



A SOLUTION FOR BOOMING CITIES

LEVERAGING AUTODESK SOFTWARE AND EXPERTISE TO DESIGN
INNOVATIVE NEW PROCESSES THAT SOLVE BIG URBAN CHALLENGES

Melody Mitugo – Process Engineer
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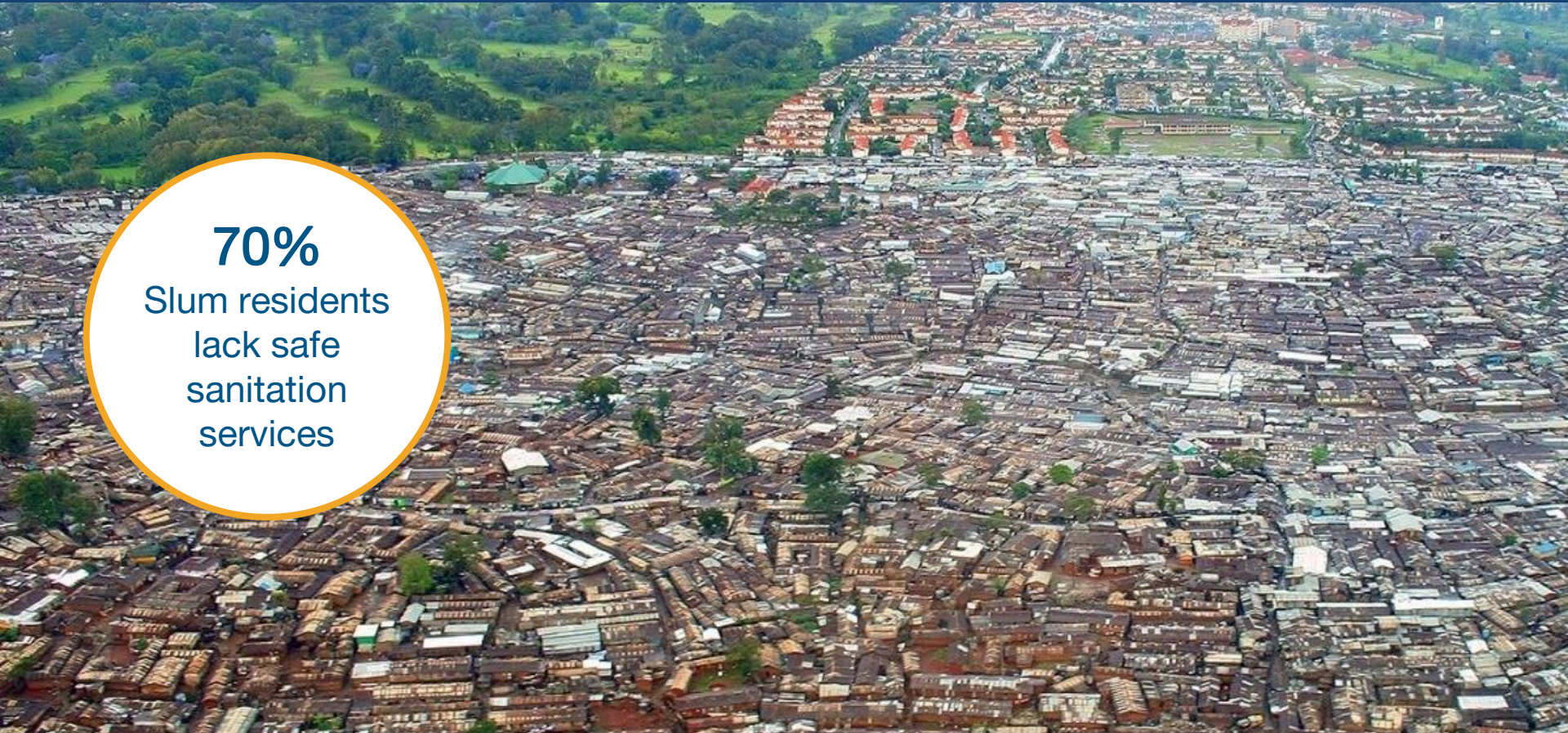
Cities are growing rapidly. Slum populations will increase from 1 billion citizens today to more than 3 billion citizens by 2050.



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1M

Sanitation
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Slum residents
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Sanitation
related deaths
every year

\$260B

Lost globally
each year in
economic
productivity

In Kenya, 8 million people live in slums where waste is improperly managed.



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66%
of Nairobi's
sanitation
waste is not
treated



Nairobi produces 1 million tons of solid waste per year and only 50% is collected.



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>2,000 T
of organic
waste is
generated in
Nairobi daily



Kenya is at crisis levels in terms of **declining agricultural productivity.**



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80%
of Kenyans
rely on
agriculture for
a living



What do these topics have in common?

