

# Engineering Comes Home: Co-designing nexus infrastructure from the bottom-up

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# Engineering Comes Home

- Water-energy-food nexus
- Co-designing infrastructure
- Tools for designers



## The nexus

- Water-energy-food
- Supply-side interdependencies
- Demand-side lived experience
- Start from the community needs and design infrastructure outward

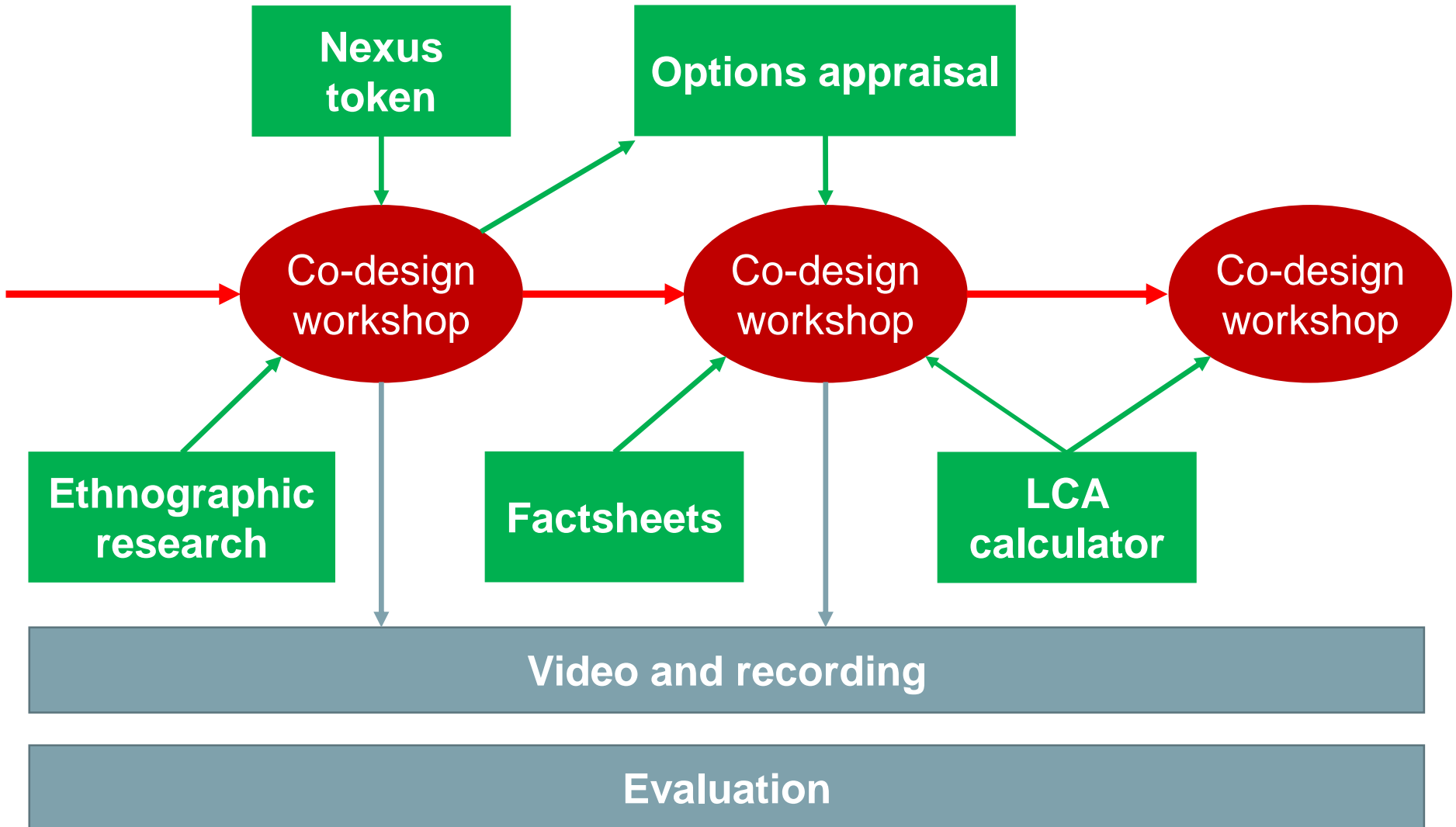


## Engineering Comes Home

- Located in South London
- 123 flats
- Combination of leaseholders and tenants



# Co-design: overall approach





# Co-design workshop 1

- Value elicitation
- Ideas for issues to work on
- Story-boards using tokens, whiteboards and photos
- Selection of key priorities for further development



# After the workshop

- Long list of technology ideas
- Shortlisted based on feasibility and desirability
  - Womery
  - Rubbish compactor
  - Rainwater
  - Food sharing
  - Data and information



# Factsheets

## Wormery

### What is it?

Wormery composting is a method of turning kitchen waste and small amounts of garden waste into nutrient-rich compost and a concentrated liquid fertiliser.

