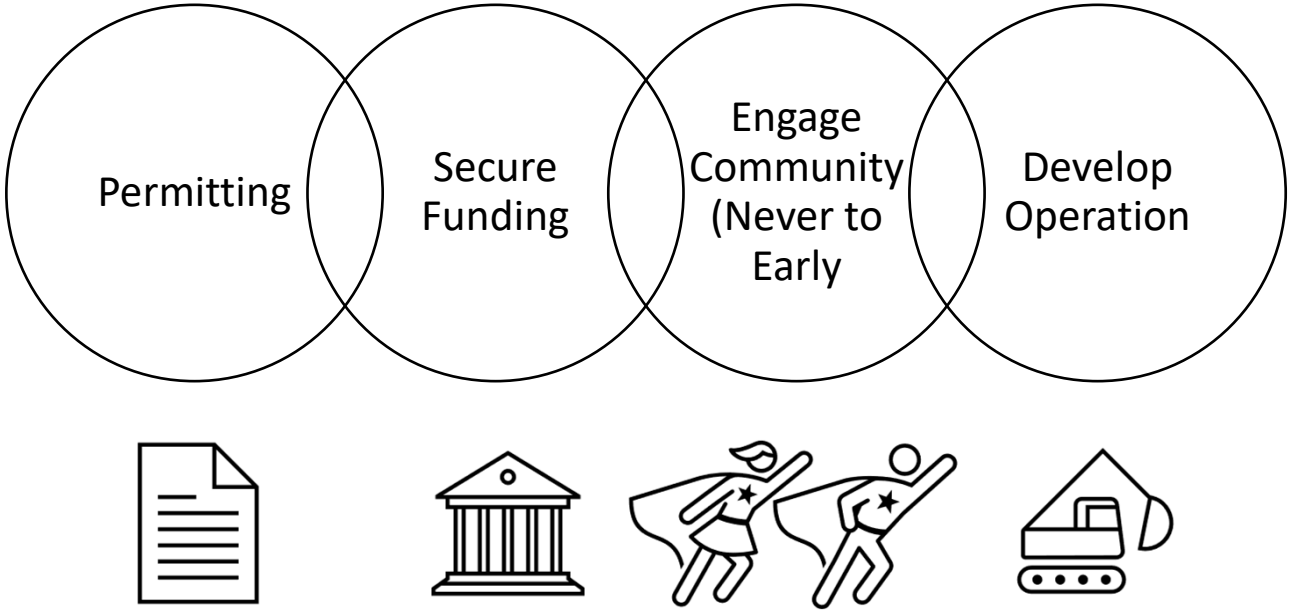