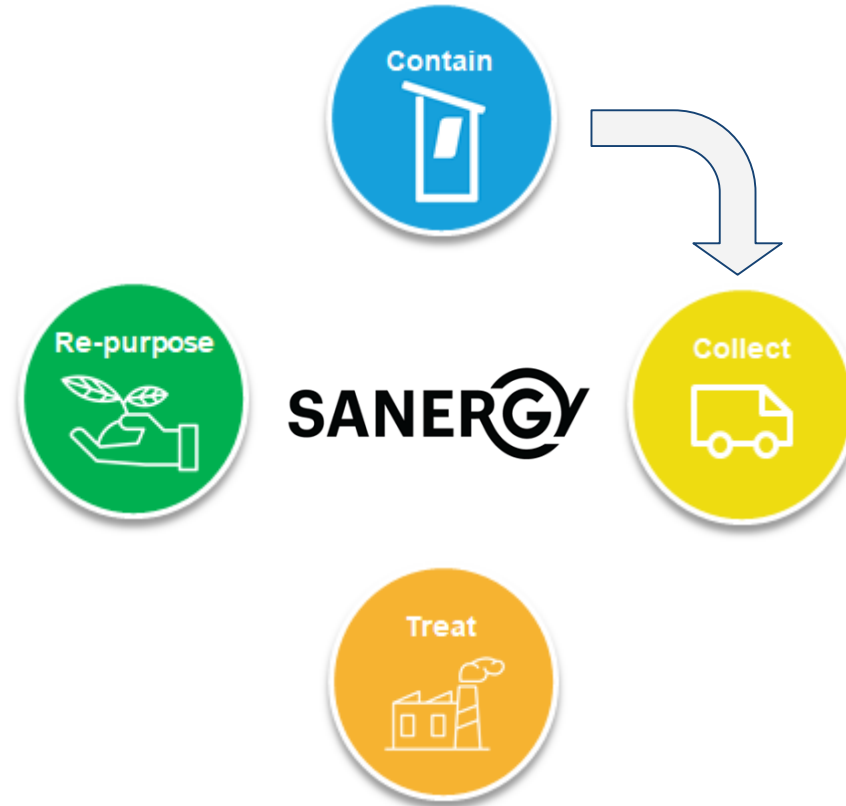
A word cloud featuring various topics related to environmental and social issues in Kenya. The words are arranged in a circular pattern, with some words appearing more frequently or in larger fonts than others. The colors of the words range from dark blue to light green.

Health
Nairobi
Soil
Toilets
Sanitation
Cities
Agriculture
Feces
Waste
Rivers
Crisis
GHG
Climate
Feed
Children
Fertilizer
Pollution
Landfills
Environment
Kenya
Slums
Productivity

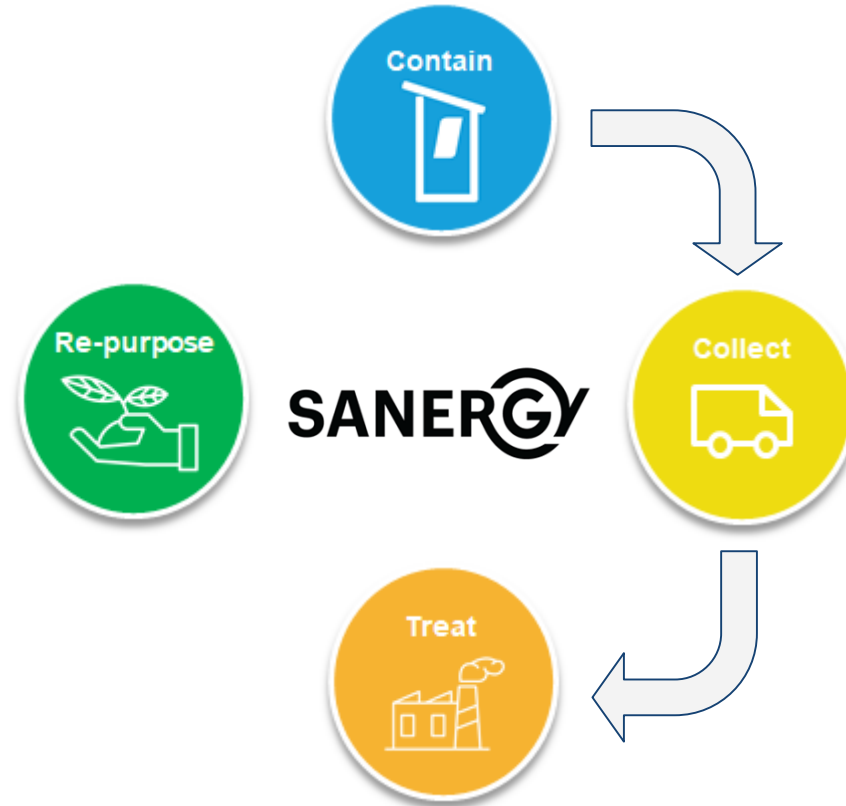
Sanergy applies a **circular economy, zero-waste approach** to solve waste management challenges for emerging cities