### How would it work?

You can buy a wormery compost bin or make your own. A wormery can take up to 3.5kg food waste per week and produce compost in 3 months.

### Keeping your wormery healthy

Once you have a wormery, three important things you need to do to keep it healthy:

- **Choose sheltered site** Worms do best in a constant temperature, not too hot or too cold. A shady spot is best (15 – 25°C is ideal).
- **Keep it moist** A healthy worm bin should be damp (like a squeezed out flannel) not dry or wet. Water lightly if it gets too dry. Add more paper and card if too wet.
- **Feed it well** Feeding is where things can most easily go wrong when you're starting out. Here are the four golden rules:

- **Little at first.** When starting your wormery, feed it carefully and patiently while the worms breed. It's better to add too little food than too much.
- **Add 20-30% 'brown matter'** - that's cardboard, newspaper or wood chips.
- **Don't add any one ingredient in large quantities**
- **Feed it a varied diet.** This will help create a healthy wormery and a rich worm compost full of nutrients and trace elements.

### What are the costs and benefits?

100L wormery composter costs around £75, less if you make one yourself. (you can use recycled plastic box and buy worms (about £15 for a 100L wormery)).

Wormery composters do not take much space, do not smell and makes compost faster than conventional composters.



### More tips for a healthy wormery

When you lift the lid of your wormery, can you see a few worms scouting round the surface? If yes, it needs feeding. If not, wait until you do. Usually you'll find they need feeding once or twice a week.

The wormery should smell sweet and healthy. An unpleasant smell is a sign that something is wrong. The two most common causes of a bad smell are:

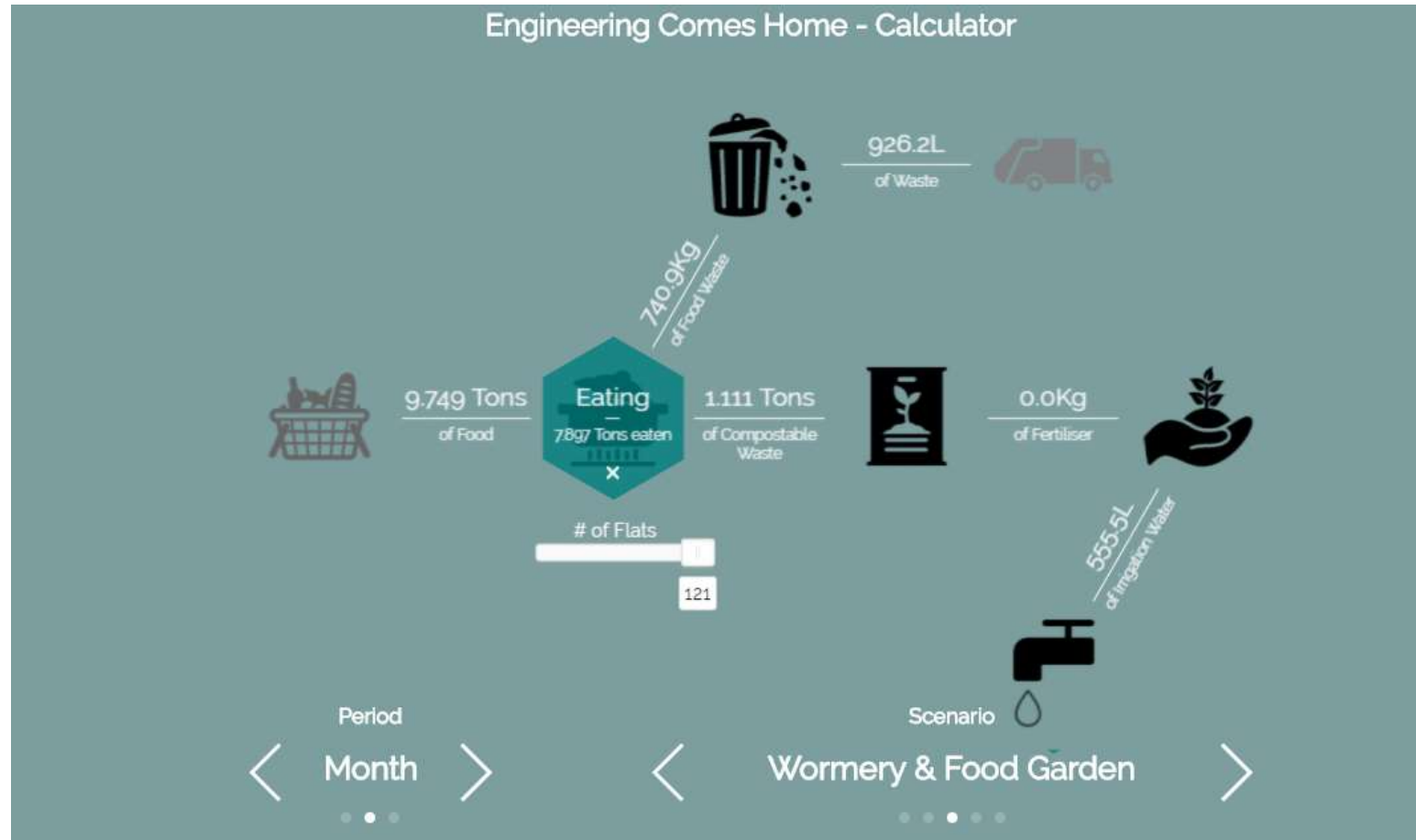
- overfeeding leading to food rotting
- adding too much food waste and too little "brown matter".

