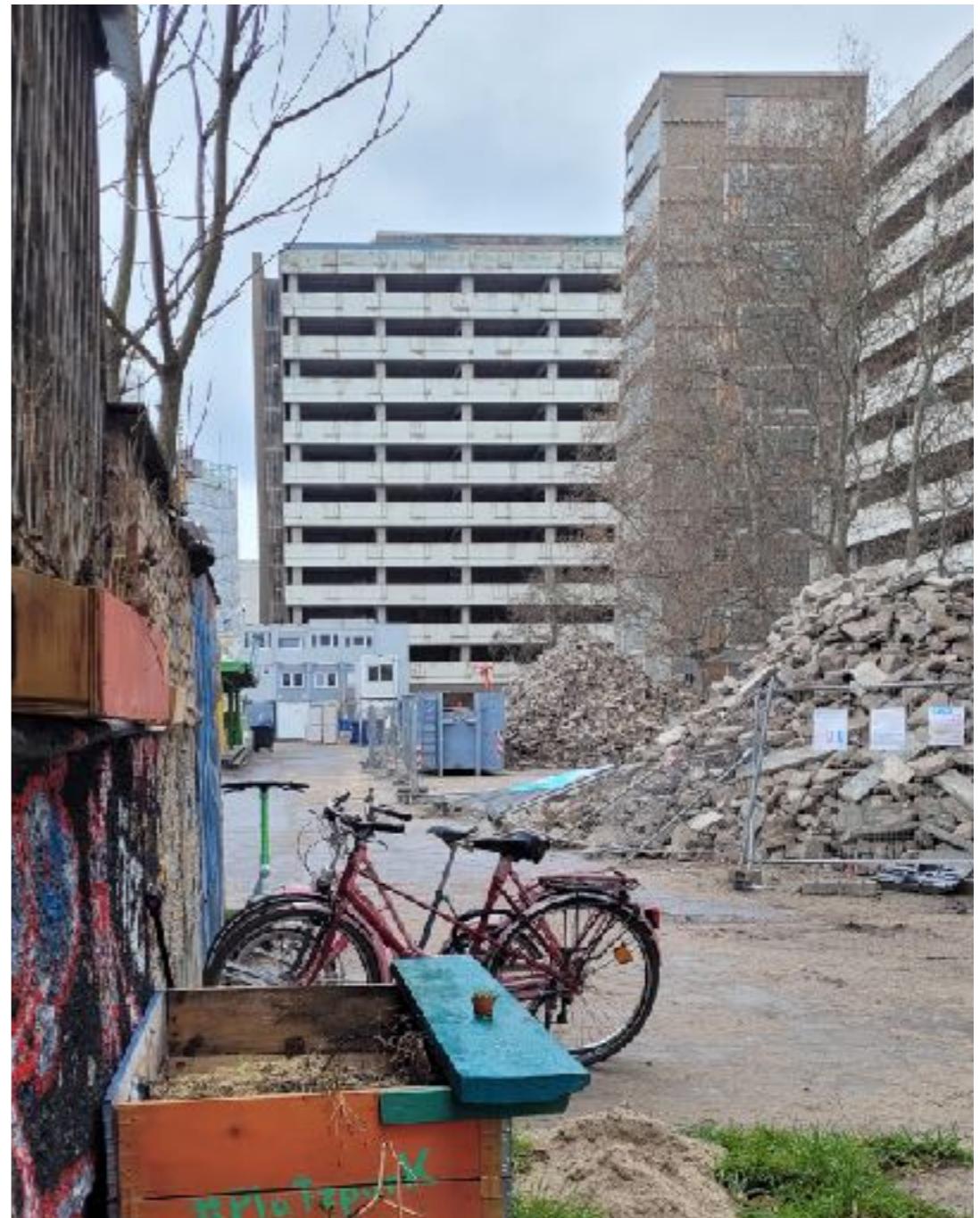


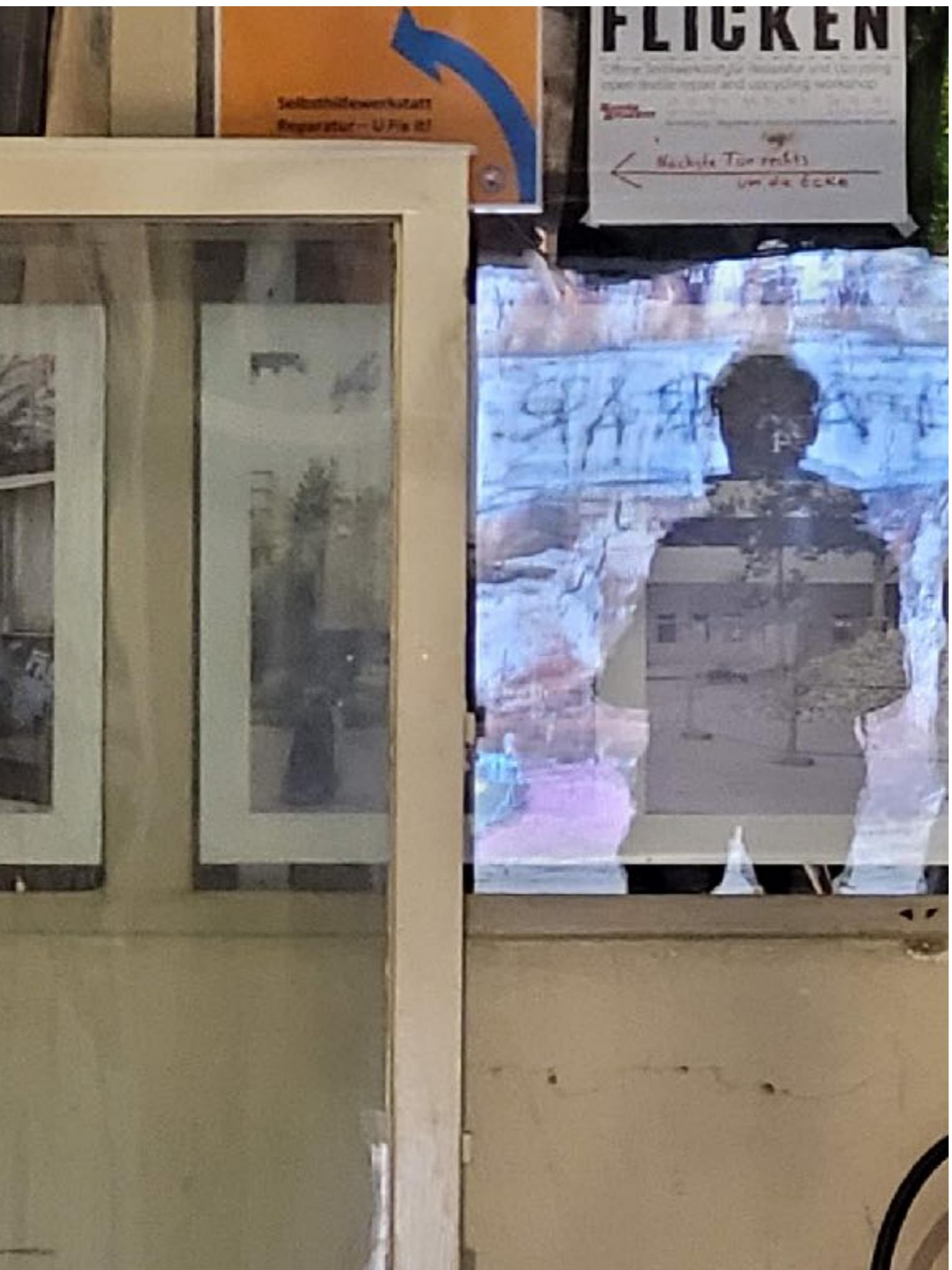
Waste prevention in Smart Cities

Smart City initiatives promise to reshape municipal services reflecting contemporary concerns. My contextual review shows, however, that smart technologies for waste management, in particular, are mainly directed only at improving the efficiency of waste collection. The assumption remains that cities should merely send excess materials to recycling, incineration or landfills. Under a global climate emergency, this is a significant missed opportunity.

Over the last decades, there have been significant improvements in waste management in contemporary cities - notably technology, methods and policies to improve the collection and recycling of materials. However, the industrial practice of recycling - transforming objects back into material for manufacturing - at least partly equates to *cutting short the lifecycle of products* that might still have value. In addition, it requires significant investment and has environmental impacts that should be factored in. *Keeping usable materials away from the waste stream* is therefore of utmost importance. Done the right way, it can also create local opportunities for social inclusion and economic development.

Urban contexts are sites of *commoning*, whether or not their inhabitants notice - or desire - it. There is no escaping the shared use of space and infrastructure, the collective construction of identity, meaning and knowledge. Neither can any city-dweller avoid exchanging goods with others. My research concentrates on coping with excess materials in cities and regions. I give special attention to collective practices to foster the reuse of objects currently discarded prematurely or otherwise left unused.





Over three years of research, I have been experimenting with an alternative approach to waste in Smart Cities focused on *prevention* rather than simple logistics. I have identified individuals' behaviours towards broken or unused things, mapped the potential stakeholders of waste prevention strategies, co-created trusted IoT design concepts with knowledgeable participants, and prototyped technologies that would help achieve greater reuse of materials.