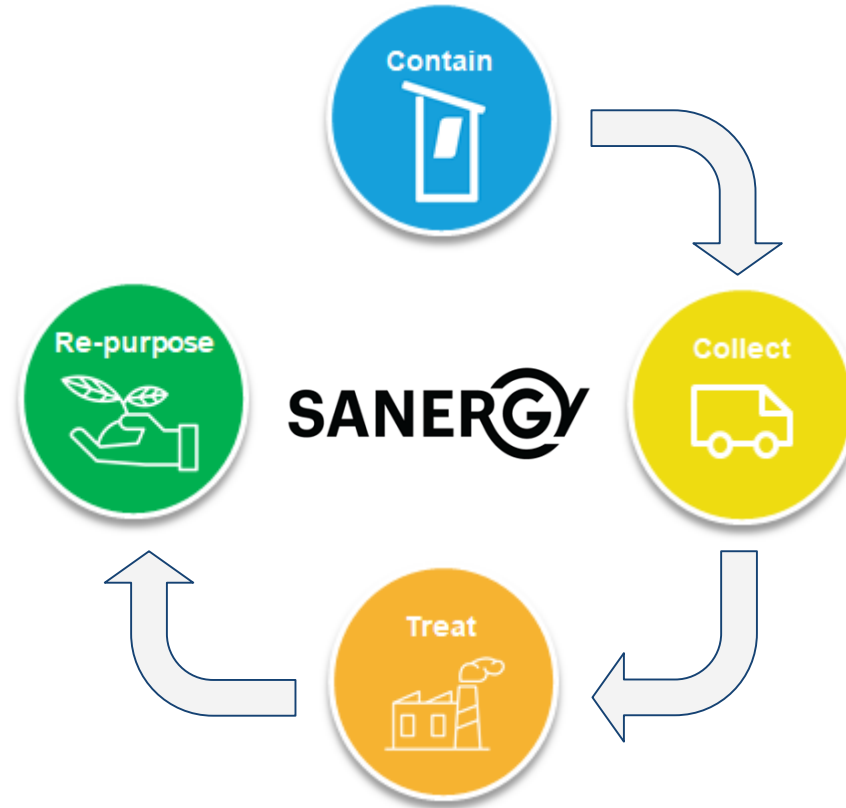
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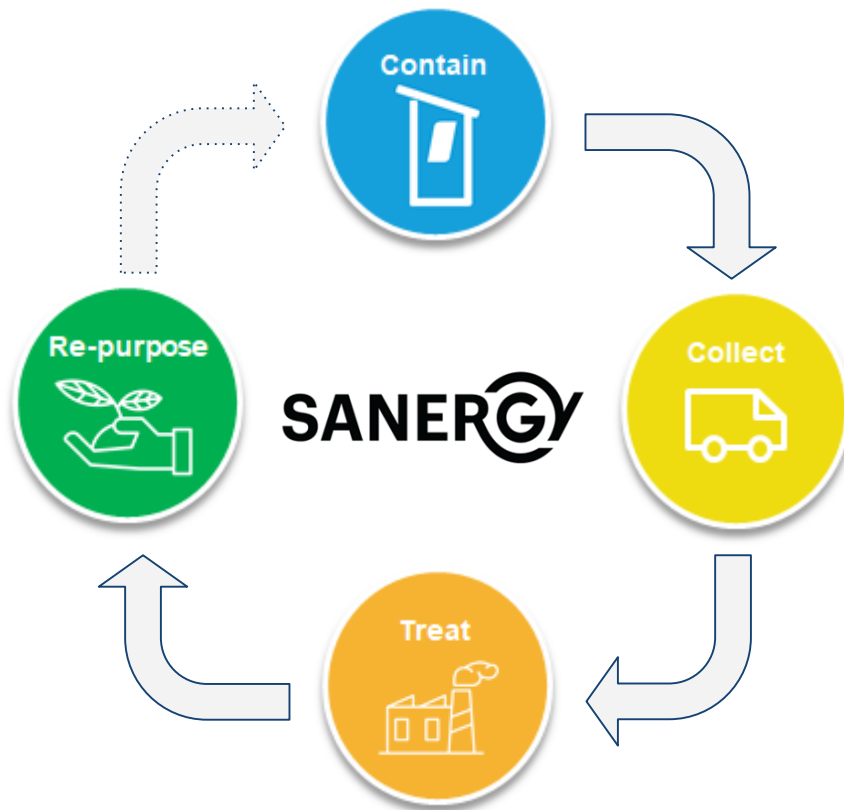
Sanergy applies a circular economy, zero-waste approach to solve waste management challenges for emerging cities

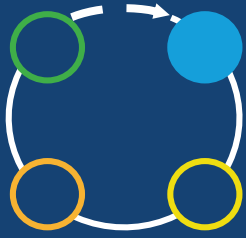


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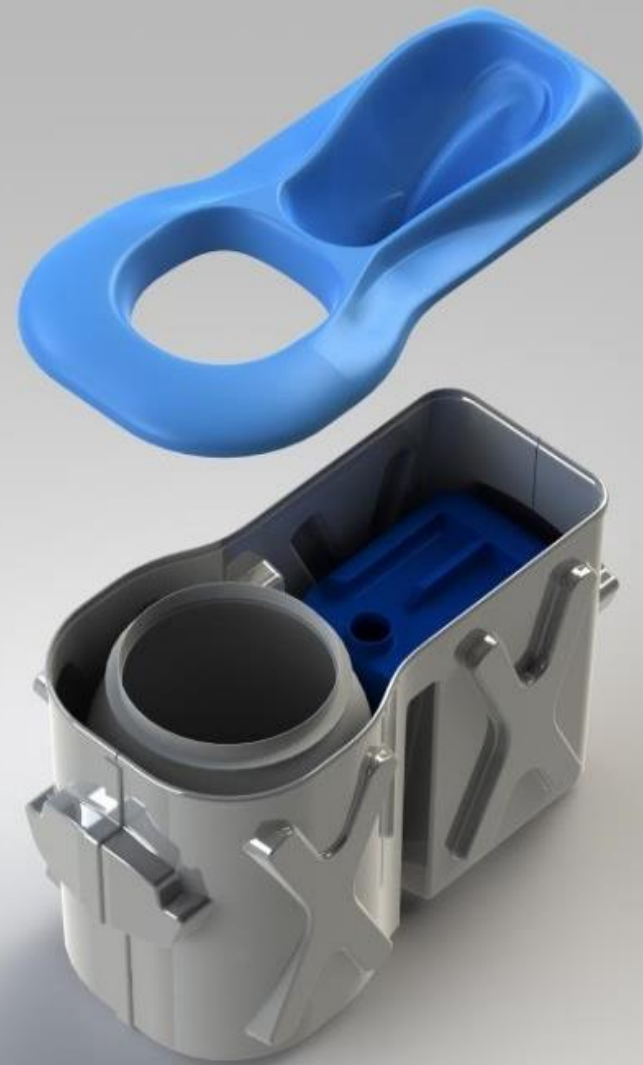


