COMMUNITY TECH MEETS DIGITAL SUSTAINABILITY

A Green Handbook for Community Tech Practitioners

GREEN WEB FOUNDATION

Promising Trouble

power to change | business in community hands

Authors
Katrin Fritsch & Hannah Smith

Suggested Citation
Fritsch, K., & Smith, H. (2023): *Community tech meets digital sustainability: A green handbook for community tech practitioners*. Green Web Foundation

March 2023

A. The case for digital sustainability and community tech

The numbers are clear. We are in a climate emergency, and we need to act now. In 2022, greenhouse gas emissions were at a record high, and since 2018 we have experienced the hottest years ever recorded.[1]

However, one aspect is often overlooked: the environmental impact of digital technologies. Smartphones, digital platforms and the internet itself are assumed to be part of the solution. Those assumptions are true, as digitisation plays an important role in advancing sustainability.[2] However, the use of digital tech is not impact-free. If not used with care, it creates significant problems.

The impact of digital tech

If the internet were a country, it would be the 7th largest emitter of CO_2, producing more emissions than the shipping industry. This makes it the world's largest coal-powered machine, since most of the internet's infrastructure runs on fossil fuels rather than renewable energy.[3]

Furthermore, there is a significant harm associated with the mining and manufacturing of minerals that go into electronic devices. These activities make up the majority of the environmental impact for most digital devices people use. Recycling rates are still low, so many of these minerals end up as e-waste, which harms areas already vulnerable to climate change. E-waste has become the fastest growing wastestream in the world.[4]

"Tech isn't special, it's just new. Every sector needs to change to meet the challenges presented by climate change, and tech is no exception."

Chris Adams, Green Web Foundation

Nevertheless, there are pathways to digitally sustainable futures. Whether in open source communities, as tools to measure the carbon impact of digital services, or initiatives for the right to repair of electronic devices, promising projects are out there. They just need to be uplifted and replicated.

That's why we created this handbook.[5] We hope to shed light on community tech organisations and their potential to advance digital sustainability.[6]

What is community tech?

Right now, community tech organisations can be a source of inspiration when it comes to alternative ways of innovation and digital sustainability.

1   United Nations (n.y): The climate crisis: A race we can win.
2   United Nations System Staff College (n.y.): Digital 4 Sustainability: A learning path
3   The Green Web Foundation (2021): Towards a fossil-free internet: The fog of enactment
4   The Global Waste Statistics Partnership (2020): Surge in global e-waste

5   Who is 'we' in this handbook? We, this is the Green Web Foundation: A non-profit organisation that works towards a fossil-free internet by 2030. We do this by building open source tools, training professionals, and advancing the state of the art of the web. Find out more about us here: www.thegreenwebfoundation.org
6   Learn more about what we mean by digital sustainability in chapter 2

For this handbook, we understand community technology as

"Any hardware or software that delivers benefit to a community group, and which that community group has the authority to influence or control"

Power to Change[7]

The report The Case for Community Tech by Promising Trouble found that community tech organisations, which often consist of people making and sharing things for collective benefit, are champions of local-scale innovation and people-centred problem solving. These organisations often look at innovation in a different way because they match existing technical opportunities with the unmet needs of their communities.[8]

According to Rachel Coldicutt, Director of Promising Trouble, community technology is either "created by a community organisation for its own use; created by a community organisation for reuse by others; or created by a community organisation as infrastructure to support a broader community of practice".[9]

Most of the time, community technology is open source, reusable by others, and decentralised. As we will show in the next chapter, these are all key social indicators for digital sustainability.[10] Additionally, The Case for Community Tech found that community tech practitioners are values-driven, which makes them more open to explore environmentally-friendly approaches to digital technologies.[11]

Community tech meets digital sustainability

We know that community organisations often pioneer the use of tech. They must improvise and make do with limited resources. Innovation is borne from these limitations. With this handbook, we want to show that community organisations also pioneer the use of sustainable digital tech. This is why we have decided to dedicate this handbook to you, the community tech practitioners out there, who are interested in building or maintaining sustainable, digital technology alternatives. We want to help you answer the following questions:

What is digital sustainability and how can you work towards it?[12]

What are the first steps for your organisation to transition to digital sustainability?