At this final stage, OpenDoTT asks me to reflect on how policy impacts my work. In that context, I identify a need for *innovative approaches to handling excess materials in Smart City initiatives*. Particularly strategies that build trust with stakeholders by challenging the usually opaque practices of waste management. Using *digital technologies such as privacy-aware IoT and trusted strategies for shared data* through participatory methods that weave commons-based materials governance is an essential contribution to the field.

This workbook helps tell the story of my research leading to this point. Previous experiences with policies, waste and inclusion are revisited whilst reconciling my position of being a Brazilian in Europe and all that this contrasting condition implies. The final pages document the reinterpretation of an original design concept called *Reuse Commons* as a participatory toolkit for trusted commons-based policy-making.

Generosity is not “efficient”

Living in urban environments means being together with others. Even though neoliberal fables depict cities as arid places where autonomous rational beings compete for scarce resources, any sensible person knows this is not the whole picture. Sometimes the public sector is there to help. In other cases, people rely on family, friends, and informal networks. Likewise, second-hand markets are common in urban environments.

One person’s excess can be the solution to another’s needs.

Moving from Brazil to the UK, and later Germany, made me experience waste and excess from different standpoints. In earlier stages of research, I sought to reflect on the idea of abundance to frame my experiments on waste prevention in Smart Cities. A comment made by a colleague made me correct the direction. She pointed out that abundance may suggest a passive attitude: like waiting for a cornucopia to provide resources. Her insight led me to reframe the research regarding generosity instead of abundance. Generosity is arguably an intentional act of care, which also applies to generosity towards material excess.

Avoiding the end of the world

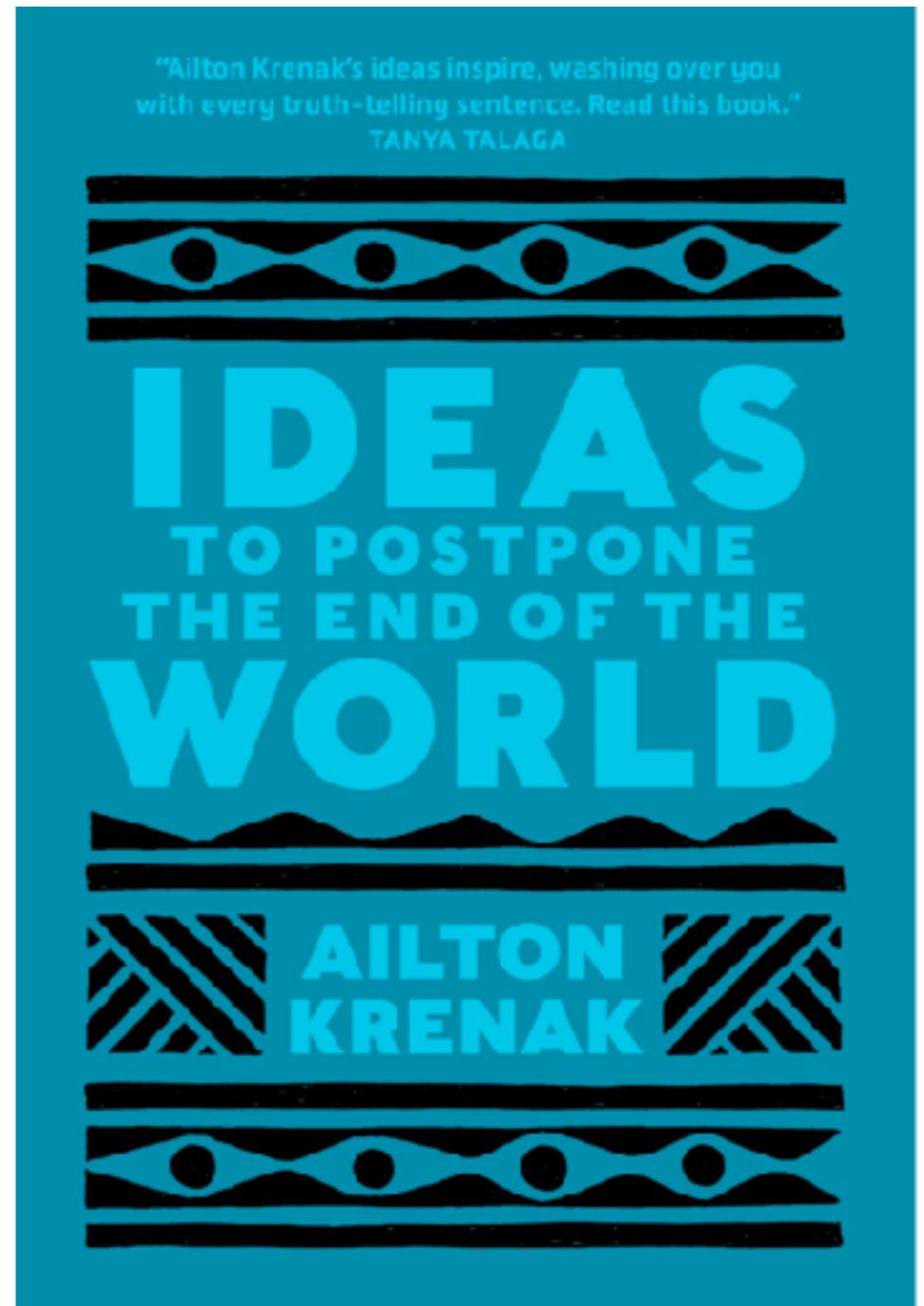
Coloniality is a theme that only appeared recently in my work. It is, however, becoming central. Not only to discuss the global metabolic rift that perpetuates centuries-old inequalities but also to shift the discussion from a grim - and scarce - scenario toward generous new possibilities.