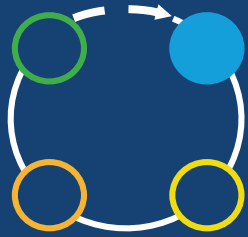
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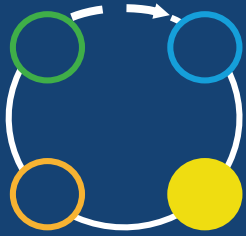
We offer non-sewered eco-friendly sanitation solutions to safely contain the waste.





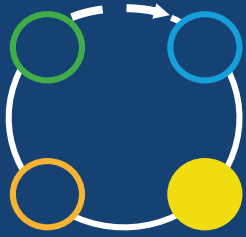
Residents
invest in our
sanitation
solutions via
a subscription
model.





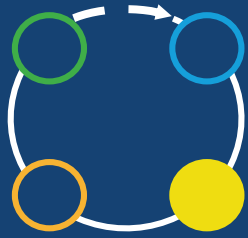
100% of the
waste is
professionally
collected
through our
logistics
services.





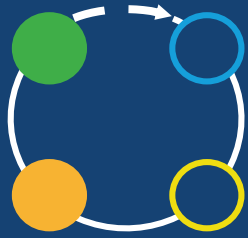
We also
collect organic
waste from
municipal and
agricultural
sources across
Nairobi.





We transport
all of the
waste to a
central
processing
plant.





We treat
and upcycle
100% of the
waste into
agricultural
inputs.







3,000

Toilets open 24/7





3,000

Toilets open 24/7

120,000

People served





3,000

Toilets open 24/7

120,000

People served

12,000 tons

Of waste treated
annually



The New Technology & Commercialization Team is in charge of developing and scaling processes to recycle the waste into valuable end-products.



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The Poop Fairies
Changing poop into \$

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Black Soldier Flies technology to process sanitation and organic waste.



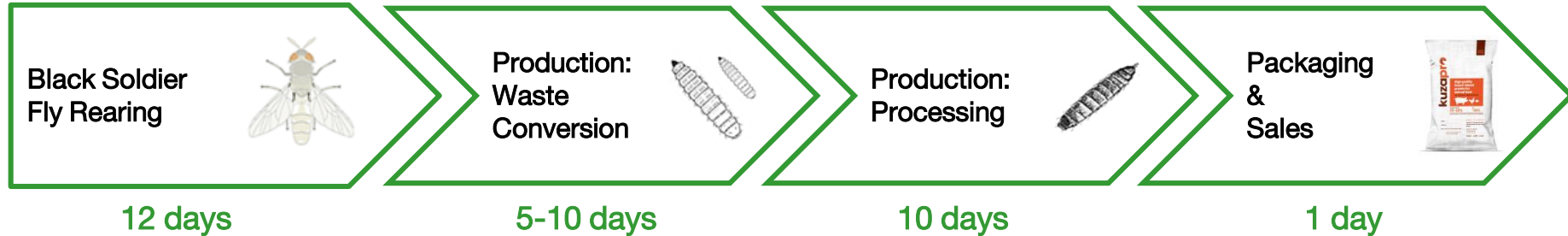
Black Soldier Flies technology to process sanitation and organic waste.



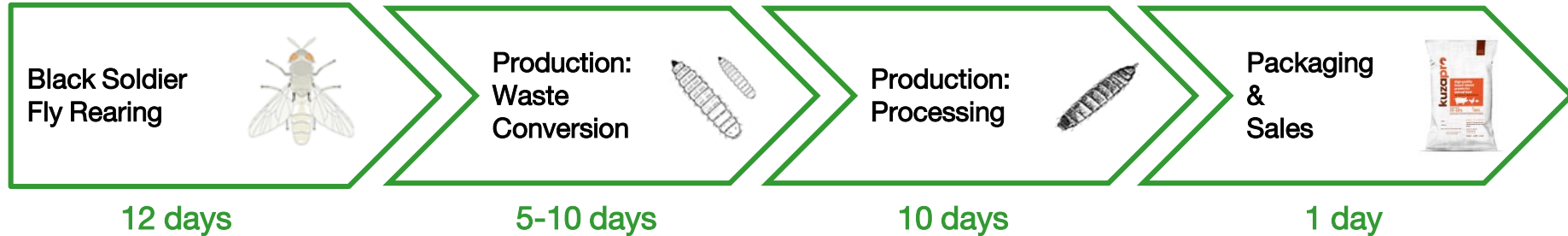
Why Black Soldier Flies?