What inspiring pathways already exist and how can we learn from them?

The goal of this handbook is to provide an **easy-to-use, approachable resource for you, community practitioners, and your communities to learn about digital sustainability and to kickstart conversations**. If you have feedback or further ideas, please don't hesitate to get in touch.

7   Fergus Arkley, Power to Change (2022): Why we are making the case for community tech
8   Anna Dent & Rachel Coldicutt (2022): The case for community tech (p. 15)
9   Rachel Coldicutt (2021): What is Community Hardware and Software?
10 Rachel Coldicutt (2021): What is Community Hardware and Software?
11 Anna Dent & Rachel Coldicutt (2022): The case for community tech
12 This report is dedicated to start the conversation with interested community tech practitioners, which is why from here onwards we will work with "you".

What is digital sustainability and how can we work towards it?

The term 'sustainability' evolved rapidly over the last thirty years, and for that reason its meaning depends on the context. [13] Sustainability principles applied to a digital technology context, 'digital sustainability', have been steadily gaining traction over the last decade. 2022 saw an explosion of interest from organisations wanting to learn more about it and on track to becoming a mainstream concern.

To begin, let us create a shared understanding of the concepts by introducing you to two useful models for (digital) sustainability:

1. Doughnut Economics
2. Consumption, Intensity, and Direction (CID)

1. DOUGHNUT ECONOMICS

Developed by Kate Raworth, Doughnut Economics offers **a vision of what it means for humanity to thrive in the 21st century**. It provides a holistic, high-level approach to sustainability using the visual of a doughnut. The Doughnut consists of two concentric rings. The inner ring is known as the social foundation. This ring represents the

floor—the minimum resources and services needed so that no person falls short on life's essentials and that everyone can prosper. The social foundation consists of human needs such as social equity, health, or education. The outer ring is an ecological ceiling, which consists of the planetary boundaries such as air pollution or biodiversity loss. This ceiling represents the dimensions that protect Earth's life-supporting systems and that humans must exist within. Between these two sets of boundaries lies a doughnut-shaped space that is both ecologically safe and socially just: a space in which humanity can thrive.

Image source: Unsplash, Maja Vujic

This way of thinking about sustainability is especially helpful when considering digital technologies. It shows us that digital sustainability should not only consider electricity and decarbonisation but also broader requirements and boundaries for people and the planet. Doingthedoughnut.tech was developed by Hannah Smith from the Green Web Foundation to provide some prompts for considering sustainability for digital technologies.

---

13   Web Almanac (2022): Sustainability

Doughnut Economics is a great way to engage your organisation with a rounded view of sustainability generally and to understand the multiple dimensions for action at a high level. The model also touches upon seven ways of thinking that will help to get us to a more sustainable and just future.

2. CONSUMPTION, INTENSITY, AND DIRECTION (CID)

The Consumption, Intensity and Direction (CID) model aims to make digital sustainability more applicable in everyday practice of technologists, especially for those on the starting blocks. It was developed by Chris Adams and Hannah Smith from the Green Web Foundation, and it focuses on responses an organisation can enact.

The model works with three different layers:

Consumption: Reducing how much digital tech we use wastefully
Intensity: Making digital tech in a less harmful way
Direction: Changing what systems digital tech is used to accelerate

Consumption: Reducing how much digital tech we use wastefully

The first layer, **consumption**, focuses on using technology more efficiently and eliminating wasteful use. It guides organisations to consider answers to the following questions:

Where can we measure our digital carbon emissions, and how can we reduce them? Do we repair equipment or put unused equipment back into circulation? Which resources can we pool? How can we generate and store less data? Do we switch things off when they are not needed?

Many organisations may be tempted to only look at this layer, perhaps because it is easier to quantify and does not challenge the status quo too much. However, reducing consumption is not the whole story for digital sustainability. The other layers are important to address systemic harms and build towards desirable and just futures.

"You can't efficiency your way to zero".[14]

Saul Griffith, Renewable Electricity Advocate

Intensity: Making digital tech in a less harmful way

Digital services are built on top of the supply chains of other services. These services are

---

14   Green Web Foundation (2021): Three levers of change as a technologist ; Digital sustainability responses

7

ultimately the products of raw materials and human labour that are often obscured and invisible. The origins and relationships behind these goods may not always be easy to uncover. Nor, once known, can it be easy to determine what harms have occurred.