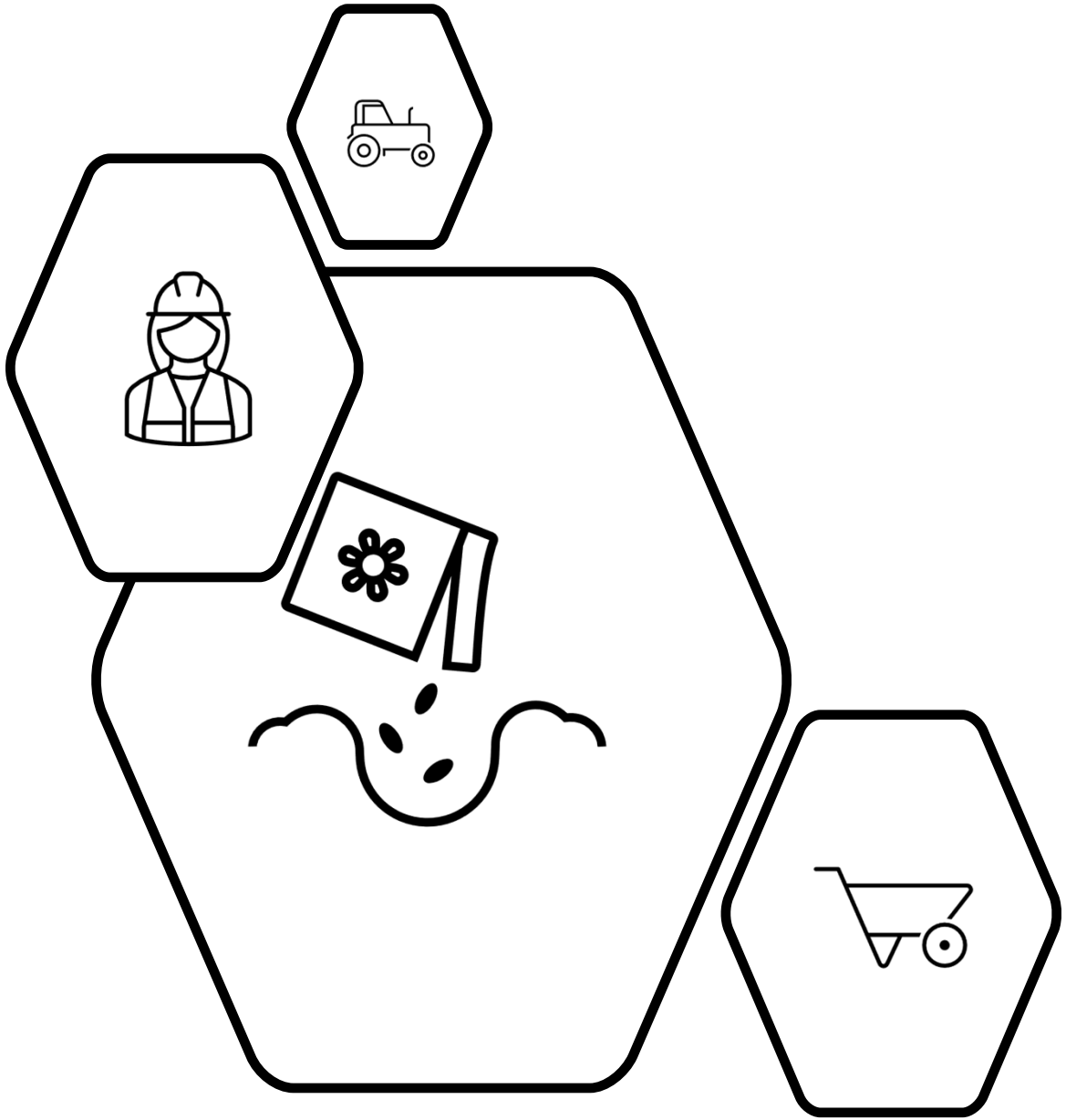
Design Phase