Native Brazilian thinker Ailton Krenak disarmed a journalist that asked him some years ago how he interpreted the rise to power of a new president notoriously against the rights of First Peoples.

"The Indians have been holding out for over five hundred years now. I'm more worried about the whites, and what they're going to do to get out of this one."

Ailton Krenak, Ideas to postpone the end of the world.

Krenak's thoughts came to aid in my transition from abundance to generosity. The excess of materials in cities and regions can be collectively governed as a commons and buy us time until the whole of industrial production moves to a fully circular paradigm. Following Krenak, we must tell alternative stories to help people realise that other worlds are not only possible - they already exist.



Technology, equality and appropriation

Research blog entry

The way technologies are used will often diverge from the intentions of designers and manufacturers. There are numerous examples of vernacular uses of technologies, sometimes in line with cultural creative practices such as the ones we in Brazil call *gambiarras* and to which other cultures have their own names as well – *jugaad* in India, *rikimbili* in Cuba, and so on.

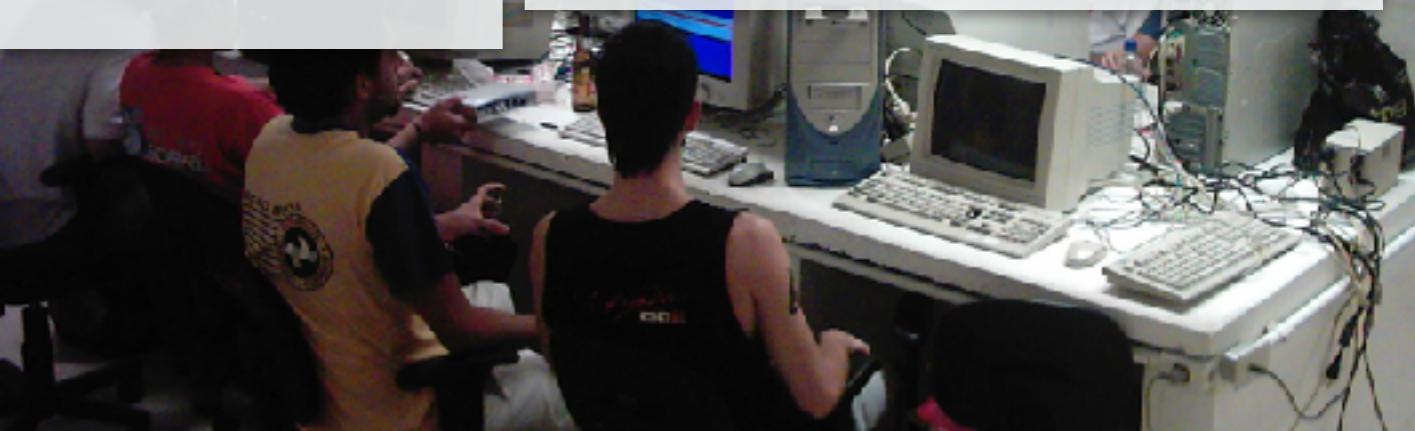
Gambiarras: making is learning is making is learning...

Perhaps these perspectives – the often rebellious, subversive, disobedient approaches to technologies – can help us understand how to design for the common good. But is that always so? It is not rare that the same alternative approaches – exploring the indeterminacy of technologies – lead to conflicting, polarising and even violent outcomes. How to move, then?

If one is to explore uses for information technology that are healthy for society at large – in other words, for the common good –, a more nuanced view is then required. It is not enough to assume that the digital is a given, that excluded communities should be brought in and learn to use it the same way as those already included. A more appropriate way to approach it could be quite the opposite.

Paraphrasing Paulo Freire, instead of promoting a banking-style of education about technology by transmitting reputable content, we should seek to encourage dialogue, use generative themes and train agents for social change. As we used to formulate back in the day in the MetaReciclagem network, 'critical appropriation of information technology for social change'.