Therefore the second layer, **intensity**, focuses on making technology with a critical look at digital supply chains. It refers to doing less harm for each unit of consumption that takes place. Organisations considering intensity may explore the following questions:

- Where do our digital technologies come from?
- How can we reduce harm that is caused by generating energy?
- How can we reduce harm in our supply chain?
- Which metrics do we use to measure success that go beyond growth?
- How can we champion open source technology and the commons?

This layer is where many community tech organisations may have more progressive practices than mainstream industry—or at least values that will help them make a difference in how they procure their digital goods and services.

Direction: Changing what systems digital tech is used to accelerate

The third and final layer is **direction**. Technology is "a social, political, and environmental accelerant."[15] Therefore, it is central to include the social considerations and ethical questions underlying that technology. Direction is what we think about when we ask: what kind of world are we working towards?

15   Cade Diem, New Design Congress

Carbon vs. sustainability?!

When working on sustainability, carbon emissions are often the main focus of the conversations. That's because we have decades of research showing that human made carbon emissions have a direct impact on climate change. Carbon emissions receive the most investment and attention, and therefore also receive the most high profile regulation.

Taking carbon emissions into account is a necessary aspect for sustainability, but it should not be the only one. We want to avoid a 'carbon tunnel vision' that ignores the other layers, such as inequality or biodiversity. In the two models we presented, we approach sustainability more holistically, acknowledging the multiple layers of analysis and action and grounding it in climate and social justice.

"The difference is: Sustainability is ethical, while de-carbonisation does not necessarily have to be an ethical practice."

Hannah Smith, Green Web Foundation

Carbon emissions are a focal point, and they are a great way to start working on sustainability within your organisation. However, when working towards digital sustainability, you should also bring attention to the social and systemic layers.

This third layer might be the most difficult to apply to everyday practices, but it can help shape a longer-term strategic direction. Questions to guide your assessment could be:

- With the technology that we build, what is our vision for a better world?
- How do we contribute to this vision?
- What other systems and services does our technology enable?
- What problems should we design digital services for, and what should be solved through behaviour or system change?
- Where can we raise awareness or educate others?

For further prompts and resources relating to the CID model, take a look at the Green Web Foundation's Digital Sustainability Responses.

Starter Kit:
Four steps towards digital sustainability

For community tech organisations new to digital sustainability, the models explained earlier provide an overview of some of the broad considerations and mindset changes needed. In this next section, we've distilled these ideas down into four actionable steps you can take today to begin working towards digital sustainability.

We want to reiterate that there is not a single solution or path. The most impactful actions are often more complex than expected. Discomfort is part of change.

1. UNDERSTAND YOUR CO₂ EMISSIONS FROM DIGITAL TECHNOLOGIES

This step might sound more complicated than it is. You don't need to generate the most precise figures straight away.
The best practice is to:

- Begin by understanding how and why digital CO_2 emissions arise[17]
- Identify areas of your digital operations you can measure (or guestimate)
- Measure and understand your emissions

17   See, for example, work by Gauthier Roussilhe or Gerry Mc Govern to get started

- Improve areas whilst also looking for other sustainability co-benefits
- Share your approach and learnings with others
- Refine and improve your approach
- Begin to tackle other digital sustainability metrics, for example on water or waste

---

How and why do digital CO₂ emissions arise? A quick primer

There are two main sources of emissions from technology. The first is the manufacture of the devices needed to make the tech run. For example the devices for a data centre (servers) and an end-user (laptops, phones or tablets). The second is the electricity required to use such devices and transfer data between them.

This handbook focuses primarily on the latter, although we address emissions from manufacturing somewhat in the section about repairing and extending the life of devices.

Organisations typically begin by calculating emissions from websites and cloud services. Luckily there are tools that make this easy for you, and many of them are open source and free to use.

For measuring websites, tools such as Website Carbon, Ecograder or EcoPing are very helpful for getting a first measurement. Once you have an idea of the scale of your emissions you can reduce them. Climate Action Tech has a great resource on reducing the carbon emissions of websites. If you want more sophisticated measurement tools, for example for a development team to use to automate the measurement of web pages or a service, have a look at

the Green Web Foundation's co2.js or the sitespeed.io sustainability plugin.