<https://youtu.be/jWEM6ohctwU>

Black Soldier Fly Larvae efficiently **reduce organic waste matter** and are harvested into safe protein for animal feed.



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Black Soldier
Fly Rearing



12 days

Production:
Waste
Conversion



5-10 days

Production:
Processing



10 days

Packaging
&
Sales



1 day

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Our 2020 goal is to build a large-scale factory able to treat and convert 70,000 T of waste annually.



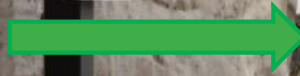
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300 T
of insect-
based
protein
monthly

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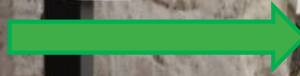
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Profitability



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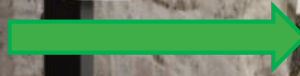
Profitability

Value of waste



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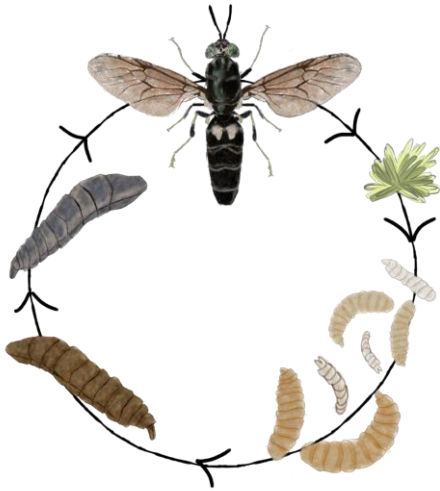
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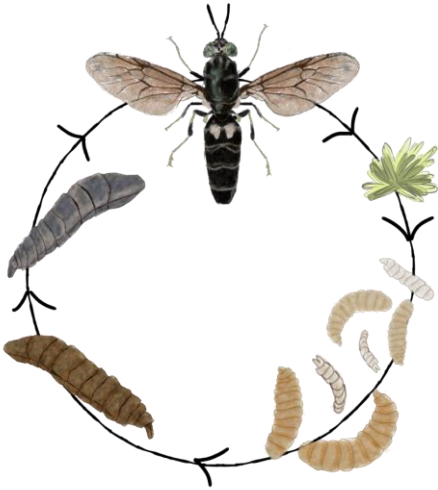
Solution for the waste crisis

Sanergy's **main constraints** to build the largest insect-rearing facility for waste management in East Africa.

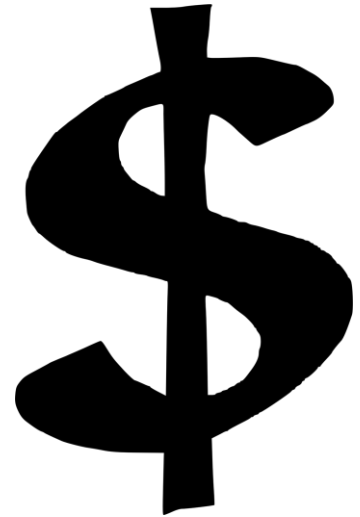
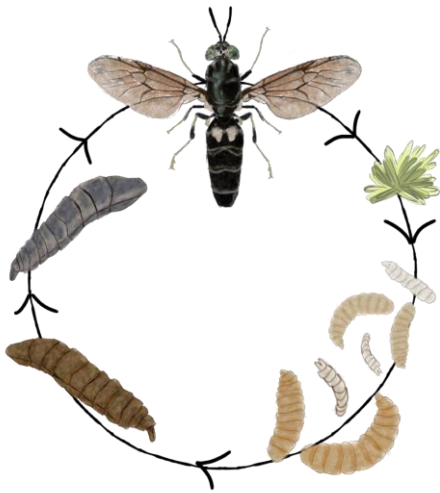
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Sanergy's R&D and scaling processes supported by the



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A AUTOCAD®

F FUSION 360

I INVENTOR

B BIM 360

Access to Autodesk
Software

Sanergy's R&D and scaling processes supported by the



Access to Autodesk
Software



Autodesk Student Expert
Impact Internship

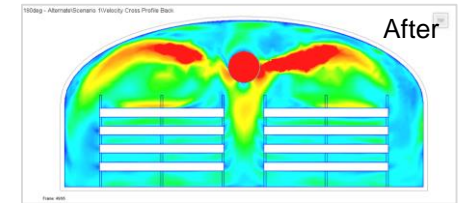
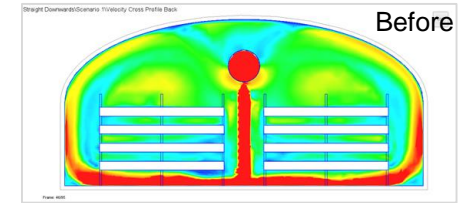
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Access to Autodesk
Software



Autodesk Student Expert
Impact Internship

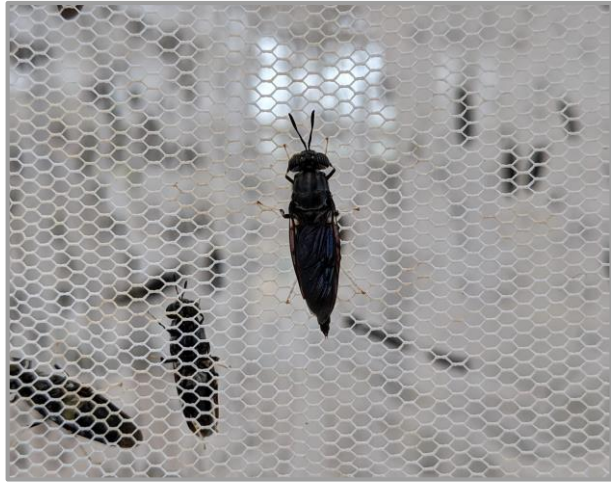


Team-Based Pro Bono
Consulting

Case study: Optimization of the rearing of adult Black Soldier Flies



Case study: Optimization of the rearing of adult Black Soldier Flies



What are the best processes and equipment to optimize egg yields at scale?

