Reuse Commons - a toolkit to weave generous cities

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Abstract

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 - equates at least in part to cutting short the lifetime of things that may still have value. In addition, it requires significant investment and has environmental impacts that should be factored in. Keeping still usable materials away from waste is therefore of utmost importance. Done the right way, it can also create local opportunities for social inclusion and economic development.

This paper summarises some of the findings and reflections of my ongoing PhD research focused not on waste management but rather waste prevention through collective practices of material reuse in cities and regions. It introduces the concept of generous cities as an alternative narrative refocusing the use of technologies and methods to address the excess of discarded materials in a time of global climate emergency and fragmented social bonds. Rather than increasing the speed of collecting discarded material to be sent out to recycling, incineration or landfilling, the research aims at reflecting on the potential value of said material and how to generate social and environmental benefits from it.

Generous cities are ones in which material generosity is incentivised and rewarded. Instead of objective efficiency, I intend to highlight the centrality of intentional care - even when performed anonymously - to promote sustainability, regenerate social bonds and enable economic inclusion for local agents. A good proportion of excess materials can generate value - and not only in the economic sense - when they are diverted from the waste stream and handled with skills and knowledge that are usually already present in cities.

To ensure that waste prevention is effectively developed within cities and regions, it must be incorporated into public policies. I describe some lessons from my experience with collaborative policy-making in the past. That context informs the path of my research on waste prevention and generous cities.

I approach that context using mixed participatory methods, direct observation and co-design. I have identified individual/household behaviour, mapped urban flows of second-hand materials, created and prototyped design concepts, and engaged with an international community of practitioners and researchers experienced with different aspects of material reuse.

I am particularly interested in adopting a commons-based perspective - following the work of Elinor Ostrom - to identify and shape the governance of material resources in cities and regions. To achieve that, I have created a toolkit called Reuse Commons, through which local actors can weave systems for material reuse. The current form of the toolkit is described in this paper.

Keywords

Waste Management, Smart Cities, Commons, Urban Studies, Sustainability.

1. Introduction: excess and reuse

OpenDoTT (Open Design of Trusted Things) was a doctoral training programme from Northumbria University and Mozilla Foundation, funded by the European Union's Marie Skłodowska-Curie Actions. Between 2019 and 2022, five PhD candidates have explored how openness, design research and digital

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technologies intersect with contemporary discussion and practice over Internet Health, privacy and trust in different areas[1]. My research topic on the project was Smart Cities.

The program was composed of a consortium of organisations providing training and outreach and was designed with the explicit intention of promoting international cooperation. We were expected to work the first year from the UK, followed by 18 months at the Mozilla Office in Berlin, as well as travelling to research activities and conferences. The global COVID-19 pandemic severely impacted those plans. Still, I had the opportunity to experience diverse urban contexts and to incorporate reflections on that in my work.

The entirety of my research journey, from arriving in the UK to the moment I type these words in Berlin, followed OpenDoTT's explicit goal of going beyond merely deploying technologies by discussing how to pursue a better future for cities and their populations. My thematic choice for that investigation was to focus on local systems to promote the reuse of excess materials - broken, unfit, unused, discarded objects - in contemporary cities and regions.

When it comes to cities, discussion about the reuse of materials is often affiliated with the field of waste management. There are, however, some problematic issues with such a thematic association. The first question is the extent to which public understanding of waste has gradually been reduced to the attempt only to increase the volume of recyclable materials collected and processed by municipal services. The dominance of recycling as the end goal of waste management leads to distortions that must be addressed. The second, perhaps of a more conceptual nature, is that accepting to define things out of use as waste conditions one's perception and expectations about such materials. Accordingly, the well-known formulation "waste is matter out of place" deserves to be challenged from a perspective that considers power dynamics and conformity to a consumerist society (From "matter out of Place'' to "matter out of Time'', n.d.; Liboiron, 2019; Reno, 2014).

In my research, I adopt an alternative take: addressing excess materials in cities and regions through collaborative practices of reuse. In doing that, I shift the focus - from an increasingly automated collection of materials that should disappear from the public eye as soon as possible to an ongoing effort to identify and expose the potential value of discarded materials and actualise that value with and to the benefit of local agents.

