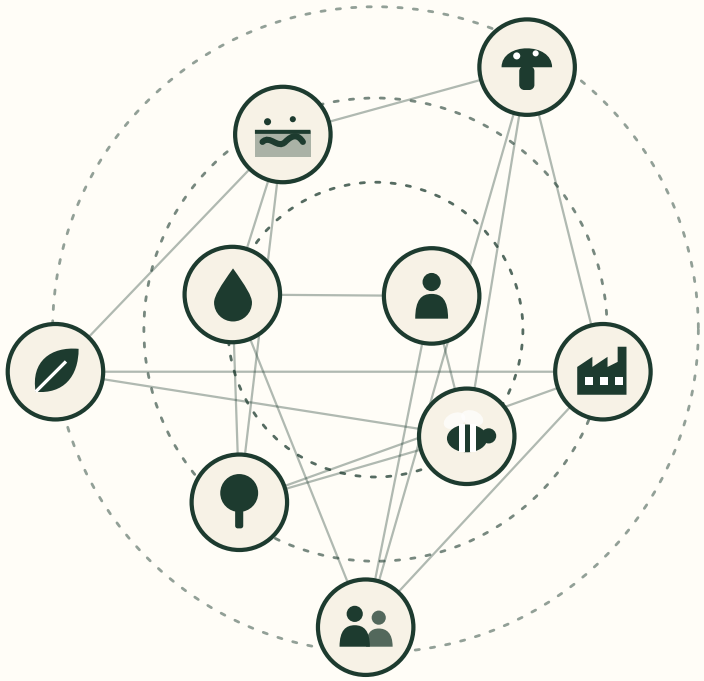
MORE-THAN-HUMAN

Systems Mapping Toolkit

A beginner's guide to mapping systems with people and the wider living world, built around four questions for systemic more-than-human design.



Q1

How are systemic relationships established?

STEP 1

Q2

Who or what do we consider?

STEPS 2–3

Q3

How can more-than-human systems be mapped?

STEPS 4–5

Q4

How do designers intervene in systems?

STEPS 6–7

Gözel Shakeri · shakeri.eu · November 2026

Based on Poikolainen Rosén et al. (2024) · structure adapted from Explorer Labs (v1.1)

Before you start

A systems map is a picture of how the parts of a system influence each other. A more-than-human systems map adds the parts most maps leave out: the animals, plants, fungi, soils, water and climate that a business, product or place depends on and affects.

WHY MAP THIS WAY?

- See dependencies: what your organisation relies on that is not on any balance sheet.
- Spot hidden harm and risk early, before it becomes a crisis or a headline.
- Find leverage points where a design decision can shift the whole system.
- Build a shared picture across disciplines, with people who know the living world.

WHAT YOU NEED

- 90–120 minutes, 3–6 people, sticky notes or a digital whiteboard.
- One concrete challenge you can describe in a sentence.
- Ideally someone with ecological or local knowledge in the room, or evidence from them.

GROUND RULES

- Start small. One garden, one product, one site. You can widen the map later.
- A boundary is a choice, not a fact. Write down what you leave out and why.
- Nonhumans cannot join the workshop. Bring evidence, observations and expert voices for them, and mark what is only an assumption.
- Iterate. Expect to loop back to earlier steps as the map teaches you things.

Four questions, seven steps

The chapter by Poikolainen Rosén, Chen, Törnroth, Gaziulusoy and Marttila asks four questions of any systemic more-than-human design project. Each step of this toolkit answers one of them.

Q1 How are systemic relationships established?

1. Frame the challenge and choose your lenses

Q2 Who or what do we consider?

2. Make your cut: draw the boundary
3. Identify who and what is in the system

Q3 How can more-than-human systems be mapped?

4. Map the relationships
5. Find feedback loops

Q4 How do designers intervene in systems?

6. Locate leverage points
7. Frame interventions

+ Critical check

What did the map simplify, hide or justify? Loop back if needed.

1 Frame the challenge and choose your lenses

Q1 · How are systemic relationships established?