Under that perspective, technology is arguably only a detail. It also means that a commons-based approach should be pursued throughout the development of technologies, not after their purposes and affordances are ascribed. My PhD design research concepts are but triggers to expose assumptions, not prototypes to be tested before mass manufacturing. An excuse to engage with a multi-faceted group of persons, each of whom has a very different stake in the conversations and ensuing exchanges. The attempt is to treat the research outcomes and the very social interaction in that group as a commons. The language, decision-making, and a sense of purpose are defined collectively. The bonds are deep and meaningful. That way, we are trying to build inclusion/equality and literacy/appropriation by default, from the ground up."



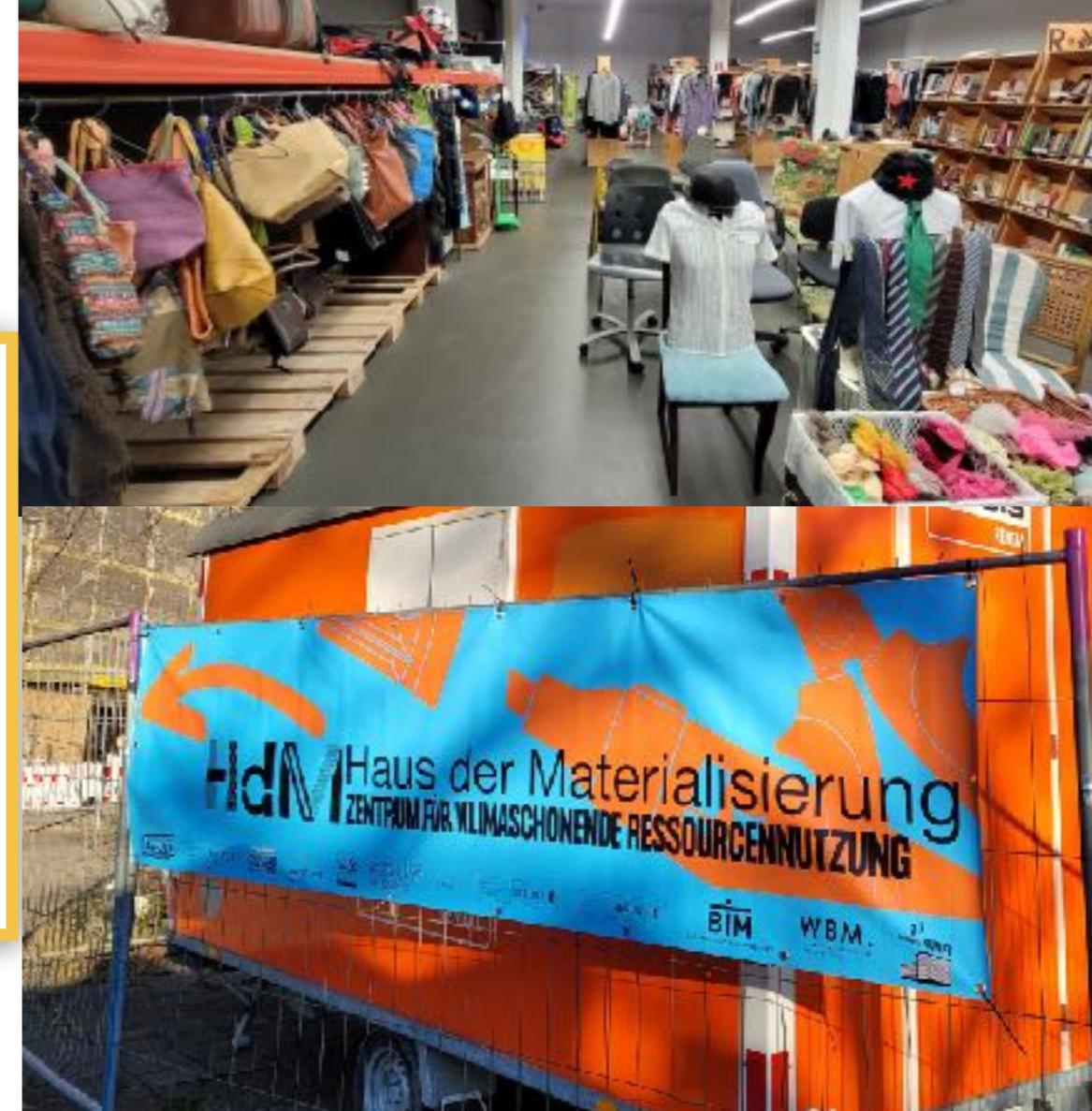
Field observation

My incursion into policies for waste prevention in Smart Cities initially intended to work further on a design concept called Transformation Labs: public infrastructure to allow individuals and communities to repair, upcycle or otherwise transform goods and materials.