Instead of top-down waste management, my work can be better framed as commons-based waste prevention. I adopt the same perspective regarding digital technologies to aid in that quest within Smart City initiatives. Instead of deploying sensors and data collection tools to improve objective control by entities of centralised power, my research experiments with the opposite: collectively generating and governing data to rebalance power relations (Research Collection, n.d.). I sustain that any solutions – technological or otherwise - in that context should be co-designed with knowledgeable stakeholders to ensure that relevance, trust, privacy and long-term dependability are incorporated by default. A chief concern is to ensure that those social groups already involved in reusing materials are not marginalised by future developments (Butoliya, n.d.; Kumar, 2016; Schröder et al., 2019).

That research focus led me to conduct a series of research activities over three years. I have investigated the behaviour of individuals and groups towards excess materials, mapped flows of second-hand and broken things in cities and regions, created design concepts in response to my findings, prototyped speculative technologies to help assess the potential value of goods and objects and to make related data available. All those actions were developed through participatory methods.

Contrary to top-down practices of waste management usually structured around the collection of solid waste to be recycled, incinerated or sent to landfills, I suggest that there is room for innovative approaches. In particular, by inviting local agents to create systems for the commons-based governance of materials, tools, equipment, space and other shared resources. I also propose the image of generous cities - simultaneously, a conceptual setting and an alternative narrative. I do not intend to replace the image of Smart Cities as a whole but rather to promote a dialogue in which environmental and social issues take centre stage. Instead of getting rid of excess materials through engineering and logistics,

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[1] The topics were: Wearables and the Self; Smart Homes; Communities and Neighbourhoods; Smart Cities; and A Trust Mark for IoT.

generous cities would be those promoting practices of care that intentionally transform excess into generosity.

I recognise that promoting a critical perspective on waste management is a crucial first step for my research to reach the public sector, as well as nonprofits and society at large. The global climate emergency requires from all fields of knowledge a deeper reflection on the materiality of contemporary society and its future conditions of objective sustenance. By setting my research on designing commons-based systems for material reuse, I expect to help set the foundation over which new approaches can be created with increased awareness of the delicate situation we live in - not around largely abstract and arguably obsolete goals of waste collection envisioned decades ago.

The following sections explore possibilities of participatory policy-making to weave generous cities. I describe a design concept developed with that goal in mind: Reuse Commons, a toolkit to help create commons-based local systems for the reuse of excess materials. This paper also occasionally references generous cities, a concept I will develop in more depth in my PhD thesis.

2. Designing services for waste prevention

To describe it as briefly as I can at this point, my research centres on how local societies can cope with excess materials under a conceptual framing of generosity. This specific focus for the investigation is based on two perceptions. First, my hands-on involvement in the past with community initiatives promoting the reuse of materials. I build on experiences with the reuse of discarded electronic equipment in the MetaReciclagem network[2] - active in Brazil between 2003 and 2012. The second factor in deciding for this particular research topic is the scarce literature I could find connecting inclusive urbanism, digital equality and environmental issues. Particularly on discussions about Smart Cities, there seems to be no awareness of the rich scholarship, for instance, on Lefebvre's idea of a Right to the City (Lefebvre, 2017). When it comes to the topic of waste, there is often a unidimensional understanding that the only goal to be pursued by using technologies in cities would be to increase the volume of recyclable collection.

At that confluence, my research experiments with an alternative narrative around what to do with excess materials. It starts from the recognition that contemporary cities will inevitably produce or import a volume of goods and materials that exceeds the local society's ability to use them. The reasons may vary from city to city, from country to country, and from one season to the next. Excess can result from overconsumption, changing economic conditions, product obsolescence, and the availability or not of maintenance services, among other factors. In any case, I propose that developing solutions for excess materials should always involve local stakeholders actively.