First cage - Off-the-shelf, dome shape cage



PROS

- Readily available
- Modular
- Sturdy
- Doesn't require a frame

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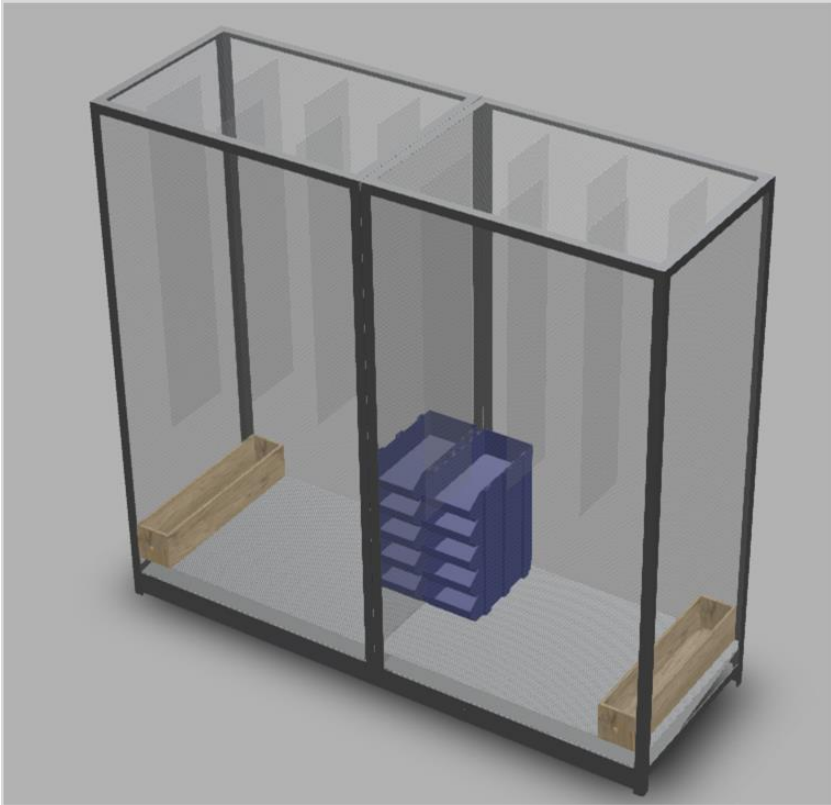
PROS

- Readily available
- Modular
- Sturdy
- Doesn't require a frame

CONS

- Short heights limits flying space
- Labour intensive

First significant design change - Tall cage



PROS

- Cost-effective
- Adequate space for flying and mating
- Plenty of light

First significant design change - Tall cage



PROS

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- Adequate space for flying and mating
- Plenty of light

CONS

- Rearing process not optimized

Final cage design - Develop the **2-step process** to optimize rearing of flies.

Final cage design - Develop the **2-step process** to optimize rearing of flies.

Dark Cage for Fly Eclosion



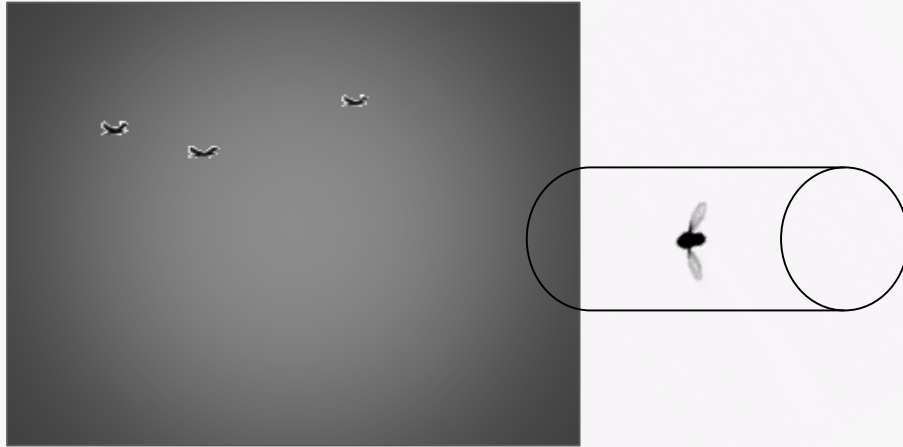
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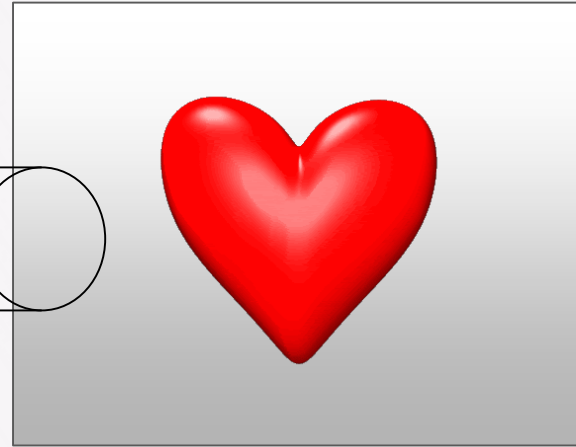