I went looking for initiatives that could become transformation labs. I visited places like the Haus der Materialisierung (House of Materialisation) and attended the Zero Waste Festival in Berlin. A short stay in Barcelona for the Circular Economy Hotspot Conference allowed me to visit many projects. My conclusion was clear:

Transformation labs exist already!

Therefore, I decided to return my attention to another of my original concepts: the Reuse Commons.



Policy-making for generous cities: Reuse Commons

Anticoloniality - against the alienation of excess

Research blog entry

"New institutional forms are required. It may be useful to borrow from Elinor Ostrom's understanding of institutions not only as recognised organisational forms but also as habits, biases and cultural affordances. The extent to which design can affect change in the real world is questionable. Creating neat policies won't do much unless we factor in power and realpolitik."

Ostrom - managing the commons

1. clear boundaries
2. locally relevant rules
3. participatory decision-making
4. monitoring of the commons
5. graduated sanctions for abuse
6. easy conflict resolution
7. right to organise
8. nested within larger networks

ANTI-RACIST

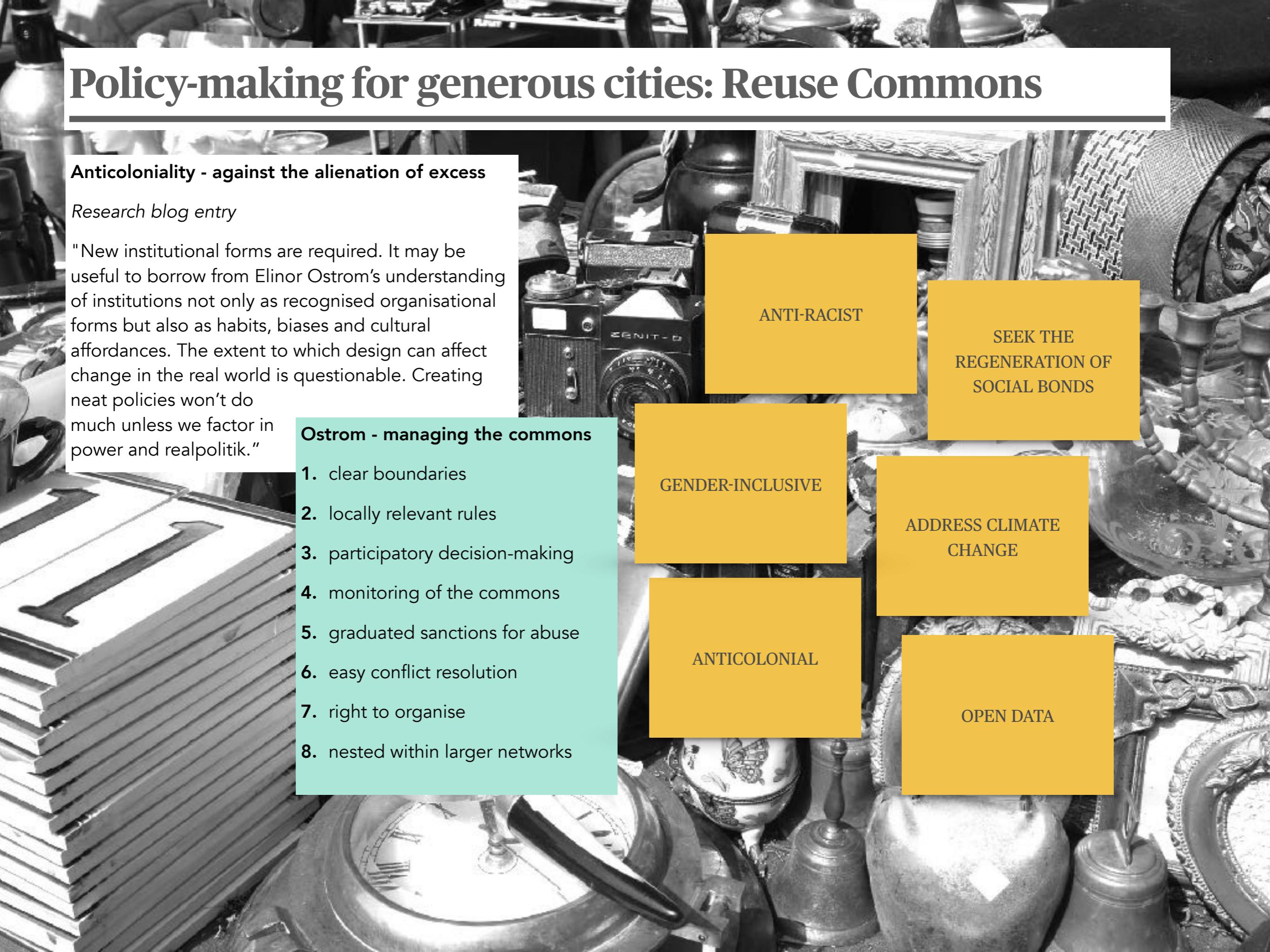
SEEK THE
REGENERATION OF
SOCIAL BONDS

GENDER-INCLUSIVE

ADDRESS CLIMATE
CHANGE