Develop Phase





Deploy

COMPOST UTILIZATION in HORTICULTURAL CROPPING SYSTEMS

Edited by

Peter J. Stoffella
Brian A. Kahn

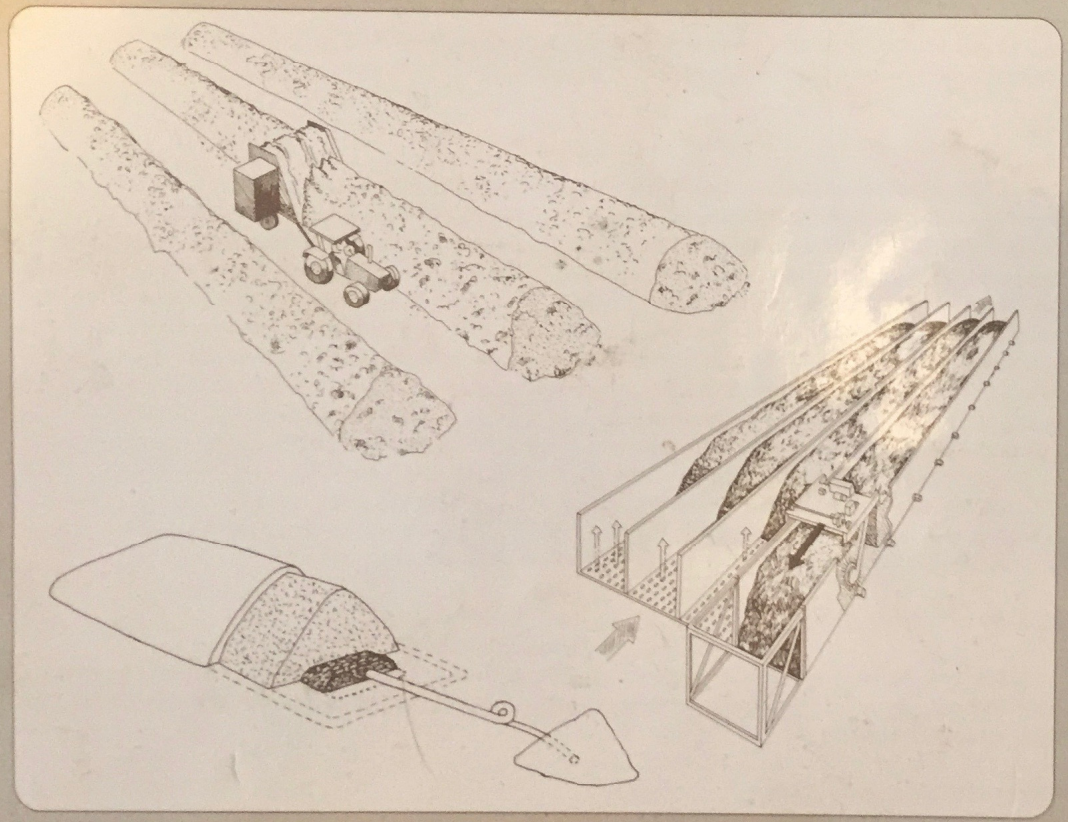
Special Indian Edition

THE SCIENCE OF COMPOSTING

Eliot Epstein

CRC PRESS

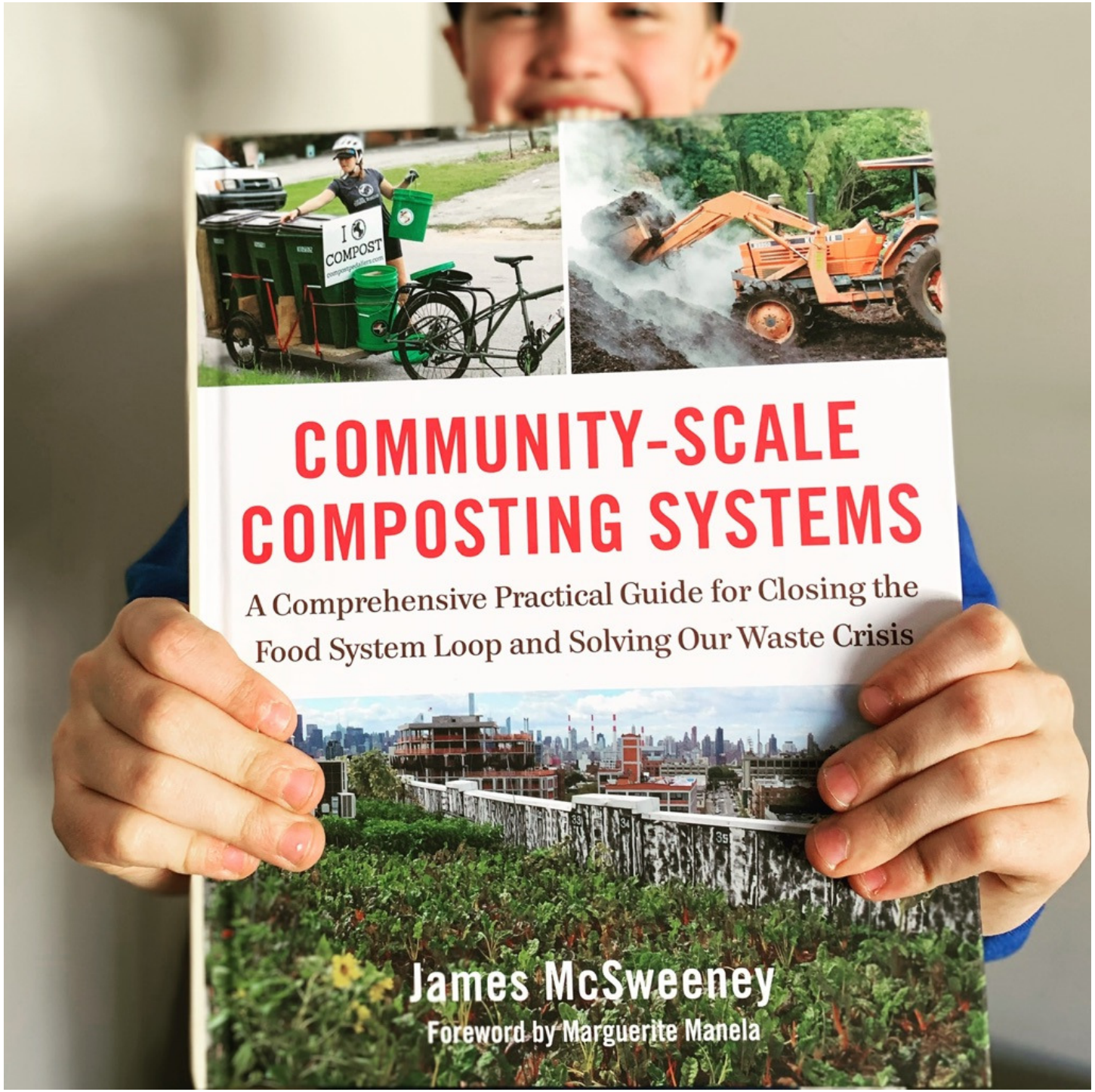
On-Farm Composting Handbook



Natural Resource, Agriculture, and Engineering Service (NRAES)

Cooperative Extension

FIELD GUIDE TO ON-FARM COMPOSTING


I COMPOST
COMMUNITY-SCALE
COMPOSTING SYSTEMS
A Comprehensive Practical Guide for Closing the
Food System Loop and Solving Our Waste Crisis
James McSweeney
Foreword by Marguerite Manela

US Composting Council®

BioCycle

Free Online Resources

- Leaf & Yard Waste Composting Guidance Document. MA DEP. http://www.mass.gov/eea/docs/dep/recycle/reduce/06-thru-l/leafguid.pdf
- Guide to Agricultural Composting. MDAR. *2010http://www.mass.gov/eea/docs/agr/programs/compostguidetoagcomposting2011.pdf*
- Vermont Agency of Natural Resources Composter Resources – Developed by CTS. Site Planning & Management, School Composting, School Curriculums http://www.anr.state.vt.us/dec/wastediv/compost/resources.htm
- Online Materials Management & Tracking Tool http://goo.gl/7dqsZh

Free Online Resources

- RecyclingWorks Source-Separation BMPs: http://www.recyclingworksma.com/local-health-department-guidance-for-commercial-food-waste-separation/
- MassDEP: http://www.mass.gov/eea/agencies/massdep/recycle/reduce/composting-and-organics.html
- Institute for Local Self-Reliance: https://ilsr.org
  - Yes! In My Backyard: A Home Composting Guide for Local Government
  - Growing Local Fertility: A Guide to Community Composting
  - Pay Dirt
- The Composting Collaborative: https://www.compostingcollaborative.org

Free Webinars and How-To Videos

- Institute for Local Self-Reliance: https://ilsr.org/tag/webinar/
- The Composting Collaborative: https://www.compostingcollaborative.org/resource-category/webinar/
- Highfields Center for Composting Video Series – Recipe Development, Pile Monitoring & Turning, School Training – https://vimeo.com/highfieldscomposting