Under a global climate emergency, striving to conserve natural resources is paramount. In other words: to understand that raw materials were already extracted from nature and had their environmental footprint increased since being transformed into goods and objects. In that situation, it is only logical that those goods should stay in use for as long as possible - both delaying the need to extract more raw materials as well as maintaining the value added to them by manufacturing and logistics. It is then vital to challenge the cities' mandate to recycle as much as possible of discarded materials. Premature recycling of objects equates to cutting short the value those objects could still hold. Furthermore, recycling is an industrial practice with its own economic and environmental impacts - deriving from logistics, use of energy and the inevitable devaluing resulting from transforming a manufactured good back into raw materials, as comprehensively explained by McDonough and Braungart (McDonough & Braungart, 2002, 2013).

The practices of reuse I investigate are often identified within the field of waste management. As discussed in the introduction, however, such framing is not entirely appropriate and often leads to distortion. Instead of merely trying to make waste management more efficient with new technologies and methods, I adopt a perspective of socially-inclusive waste prevention. I am not naive to suppose we

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[2] MetaReciclagem was a distributed network of comunity labs in which donated computers were refurbished using free and open source software.

can eliminate the production of waste in the foreseeable future. Nonetheless, framing the discussion into making the most out of materials that have already been extracted from nature and transformed into objects helps us see the situation from a different angle. It creates new possibilities with positive impacts both in environmental and socio-economic terms. That should be the backdrop to any attempt at developing solutions.

My work is noticeably related to systemic proposals willing to impact policy-making, such as the Circular Economy (Ellen MacArthur Foundation, 2015, 2019; Webster, 2017) and Doughnut Economy (Raworth, 2017). By extension, it also relates to emerging fields such as Zero Waste and similar ones exploring concepts of resource sufficiency. Additionally, points of interaction with the policy agenda manifest in terms such as the Green New Deal or similar formulations, as well as "Net Zero" commitments on an international level. Even if well-intentioned and driven by scientific evidence, however, most of these approaches risk adopting a top-down nature in wealthier nations and a colonial position over developing countries (Schröder et al., 2019). My intention to always bring local stakeholders - particularly those with embodied experience in the reuse of materials - to the discussion and decision-making is a response to that perception, partly based on my experience before starting the PhD. The intention is to replace unidimensional solutions based on the perspectives of corporations and government with alternatives centred on people - city-dwellers, consumers and specialised labour.

2.1 Policy and Smart Cities

Among the many possible ways to criticise the Smart City narrative, the lack of social participation is a frequent concern. It may be redundant to argue that democratic institutions should regulate the deployment of data-driven devices in the urban environment with transparent and accountable rules. That is, however, not always the case. Sidewalk Labs' attempt (Ahmed et al., 2019) to force into Toronto the company's understanding of what a Smart City should be is a significant - and by far not the only - example of authoritarian behaviour.

Critical literature about Smart Cities (Cardullo & Kitchin, 2018; Engelbert, 2019; Greenfield, 2013; Morozov & Bria, 2018) explores some aspects vis-a-vis references to a Right to the City (Harvey, 2003; Lefebvre, 2017; Sassen, 2007). Smart City initiatives usually offer little to no agency for most local stakeholders. They adopt a top-down approach in which the interests of corporate actors and local authorities align. Typically, expanding profits of the former and control over society by the latter. The collusion of political and economic powers and the resulting unequal dynamics are relatively easy to grasp in topics such as street surveillance with cameras. But it is often unaddressed regarding other target areas of Smart City development. Public services are redesigned under a questionable measure of efficiency (Greenfield, 2013) based on costs and frictionlessness. The meaning of such efficiency is seldom discussed with local populations, and even less so is whether city dwellers' even desire to have services redesigned along these lines. Societal trust in solutions - particularly technological ones - is taken for granted.

When expanded internationally, the Smart City rhetoric acquires even more unbalanced characteristics (Datta, 2015; Datta & Odendaal, 2019). Not only do its leaders allow little room for criticism, but their discourse is charged with coloniality. Typically, the discussion about Smart Cities in developing countries implies that the solution for problems faced by any municipality already exists. It has been created and tested in rich nations and should be imported wholesale, sometimes attached to earmarked development funds. Arguably, even in societies with relatively advanced democratic institutions, participation is lacking in Smart City initiatives (Willis, 2019). When transposed to nations where such institutions are still emerging and gaining stability, there is a need for even more participation and consensus-making. Not less.