ANTICOLONIAL

OPEN DATA



Commons-based policy-making

Reuse Commons is a toolkit to develop trusted participatory policies for waste prevention in Smart Cities. It allows stakeholders to weave systems for commons-based governance of excess materials. The toolkit follows some principles:

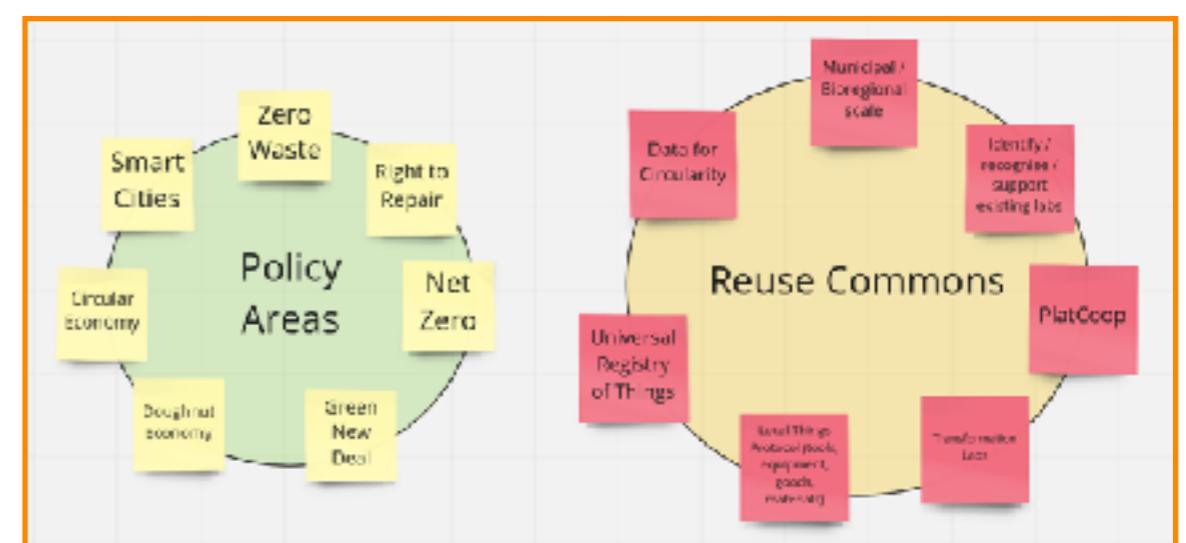
- Reward the conservation of resources.
- Evolving spiral: never return to the same state.
- Allow a diversity of stakeholders to join in.
- Stakeholders define the terms in which they participate.
- Any participant can leave as they wish.
- Create solutions for storing, transforming, exchanging, and circulating goods and materials.
- Protocols for transactions.
- Sharing of tools and equipment.
- Visualisation of the whole network.

The toolkit helps participants visualise potentialities, negotiate protocols to exchange materials and data, reflect on existing and desirable policies, and deploy or create privacy-aware technologies to help build trusted generous cities.

Municipalities, nonprofits and entrepreneurs can use Reuse Commons to shape innovative, regenerating, and climate-aware waste policies for Smart Cities.



Transforming field notes, discussions and lived experiences into a collaborative tool



Reuse Commons

A participatory toolkit to enable Smart Cities to transition to Generous Cities.