TIME 10–15 MIN

WHAT TO DO

Write your challenge the way your organisation would normally state it. Then choose two or three lenses. Every lens makes different relationships visible and hides others, so the choice shapes everything that follows.

PROMPTS

- Which lens would your organisation normally use?
- Which lens has it been ignoring, and what might it reveal?
- Rewrite the challenge so that it names who and what should thrive.

Ecological · Material & energy flows · Economic · Social & cultural · Political & power · Technological · Time: day, night, seasons

Challenge as first stated

Lenses we choose, and why

Reframed: How might we … so that people and the wider living world can thrive?

WORKED EXAMPLE

A garden robot mower

FIRST STATED

“Make our robot mower more attractive to garden owners.”

LENSES CHOSEN

Ecological · Social & cultural · Time: day, night, seasons · Economic · Technological

Ecological: who lives in, feeds on and moves through the lawn? Social: why do owners want a short, striped lawn? Time: when does the mower run, and who is active then?

REFRAMED

How might a robot mower take part in the life of a garden, so that the owner, the lawn and the animals living in it can all thrive?

WHAT THE LENSES SURFACED

- The time lens raises night-time mowing straight away, when hedgehogs are out foraging.
- The social lens shows that the “perfect lawn” is a norm, not a need.
- The ecological lens turns the lawn from a surface into a habitat.

2 Make your cut: draw the system boundary

Q2 · Who or what do we consider?

TIME 10–15 MIN

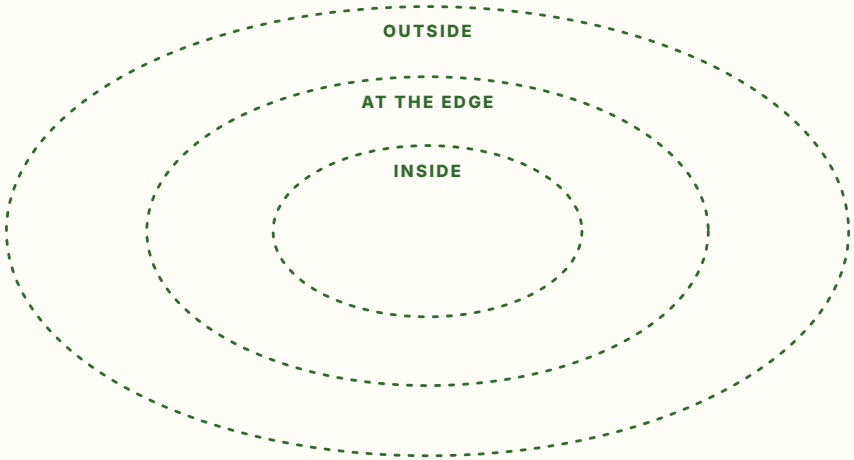
WHAT TO DO

Boundaries are made, not found. The chapter calls such choices agential cuts: every cut includes some beings and relationships and excludes others. Decide what is inside, what sits at the edge and what is outside. Then record what you left out on purpose, and why.