2.2 Policy-making in practice

I come from a background in grassroots activism on themes such as digital rights and ICT for development. My involvement with policy-making happened as some collaborative projects I co-founded started to scale and become influential in Brazil about two decades ago. After some time, it became clear to the people involved that ad-hoc activism was not the most effective way to promote

sustained change in the real world. If initiatives were to achieve permanence, they had to acquire institutional legitimacy. We found that this can happen by influencing those political actors involved in making, discussing and approving policy and deciding on budget allocation.

Policy-making can be described as the creation of clear and rational rules over collective - and often diverging - interests. It could then be interpreted as an ongoing effort to shape and adapt institutions to govern society. Policy-making is also related to enforcing and monitoring legislation, regulations and their concrete use. My experience in Brazil made me conscious of well-written laws which are simply not put into practice. It is then essential to reflect also on the limits of institutional policies.

Sometimes creating policy requires stakeholders to reduce the complexity of issues in order to seek consensus - as boundary object allowing different vocabularies to find common ground (Star & Griesemer, 1989). When interests diverge significantly, the result may be that none of the parts involved is satisfied. The most appropriate way to address such a condition would be to involve the affected parties as much as possible in the process from the beginning. Design research methods can come in aid on this matter.

Regarding policy areas relevant to my research on the reuse of materials, there is a comprehensive background following decades of discussions, conferences and developments. The well-established formula of the "Rs" of waste was gradually assimilated by public opinion and influenced policy-making worldwide. The simplest version of the formula says that society should Reduce consumption, Reuse products and materials, and Recycle what can be recycled. There are alternative versions of that formula with additional steps. Whatever the formulation, there is an expected hierarchy for those measures. Recycling should be a last resource, only actioned when reducing and reusing materials is not feasible anymore. As a growing number of accounts phrase it, recycling is not enough (Reaching 2030's Residual Municipal Waste Target — Why Recycling Is Not Enough — European Environment Agency, n.d.; Sullivan, 2020). Waste prevention practices are more effective per money invested than collection and recycling (Esmaeilian et al., 2018).

In my research, I focus chiefly on waste prevention through community-based reuse practices, usually found in projects of repair, upcycling and re-circulation. A central question then follows: how can participatory policy-making be developed to reflect the concerns of different stakeholders involved with such initiatives?

3.   Weaving generous cities

OpenDoTT was planned around a progressive structure. In the first year, I have identified waste prevention as my central subject of investigation within the topic of Smart Cities. I then conducted two research studies and created eight design concepts in response[3]. During the second year, I led an online co-design lab with active participants from seven countries and worked on prototypes based on those concepts. Two such prototypes were speculative technologies: ThingWiki (an online database collecting information about the reuse of products and materials) and E-I, or Evaluation Interface (a machine to identify physical objects and parse information from ThingWiki). Even if unfeasible – presently or at all - due to technological limitations or predictable constraints to data access, they helped trigger "what if" scenario projections in conversations with participants. The other prototype was a blueprint for that I called Transformation Labs.

Transformation Labs were my response to a perceived absence of available infrastructure for city dwellers to access tools, equipment and knowledge to reuse materials through repairs, upcycling, adaptations, and exchange. I saw Transformation Labs as similar to Fablabs and Makerspaces, only tilting the discourse and vocabulary from designing new products to be manufactured from virgin materials to the reuse of redundant matter. Developing new devices, tools and data entry points to feed on other design concepts such as the Universal Registry of Things was also part of the plans for the Labs. I assumed there was room to deploy them as public infrastructure in cities and design policy around their

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[3] The names of the design concepts are quite self-explanatory: Universal Registry of Things; Point and Reuse; Save this Thing; Make Waste Visible; Reuse Dataset; Reuse Commons; Transformation Lab; Reuse Bin.

social, environmental and economic benefits. My initial expectation for the final year of research - focused on policy - was to work further on the concept.