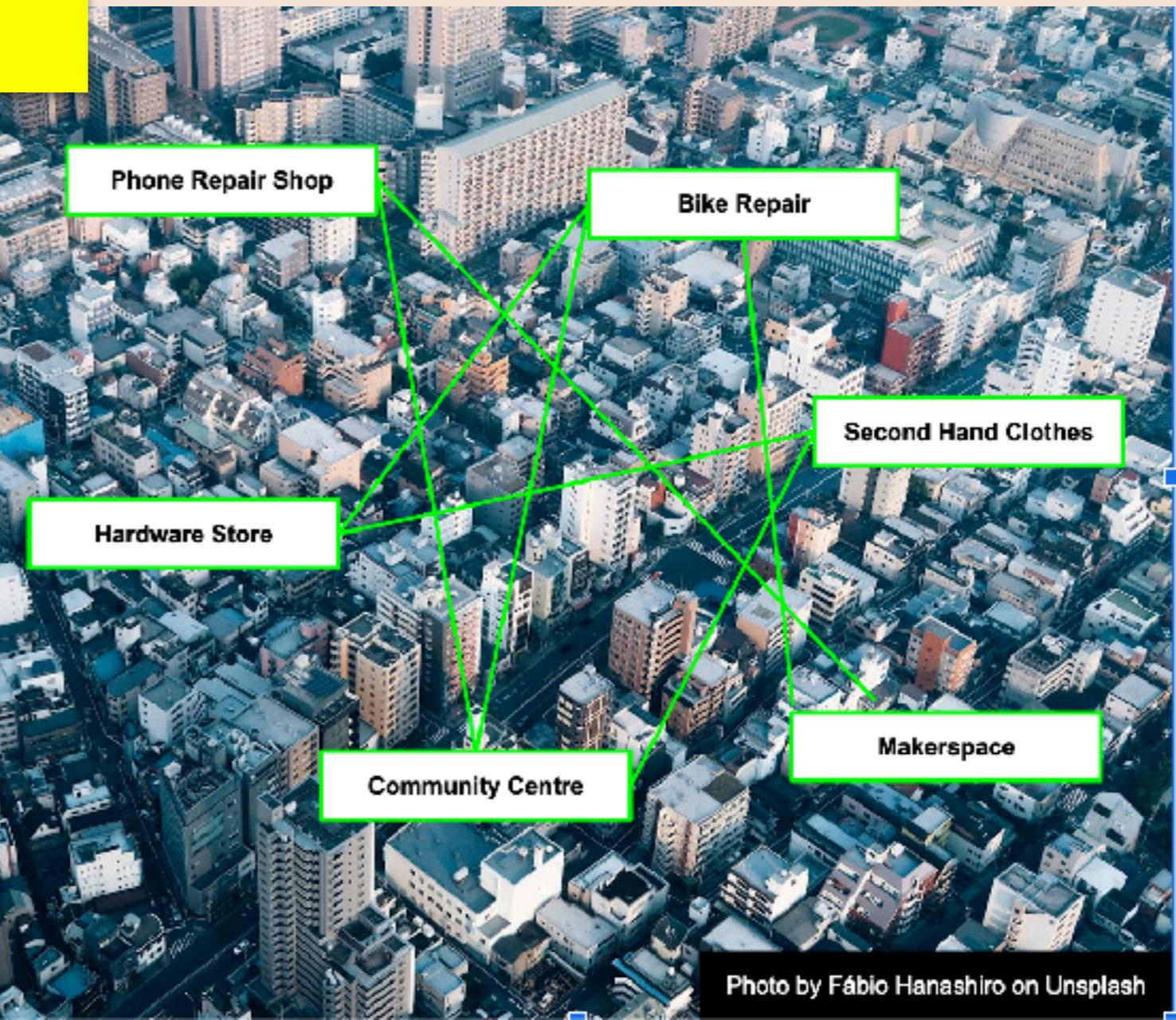
Reuse Commons contains the following tools:

- Generative Mapping;
- Collaboration Cards;
- Data / Material Flows.

"We receive 300kg of computer donations each month"

"My team is skilled in computer refurbishment"

"The city can pay for the diversion of electronics from the waste stream"





Drawing on my work exploring waste and the Smart City, I have the following recommendations for policy and Smart Cities in general:

- The top-down approach of most Smart City initiatives fails to earn trust from stakeholders such as city inhabitants, communities, organisations and businesses. I recommend participatory and transparent policies be created and implemented. Technology should not only be developed for people but also about and with people.
- Frictionless systems (e.g. solutions for waste management focused on making materials disappear from the public eye) hinder transparency and erode trust. People need to see, hear and touch information related to their everyday life in order to get the big picture. That extends to data about the waste generated and circulated in contemporary cities. I recommend adding friction to systems by making data more visible and relatable to the inhabitants of Smart Cities.

- Positive and trusted transformation must embed inclusion, human rights and respect for differences by default. I recommend policies that ensure inclusion and human rights since their early design phases for any new Smart City developments. Within the concept of Generous Cities, that means incorporating informal agents seldom considered in official waste policy conversations - such as waste pickers, members of community-based zero-waste initiatives and repair professionals.

- There is a mismatch between the time required to build collaborative policy and the time of political/electoral cycles. I recommend stronger cycles of development that weave city inhabitants into collaborative policy-making activities for the future of the Smart City, ensuring buy-in and resilience against changes in the political scenario.

- Transparency needs to be built in by default. As well as friction, I recommend data stewardship as a strategy for Smart Cities to achieve more transparency and give people more agency over the data that is being collected through IoT devices in the Smart City.