PROMPTS

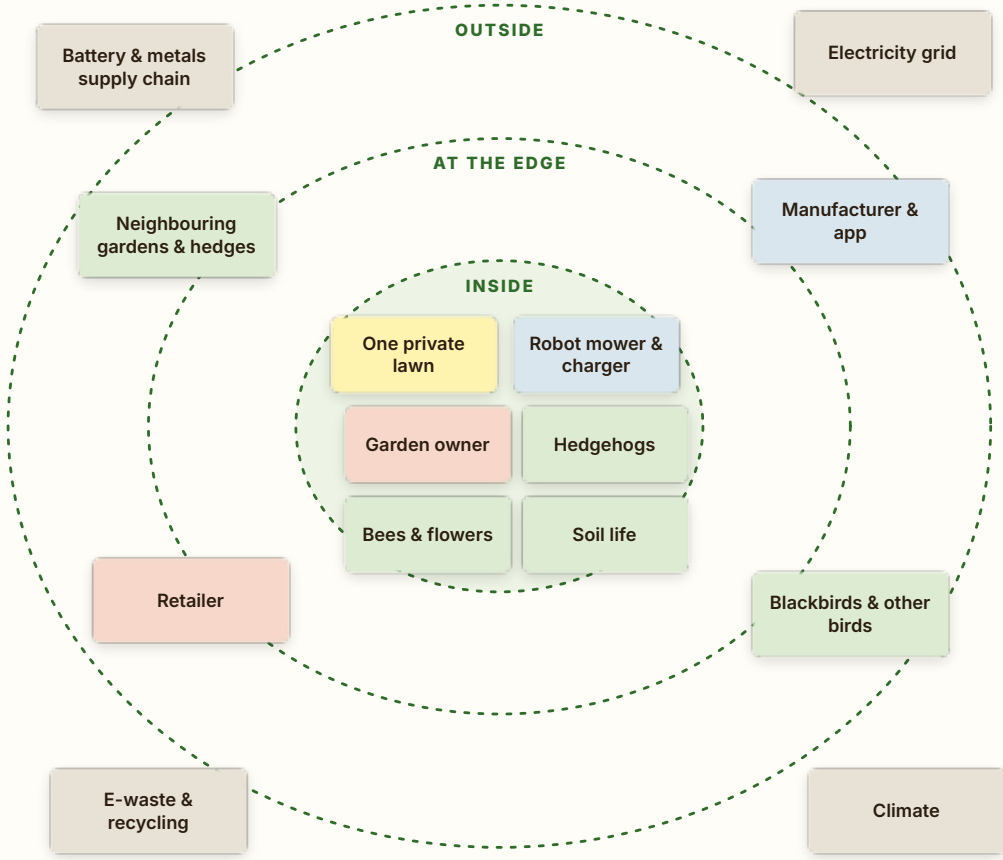
- Space: where does it happen? One site, a street, a region?
- Time: which hours, seasons, product lifetime?
- Scale: one product, or its whole supply chain?
- Who drew this line, and who would draw it differently?

TIP If a nonhuman stakeholder keeps crossing your line, as animals and water do, put it at the edge rather than leaving it out.



Left out on purpose, and why

WORKED EXAMPLE — *A garden robot mower*



Left out on purpose, and why

The battery and metals supply chain matters, but it needs a map of its own. We put hedgehogs and neighbouring gardens at the edge because hedgehogs roam across many gardens in a night: no single lawn contains them.

3 Identify who and what is in the system

Q2 · Who or what do we consider?

TIME 15 MIN

WHAT TO DO

List the human stakeholders and the technologies and materials. Then go through the seven types of natural nonhuman stakeholders below (Veselova & Gaziulusoy). One living being can belong to several types at once: a tree is also part of a multispecies collective, a life process and a carbon cycle.

TIP Aim for 5–10 entries per row at first. Leave a gap where you lack knowledge, and note who could fill it.

- **Humans**
  Users, workers, neighbours, decision-makers
- **Technologies & materials**
  Products, infrastructure, data, materials
- **1 · Individual organisms**
  One particular animal, plant or fungus
- **2 · Single-species collectives**
  A population, colony or herd
- **3 · Multispecies collectives**
  Communities such as a soil food web
- **4 · Life processes**
  Pollination, decomposition, growth
- **5 · Living systems**
  Ecosystems such as a wetland or hedgerow
- **6 · Biogeochemical cycles**
  Water, carbon and nitrogen cycles
- **7 · Processes of the atmosphere**
  Weather, microclimate, air quality

WORKED EXAMPLE — *A garden robot mower*

Humans
Garden owner · neighbours · product designers · retailer

Technologies & materials
Robot mower · blades & bump sensors · app · charging station · battery

1 · Individual organisms
The hedgehog that crosses the lawn at night

2 · Single-species collectives
The local hedgehog population · a bumblebee colony

3 · Multispecies collectives
The plant community of the lawn · the soil food web

4 · Life processes
Pollination · decomposition of clippings · flowering

5 · Living systems
The garden and the network of hedges it connects to

6 · Biogeochemical cycles
Carbon and nitrogen in the soil · rainwater

7 · Processes of the atmosphere
Microclimate: night-time cooling, dew, summer heat

4 Map the relationships

Q3 · How can more-than-human systems be mapped?