If you are running a wormery as a group or community, you'll want to think about ways to let each other know who has done what and when, so that the worms stay happy and healthy.





# LCA calculator



<https://calculator.ilab.org/>

## Co-design workshop 2

- Analysis of options
  - Fact sheets
  - Calculator
  - Discussion
- Group selection of preferred technology
  - Rainwater harvesting



# Smart rainwater harvesting

- OTA Analytics
- Future Cities Catapult
- Optimise surface water storage, as well as supply
- Prototype installed for resident use and demonstration



## Co-design workshop 3

- Detailed introduction to rainwater and combined sewer overflows
- Mapping of downpipes and potential locations
- RWH Calculator
- Worksheet to size and locate new tanks





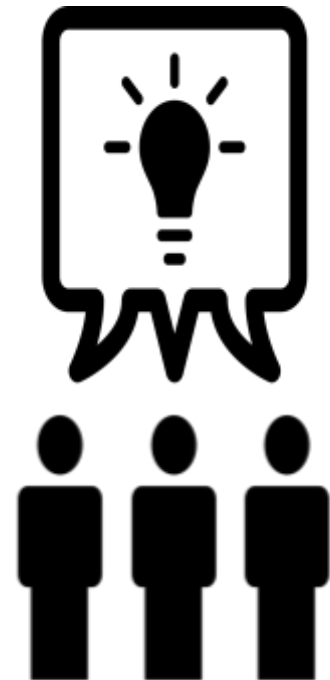
# Evaluation

- Positive experience
- Community building
- Improved knowledge
- Tangible outcome
- Timing and notification



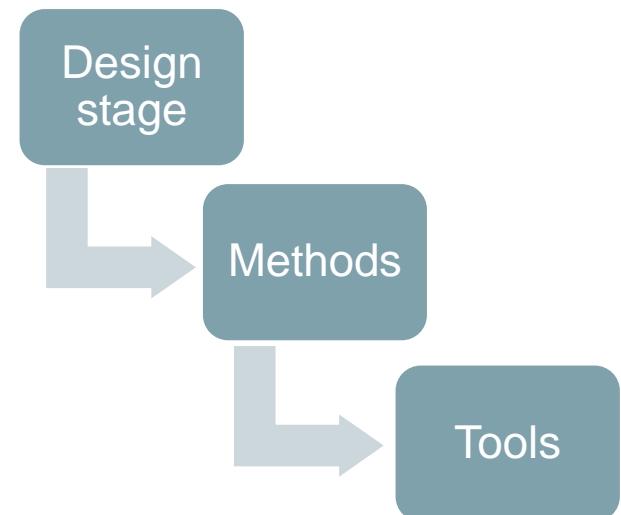
## What's in our toolkit (so far...)?

- Social practice methods
- Co-design methodology (tools, processing outcomes)
- 2-4-8 value elicitation
- Tokens and equipment for building and discussing systems ideas
- Video documentation and sound recording
- Field observation template
- Formalised method for analysing workshop outcomes
- Options appraisal (feasibility, desirability)
- LCA calculator
- Fact sheets and photos for selected technology options
- Rainwater calculator
- Rainwater design specification worksheets
- Community infrastructure mapping
- Evaluation template



# Structuring the toolkit

- Design stage
  - Characterising the community
  - Requirements capture (workshop 1)
  - Options evaluation (workshop 2)
  - Detailed design (workshop 3)
  - Evaluation
- Methods
  - Engineering method statement
- Tools
  - Templates, step-by-step
  - Implementation and reflections



# Engineering Comes Home

- Starting from the bottom-up
- Community as design partners
- Integrating data and decentralised technologies
- Practical tools for planning and engineering