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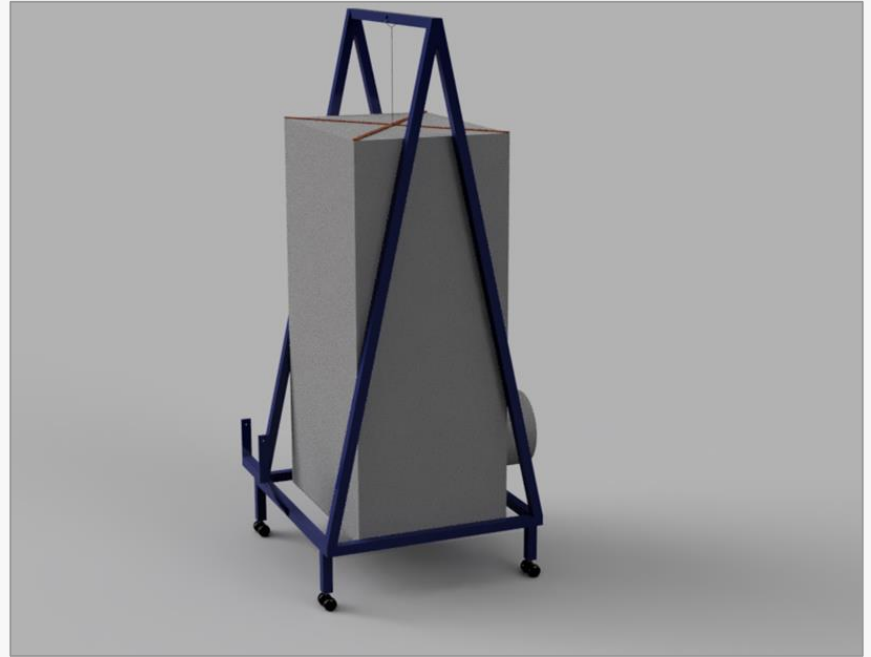
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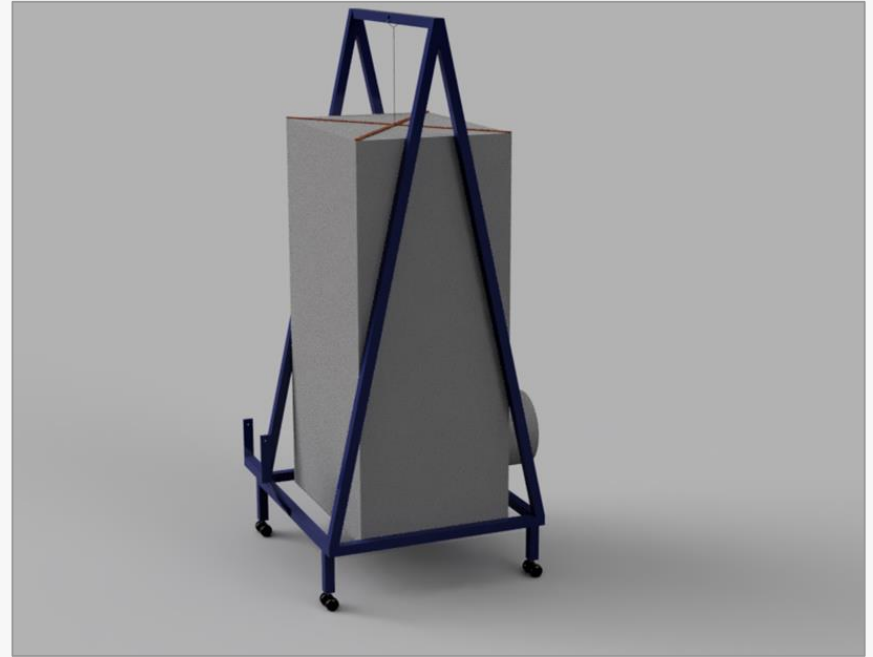
Love Cage for Mating



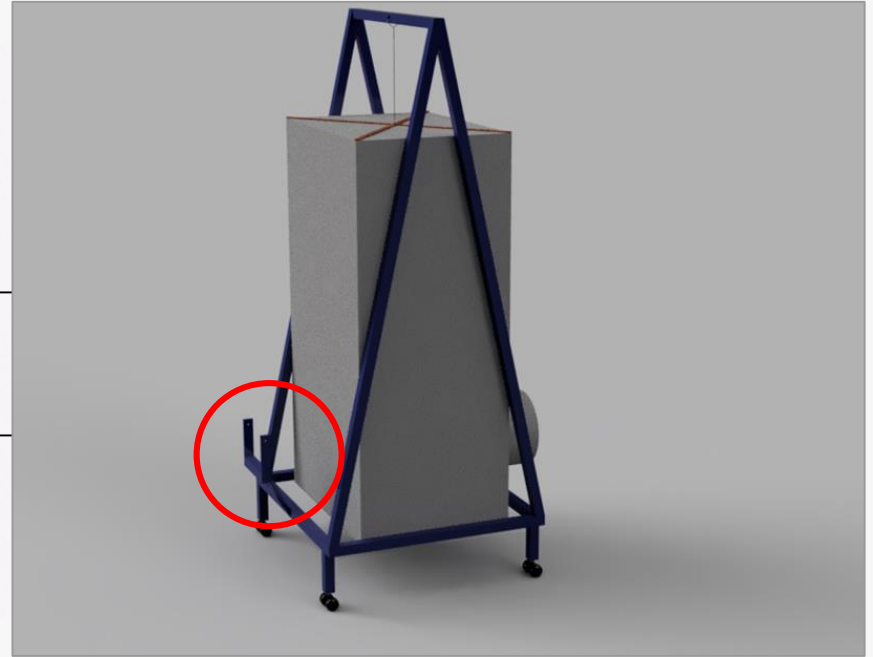
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Optimal **climate conditions** to boost Black Soldier Flies' love.