TIME 20–30 MIN

WHAT TO DO

Turn your stakeholders into variables, things that can go up or down (“hedgehog” becomes “hedgehogs foraging on the lawn”). Place them on the map and draw arrows: what leads to more or less of what? Mark each arrow + if both move in the same direction, or – if they move in opposite directions.

PROMPTS

- What does each stakeholder need, and what does it give?
- Where do food, energy, water or materials flow?
- Which arrows rest on evidence, and which are guesses?

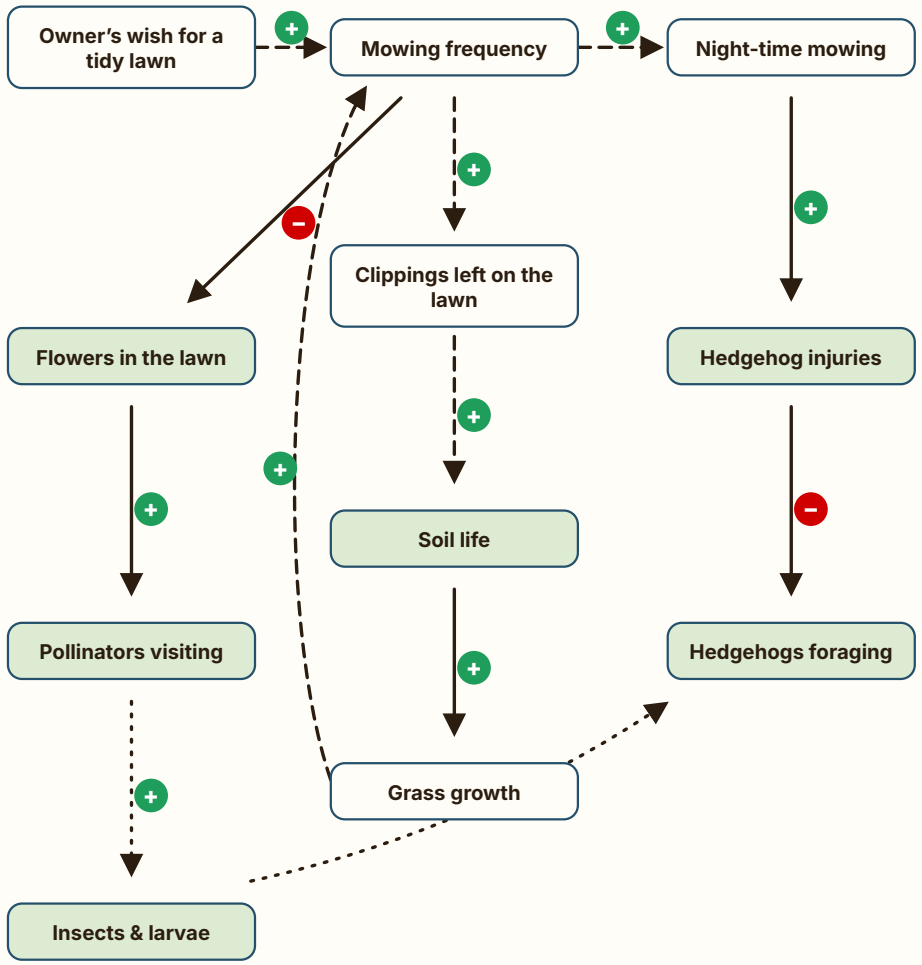
LEGEND

documented evidence — observed locally - - - assumption to test

Your map

WORKED EXAMPLE

A garden robot mower



Green boxes: nonhuman stakeholders as variables. Evidence for hedgehog injuries: Rasmussen et al. (2021); Leibniz-IZW (2024).

5 Find feedback loops

Q3 · How can more-than-human systems be mapped?

TIME 15 MIN

WHAT TO DO

Follow the arrows until they come back to where they started. A reinforcing loop (R) amplifies change, for better or worse. A balancing loop (B) pulls the system back towards a set point. Count the minus signs: an even number means R, an odd number means B.