For measuring cloud usage, some cloud providers such as Microsoft, Google and to some degree Amazon already provide carbon emission estimates in the dashboards they provide. It's worth taking a look. For a more fine-grained, and independent measurement of these emissions, you could use Cloud Carbon Footprint.

For measuring an organisation's footprint more generally, there are other tools which can plug into your billing or even accounting systems to give you high level figures. These won't typically give very detailed estimates for the digital side of your operations, and they will be less fine-grained than the tools mentioned above. However, they may help you make sense of the magnitude of your digital emissions in comparison to other parts of your business. Two such examples are Sage Earth and Ecologi Zero.

2. CHECK IF YOUR HOSTING IS GREEN

Using a green hosting provider is one of the easiest ways to reduce the greenhouse gas emissions associated with a digital service that you are responsible for. Data centres require a lot of electricity to run, and they are often powered by fossil fuels.

The good news is **it's relatively easy to switch your website to run on data centres that use cleaner, greener energy**. Switching to a verified green hosting provider supports the hosting companies doing the right thing and contributes to a greener energy grid for everyone.

To find out if a website is being hosted by a green provider, you can check your website's URL using the Green Web Checker. The Green Web Directory provides a list of green providers if you would like to switch.

3. KEEP SERVICES SIMPLE AND ACCESSIBLE

Digital technologies give us a lot of potential to solve complex problems. However, that also means we sometimes solve simple problems in unnecessarily complicated ways. Big and complicated digital services place greater burdens on the end user. Such services will feel slow and burn through battery and bandwidth—which are valuable resources especially for community groups.

When it comes to sustainable digital services, simple is best. It is better to offer fewer features that are well designed and built accessible rather than overdoing it.

One cause of complexity is digital media such as images and video. When creating websites or applications **use media sparingly and only when it adds real value to the content around it**. There's plenty of research out there that shows well-written copy is the key to getting conversions, not design[18] or stock images.

When you have paired down to the media you actually need, consider the file size. There are a number of factors that affect file size such as the dimensions of the image you are using, the file format and compression settings. Autoplaying videos is generally not recommended.

The Sustainable Web Design website has some great strategies to guide you on these issues:

Has the design used imagery efficiently?

Are video and animation used only when they add genuine value to the user?

---

18   Unbounce (2021): Copy or Design: What's More Important to Your Landing Page Success?

4. TAKE A CIRCULAR FIRST APPROACH TO PURCHASING TECHNOLOGY

Most of the impact from devices comes from their manufacture rather than their usage. The fewer devices each of us owns, and the longer we can keep what we do own in useful operation, the better. As mentioned in our opening statement, e-waste isn't usually recycled properly. So using fewer devices and for longer is a good guideline.

There are a few strategies you can consider as a community tech organisation.

1. **Pool devices.** A practical approach in the workplace is to implement a Bring Your Own Device to work policy. This allows staff who already have suitable devices at home, such as laptops and mobiles, to use them as a primary work device and negate the need for a duplicate work device. A great example of pooling devices at the community level is the Library of Things.

2. **Purchase second hand or remanufactured tech.** There is a growing awareness that buying second hand or remanufactured tech does not mean you are compromising on quality. Have a look at Tech Buyer, Refurbed Ireland and Back Market.

3. **Buy suitably powered devices.** Digital technologies have become increasingly powerful, but for the vast majority of our everyday needs we don't need cutting edge laptops or mobile phones.

4. **Buy ethically made tech.** This is tech that can either trace its supply chain of rare raw materials to responsible sources, or tech that has been explicitly built to be modular and repairable without specialist means. Have a look at FairPhone and Framework laptops.

5. **Get unused devices back into use.** Most organisations (and households!) have a guilty drawer or even cupboard with devices that they no longer need. There are lots of good causes that can make use of this tech and get it back into productive use. The Restart Project curates a list of places you can donate in the UK.

Who works on digital sustainability and how? Case Studies

We hope we have shown that digital sustainability is not a single checklist or metric. Instead, it addresses multiple layers and therefore also provides many pathways for action.

To apply the theory to practice, we interviewed three community tech practitioners who are working on digital sustainability in their own way. With these case studies, we want to show the potential for digital sustainability in your own organisations and inspire you to learn from and with each other.