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250%
Higher
egg
production



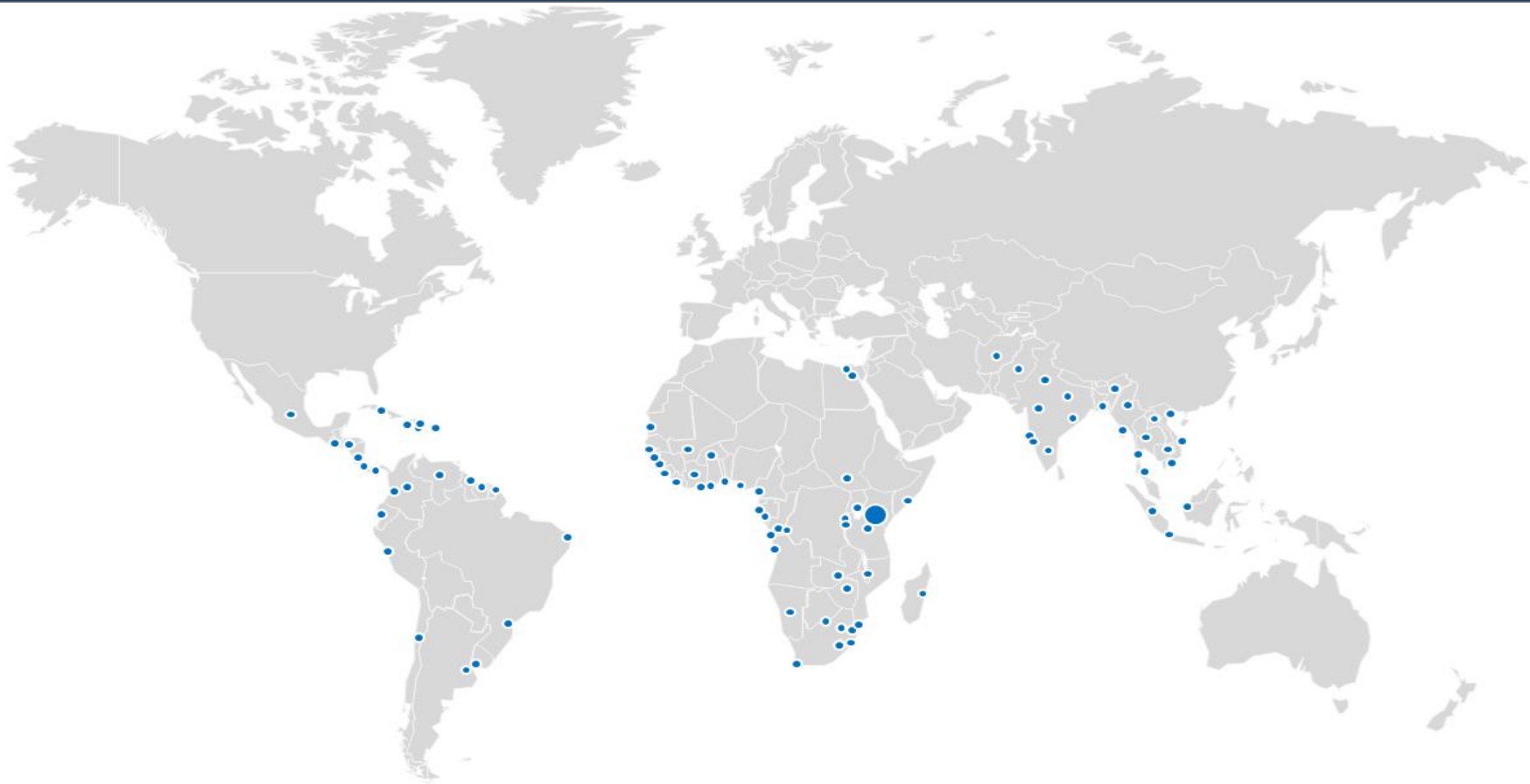
Optimal climate conditions to boost Black Soldier Flies' love.

250%
Higher
egg
production

70%
Less
space
required



The Future: Leverage Autodesk's expertise to design solutions that can serve 1,000 emerging cities with the same challenges.



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An aerial photograph of a city skyline, likely Accra, Ghana. In the foreground, there is a large green park with a winding path and a pond. Several people are visible on the path and in the pond. The background features a dense cluster of modern high-rise buildings under a bright blue sky with scattered white clouds.

Asante!

Any questions?

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