PROMPTS

- Where do things get steadily better or worse, and why?
- Where is there a delay between cause and effect?
- Which harms never come back round to the people who cause them?

TIP A missing loop is a finding too. If a harm never feeds back to whoever causes it, nothing in the system will correct it.

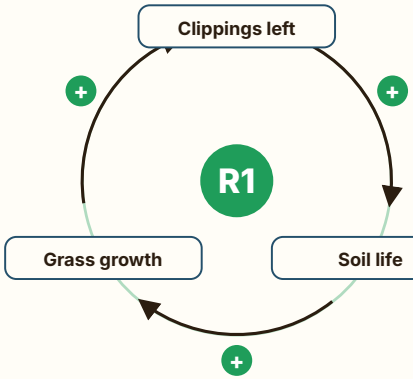
Reinforcing loops (R)

Balancing loops (B)

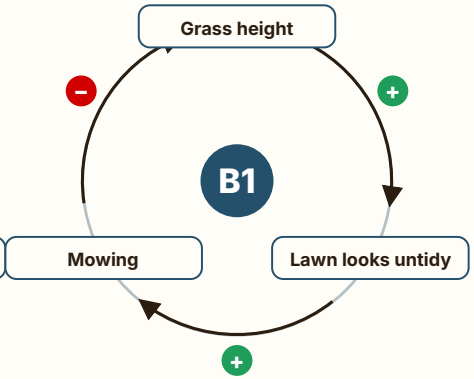
WORKED EXAMPLE

A garden robot mower

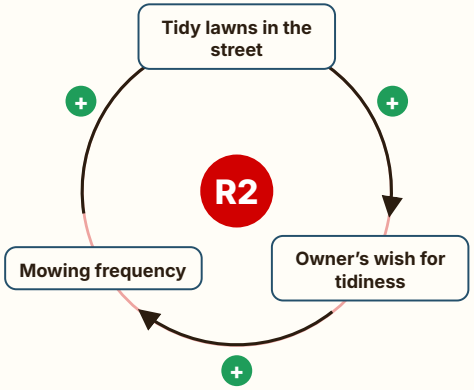
Living soil (virtuous)



Keeping the lawn short



The tidy-lawn norm



MISSING LOOP

Night mowing → hedgehog injuries → … nothing. The owner rarely finds out: in one German study most injured hedgehogs were found more than 12 hours later.

R2 also lowers flowers and pollinators as a side effect. B1 is the loop the product is built to serve. R1 is a loop the product could strengthen by leaving clippings to feed the soil.

6 Locate leverage points

Q4 · How do designers intervene in systems?

TIME 15 MIN

WHAT TO DO

Leverage points are places where a small shift can change the whole system (Meadows). Shallow ones are easy to change but change little; deep ones are harder but transform more. Mark candidates on your map with a star and sort them on the ladder below.

PROMPTS

- Which loop from step 5 drives the outcome you want to change?
- Where could new information create a missing feedback?
- What goal or belief keeps the system as it is?

shallow → deep

Parameters
numbers, settings, quantities

Feedbacks
loops, information, delays

Design
rules, structures, who decides

Intent
goals, values, paradigms

WORKED EXAMPLE — *A garden robot mower*

PARAMETERS

- ★ Raise the cutting height
- ★ Mow less often

FEEDBACKS

- ★ Mower reports every bump or stop to the app
- ★ App shows flowers and wildlife, not just “lawn done”

DESIGN

- ★ Daytime-only mowing as the factory default
- ★ A hedgehog crash test in product development
- ★ Mow-free zones built into the lawn map

INTENT

- ★ Success = a garden that is alive, not a perfect surface
- ★ The lawn as habitat shared with other species

Most product teams work on parameters. The missing hedgehog loop points to the feedback and design levels; the reframed challenge from step 1 works at the level of intent.

7 Frame interventions

Q4 · How do designers intervene in systems?

TIME 15 MIN

WHAT TO DO

Choose one or two leverage points and turn each into a challenge statement: How might we … so that …? Name who and what should benefit. Then decide on a first, small experiment that would teach you whether the intervention works for people and for the living world.