1. Communities, care, and repair:
   The Restart Project
2. Emerging communities:
   Mastodon.me.uk
3. Levelling up energy community:
   Carbon Co-op

1. COMMUNITIES, CARE, AND REPAIR: THE RESTART PROJECT

The Restart Project helps people learn how to repair their broken electronics and rethink how they consume them in the first place. They convene and support community tech practitioners across the globe to inspire and empower them to reuse and repair their devices. We spoke to their Co-Director Ugo Vallauri about the value of communities for creating transformational change.

About the Restart Project

Everything started in 2012 when Janet Gunter and Ugo Vallauri hosted their first Restart party in London. Their idea was to shift conversations on e-waste by hosting repair parties, fixing devices and empowering people. What was interesting from the first party onwards was the strong push from the repair community to continue work on this topic and to host parties on a regular basis.

"There has been a very strong community of tinkerers, repairers, and fixers from the start that identified themselves with our message and our vision and that helped tremendously in shaping the concept. This circle of people inspired us—they often knew more on a technical level—and challenged us to manifest the work of the organisation into something more systemic."

Ugo Vallauri, The Restart Project

Today, The Restart Project continues to host events. They also run the platform re-starters.net, which supports more than 500 communities across the world to learn from each other on repair and reuse. The Restart Project wants to connect their community work with the broader policy level and advocates for the Right to Repair. To support this they started repair.eu, an EU initiative with more than 100 organisations working towards legislative change. According to Ugo, only with the support of communities and the willingness to connect the dots more broadly, is there sufficient power to put repair on top of the agenda.

Why we chose this case

Ugo has a lot to share about his organisation's experiences with community work and cross-collaboration. The Restart Project works towards digital sustainability because they extend the use of electronics through empowering others, reduce e-waste and hence minimise the environmental impact of digital technologies across the world.

From a Doughnut Economics point of view, they acknowledge the ecological boundaries of rare earth minerals, and through community work they strengthen the social foundation by providing an inspiring alternative to the status quo and upskilling people in the community.

"To us, sustainability means empowering people to make better choices in technology and beyond."

Ugo Vallauri, The Restart Project

Application of the CID Model

Consumption: The Restart Project addresses the question 'Do we repair equipment or put unused equipment back into circulation?' with a clear yes. To measure their impact, The Restart Project has created the 'Fixometer', a tool which captures the environmental and social impact of their work. According to the 'Fixometer', as a direct result of their 4,590 fixing parties to date, 22,184 devices have been fixed, 792,181 kg CO_2 emissions and 65,687 kg waste have been prevented.[19] According to Ugo, the Fixometer has helped to show the impact to funders and also motivate others to get involved.

Direction: The value of community is central in the work of The Restart Project. With their

platform restarters.net, they enable substantial change and can clearly address the question 'Where can we raise awareness, or educate others?' They provide a range of possibilities on how to get involved, because they have realised there are many different kinds of communities who often have a strong desire to remain independent. Ultimately, The Restart Project gives the power back to the communities and enables them to change, amend, and repair their technologies.

How to start your own repair initiative
Top five tips from Ugo Vallauri

1. Don't be daunted to start small and promote offline in your community! This is how many successful initiatives have started.
2. Try to provide some level of continuity of your work. Potential volunteers are often very excited and motivated to come again if there is some level of regularity involved.
3. Go where the community is as opposed to expecting the community to come to you. Explore taking events into multiple places and formats so you can reach a wider audience.
4. Visit other repair initiatives and shadow one of the organisers to learn about their work. Through that, you will also learn about safety and liability when repairing devices.
5. Join The Restart Project's international community at restarters.net. There, you'll find a very open and accessible network that shares their learnings about repair in an informal way.

---

19   The Restart Project - Fixometer: https://therestartproject.org/fixometer-2/

2. EMERGING COMMUNITIES: MASTODON.ME.UK

Mastodon.me.uk is a server that runs on the Mastodon network which is a distributed, open source social media network that no one single organisation or individual controls. In October 2022, Elon Musk bought the social media platform Twitter, and many Twitter users began to look for alternative platforms. Mastodon was shared widely and had a massive influx of new users. Mastodon.me.uk is only at the beginning of its journey towards digital sustainability. We spoke to James Smith, who originally set up the server, about place-based online communities and the many possibilities for human connection on the decentralised web.

Introduction

James originally found out about a new, distributed network called Mastodon on Hacker News. He got excited about the functionalities and decided to set up his own server called mastodon.me.uk, in 2017. The original idea of this server was to create a community around civic tech in the UK. Today, mastodon.me.uk has 1000 active users, receives support from volunteers of the community, and runs on green energy. James sees the server not as a set idea with a big vision, but rather as an emerging experiment on how to create communities differently in a decentralised way.

Mastodon is similar to Twitter, but it is not driven by profit or by companies. Rather, according to James, it goes back to the roots of the early federated internet, with smaller communities, decentralised networks, no monopolies, no recommendation algorithms, and also no paid advertisements.

"It allows you to build much more human communities. Because you end up with a local area that is made up of people that are there for the same reasons as you are. And those local servers can build whatever community they want."

James Smith, mastodon.me.uk

Why we chose this case

The big social media platforms such as Twitter or Facebook have become centralised monopolies that often foster hate speech and leave little to no space for smaller communities and innovation. The fact that Elon Musk was able to buy Twitter and change it within a few days, shows how vulnerable these platforms have become to the willpower of a few.

Mastodon is a great example for alternative networks that are decentralised and allow different communities to form. Open source, decentralised solutions ultimately also lead to more digital sustainability, because they give back control to the people who operate the servers.

This also applies into the Doughnut Economic model, because Mastodon servers allow for more diversity and deeper connections between humans. Through that, they can build the necessary social foundation to thrive. Mastodon.me.uk is currently exploring steps towards more environmental sustainability: they have switched to a green hosting provider. However, they are just at the start of the process, but they are not afraid of the steps to take. That's why we want to highlight this case.

Application to the CID Model

Intensity: Mastodon in general makes technology less harmful, because it champions open source technology and the commons. This allows users to have the power and to make changes, as we can see with mastodon.me.uk. In the interview, James said: "It is very powerful for users, because ultimately, in comparison to other platforms, they *can* still make choices*.*" In the case of mastodon.me.uk, this means that switching to a green hosting provider that is based in the UK was a choice that James could make. He considered the Green Web Directory to find such a green hosting provider, but ultimately found a UK-based provider on his own. The distributed access and open source technology of Mastodon ultimately allows users to make more sustainable choices about the technology they use.

Direction: According to James, Mastodon has a lot of potential to become more sustainable because of its decentralised character. On the one hand, sustainable choices can be made by the users, on the other hand, an intentional community can be fostered that embraces dialogue and discussions over hate and advertisements. When a big influx of users wanted to join mastodon.me.uk, the community decided to limit the amount of signups. "I had to turn off the sign ups, because I want to intentionally create a community. Now, we only accept 100 new users per week to keep the conversation quality high." With this vision for mastodon.me.uk in mind, and the power of the community, the network is on a promising journey towards digital sustainability.

Build your own Mastodon community successfully and sustainable
Top four tips by James Smith

1. *Don't rush into running your own server!* Before setting everything up, explore the Fediverse and get inspired. If you really decide to run your own server, always set it up together with a community and not as an individual.
2. *Use a hosting provider that runs on green energy.* Visit the Green Web Directory to find verified hosting providers that run on green energy. Through that, your server will be hosted environmentally sustainable.
3. *Community first, technology second.* Focus on the community when running a server: work on content moderation guidelines and figure out how to define your community. There are already tools that you can use, such as social.coop, to help you set up guidelines and governance structures. Ultimately, you create a space of connection, and that will make the server most successful in the long run.
4. *Set up options to donate.* If users see a value in your server, they are also willing to donate. Use Open Collective to set up a donation option and share your costs with the community.

3. LEVELLING UP ENERGY COMMUNITY: CARBON CO-OP

Carbon Co-op is a cooperative that helps people and communities to make the radical reductions in home carbon emissions necessary to avoid runaway climate change. It began as a small community project, and since then it has proven that carbon reductions are possible—especially when there is support from communities. We spoke to Matt Fawcett, who works at Carbon Co-op on energy monitoring and smart technology, about the value of community, sustainability beyond carbon and how to measure success.