PROMPTS

- Who benefits, and who or what bears the cost?
- What is the smallest test you could run in the next month?
- Who needs to be involved, human or not, and how will you include their perspective?

1 Leverage point

How might we …

… so that …

First experiment · who to involve

2 Leverage point

How might we …

… so that …

First experiment · who to involve

WORKED EXAMPLE — *A garden robot mower*

1 DESIGN · DEFAULT SETTING

How might we make daytime-only mowing the default, and night mowing a conscious exception,
so that hedgehogs can forage safely while owners still get a tended lawn?

FIRST EXPERIMENT

Ship the default to a pilot group; track how many owners keep it. Involve a hedgehog rescue centre.

2 INTENT · WHAT COUNTS AS SUCCESS

How might we change the app's success measure from "lawn done in 42 min" to "garden alive",
so that owners see flowers, insects and healthy soil as signs of a good lawn?

FIRST EXPERIMENT

Prototype one app screen with flower and pollinator counts; test it with 10 owners and an ecologist.

+ Critical check: what did the map do?

TIME 10 MIN

A systems map is a tool for seeing, and every way of seeing leaves things out. The chapter closes on the tension between formal systems thinking and a more open, relational view of the more-than-human world, and names risks such as oversimplifying, rendering things invisible and using systemic patterns to oppress. Before you act, ask:

Oversimplification

What did boxes and arrows flatten? A hedgehog became a number on our map. What does that miss about its life?

Invisibility

What is off the map, and whose knowledge is missing? Who could tell us: an ecologist, a rescue centre, a long-time gardener?

Power

Who benefits from this map? Could it be used to justify harm, for example by labelling a species as a pest?

Representation

Who spoke for the nonhumans, and on what evidence? Which arrows are still assumptions?

The cut

Would a different boundary tell a different story? Try redrawing it at a larger or smaller scale.

Going outside

What would we learn by observing the system itself, for example walking the garden at night, rather than only mapping it?

If any answer changes the picture, loop back to step 2 or 3. That is the method working, not failing.

Sources and credits

THE FOUR QUESTIONS

Poikolainen Rosén, A., Chen, Y., Törnroth, S., Gaziulusoy, İ. and Marttila, T. (2024) 'Four Questions for Systemic More-Than-Human Design in Practice'. In Poikolainen Rosén, A., Salovaara, A., Botero, A. and Juul Søndergaard, M. L. (eds) More-Than-Human Design in Practice. London: Routledge, pp. 132–149. https://doi.org/10.4324/9781003467731-13 (open access, CC BY-NC-ND).

TYPOLOGY OF NONHUMAN STAKEHOLDERS

Veselova, E. and Gaziulusoy, İ. (2021) 'When a tree is also a multispecies collective, a photosynthesis process and a carbon cycle: A systemic typology of natural nonhuman stakeholders when designing for sustainability'. Proceedings of Relating Systems Thinking and Design (RSD10).

LEVERAGE POINTS

Meadows, D. (1999) Leverage Points: Places to Intervene in a System. Hartland, VT: The Sustainability Institute. Grouping into parameters, feedbacks, design and intent after Abson, D. J. et al. (2017) 'Leverage points for sustainability transformation', Ambio 46, 30–39.

WORKED EXAMPLE: HEDGEHOGS AND ROBOT MOWERS

Rasmussen, S. L. et al. (2021) 'Wildlife conservation at a garden level: the effect of robotic lawn mowers on European hedgehogs', Animals 11(5), 1191. Leibniz Institute for Zoo and Wildlife Research (2024) news release on hedgehog injuries caused by robotic lawn mowers in Germany.

TOOLKIT STRUCTURE

The step-by-step worksheet format (challenge, boundary, elements, map, +/– links, loops, intervention points with How Might We statements) is adapted from Explorer Labs, Systems Mapping Toolkit for Beginners, v1.1. This version reorganises the steps around the four questions and adds nonhuman stakeholders, evidence marking and a critical check.

This toolkit summarises and applies published work in its own words; it is not a substitute for the original chapter, which is free to read online. The worked example is illustrative: it combines published evidence with assumptions, and the map marks which is which.