About Carbon Co-op

Carbon Co-op was founded more than ten years ago with a number of people who wanted to make radical cuts in their household carbon emissions. These people had different backgrounds, ranging from architects, climate activists and householders. What they had in common was the vision to demonstrate that it *is* possible to reduce carbon emissions in the household significantly.

"We wanted to show what's possible, because that makes it more difficult for policy makers to say: 'It's not possible'. We were already doing it and that made the difference."

Matt Fawcett, Carbon Co-op

Today, Carbon Co-op has shown that cuts of carbon emissions in households of up to 80% are possible. Carbon Co-op runs projects, develops open source technolo-gies, hosts events, and publishes reports in order to show that more sustainable households are possible. For example, they provide webinars on community-led approaches to retrofitting, and developed a monitor to gain new insights through smart metre data on household energy usage and carbon emissions.

Why we chose this case

Carbon Co-op works towards digital sustainability because they build and provide open source technology to achieve the goal of reducing carbon emissions. They also acknowledge that open source tools are not enough, and therefore build engaged communities to take climate action. From a Doughnut Economic model perspective, they tackle climate change, one of our ecological boundaries, through reducing carbon emissions. Their mission is dedicated to housing and energy, which are two of the key social foundation indicators in the Doughnut model. At the same time, because they build open source technology *with* and not *for* the community, they build an important network of trust and empowerment, which is another key social foundation indicator.

Application to the CID Model

Intensity: Carbon Co-Op works on intensity, because they directly address the question ' How can we champion open source technology and the commons?' In every project, Matt includes the community from the very beginning, incorporates their feedback, and makes sure that their needs are met. It is also important for Matt to be transparent that these technologies are often pilots, so there is still room to shape them. Matt encourages the community to have a voice in the development process, and that can be very empowering.

Direction: For Carbon Co-Op, sustainability means more than reducing carbon emissions. They approach sustainability from a holistic angle, ensuring that the needs of their community are met. They answer the question "What problems should we design digital services for, and what should be solved through behaviour or system change?" with thought-through tools that acknowledge the role of community and face-to-face interaction. That's why they dispel the myth that digital tools alone are enough. This is why Carbon Co-Op raises awareness and builds networks to educate others. Originally, Carbon Co-op supported people who wanted to reduce their emissions, but now a very engaged and knowledgeable community has formed.

"We now have a lot of vocal and powerful users, which is great! This allows us to have informed conversations, and to explain concepts to each other."

Matt Fawcett, Carbon Co-Op

However, there is still a long way to go to cut emissions of households globally. From Matt's perspective, an opportunity to solve this issue is to work across communities, networks, and organisations—and to acknowledge that solutions to tackle climate change can't be handled alone but only in cooperation with others.

Working on open source community tech: What to keep in mind
Top four learnings by Matt Fawcett

1. *Documentation is key!* Even great people sometimes have to leave, so make sure to have good organisational memory on projects and detailed handovers. This will save you a lot of work later on.
2. *Communication is vital.* Often people in open source projects are not remunerated enough. That's why clear and respectful communication is very important.
3. *Respect and honesty are the central values for community work.* When working with communities on technology, appreciate their feedback, provide them with the results, and let them know what does not work. This is a sign of respect and honesty, not of imperfection.
4. *Encourage people to have a voice!* The best results emerge when people have a voice and are empowered to co-develop technologies.

Outlook: Where from here?

has indicated some pathways and alternative visions that show that a just and sustainable future is possible.

Community tech organisations are well placed to create a better world because they understand the needs of both people and the planet. Their roots within communities allows for this understanding and builds promising foundations for the future. With this handbook, we sought to share the state of the art of digital sustainability with community tech practitioners. We wanted to share ways of action and inspire ways forward.

What surfaced throughout the case studies was the appreciation for longer-term funding. Funding maintenance allows organisations to grow deeper roots in their communities and build meaningful change in the long run. Through this, a more diverse and sustainable ecosystem can be created and maintained.

Focusing on big tech is not enough, because meaningful innovation often happens in communities. We hope that with this handbook, we showed that community tech does not only benefit society, but also builds promising, environmentally sustainable, alternatives.

We are only at the beginning of this journey towards digital sustainability and community tech. But we hope that this handbook