However, my approach to this last round of co-design led me through a significantly different route. That was based on my direct observation of reuse initiatives in different parts of the world, as well as taking part in a series of events on related topics both online and in person and ongoing interaction with peers working in the field. Additionally, a recent call to pay attention to issues around coloniality helped me better understand my path.

To this last point, looking back on my previous experience in international cooperation, I can now identify aspects of colonial imposition both culturally and financially. I expect my work to be useful for waste prevention and material urban generosity beyond the cities in the global north. In that case, it doesn't make sense to focus on a prescriptive blueprint with a list of equipment, spaces and methodologies. Instead, I prefer to be informed by relevant work to balance scarcity and excess in all parts of the world.

I had, for instance, the chance to learn from initiatives such as #ASKNET (#ASKnet, n.d.), which helps organise repair cafes, set up physical workshops and promote knowledge exchange in different localities of Africa. I had yet another layer of understanding when participating in CEHotspot, a conference on Circular Economy in Barcelona. The meeting took participants to visit a series of circular economy initiatives, including reuse centres, social stores, community-based repair workshops and a fablab integrated with a natural park. I made similar visits and observations to reuse initiatives in Berlin, as well as a festival on Zero Waste. I have also attended events on innovative approaches to policy and public administration, and presented my work in a seminar (Dillon, 2022) associated with COP-26, the international conference on environmental policy. I reflected on projects I was involved in prior to starting the PhD under a new framing. Finally, conversations with OpenDoTT colleagues and supervisors were also part of my construction.

I eventually decided to move on from the plan of detailing a blueprint for Transformation Labs in the form of a predefined infrastructure. It is important to this point to mention scholarship exploring connections between grassroots innovation, makerspaces and social issues (Maxigas et al., n.d.; Smith, n.d.; Smith et al., 2013; Troxler, 2016; Troxler & Maxigas, 2014). In connection with that perspective, I started viewing any contemporary city as a large-scale situated makerspace. In that setting, materials are already circulating and being transformed by all sorts of facilities: commercial repair services, community networks, material exchange projects, civic collectives, second-hand shops and many others. Equipment and knowledge are already in place. One should look into ways to enable them to be used and to produce local social and environmental outcomes.

4.   Commons for waste prevention

Cities have workshops where skilled persons transform, repair and adapt goods and objects. To increase the reuse of materials under a vision of generous cities, what needs to be better developed are governance tools enabling individual and collective actors to connect and find ways to cooperate. Cooperation can take many forms - sharing tools and equipment, circulating materials, bidding collectively to acquire infrastructure or influencing policy-making at a local and regional scale.

This understanding made me return to another of my design concepts. Originally described as an "ecosystem for the collective stewardship of post-consumption materials", the Reuse Commons can be thought of as a mediating layer connecting initiatives on the ground with one another. It can also become a systemic tool to negotiate generous city strategies between communities, nonprofit organisations, businesses and the public sector.

The Reuse Commons is - and explicitly so - inspired by the literature on commons-based governance systems. Chiefly the work of Elinor Ostrom (Bond, 2013; Ostrom, 1990; Savazoni, n.d.) poses the concept of institutions as collectively recognised systems - either formal or informal - to govern common-pool resources. That perspective on the commons is helpful in situations with diverse stakeholders simultaneously competing and cooperating in a sustainable way. Looking to develop ways to govern the

reuse of materials in cities and regions should draw inspiration from these forms. A Reuse Commons strategy can help reinforce the social and environmental benefits of actors often seen as isolated, such as repair shops, clothing swap events, mobile bike repair workshops and a vast diversity of other initiatives.

Ostrom proposes eight rules for managing the commons, most of which can be immediately applied to the Reuse Commons concept. Risking oversimplification, they are as follows (Wall, 2017):

- Clear boundaries.
- Locally relevant rules.
- Participatory decision-making.
- Monitoring of the commons.
- Graduated sanctions for abuse.
- Easy conflict resolution.
- Right to organise.
- Nested within larger networks.

Departing from top-down waste management defined exclusively by local authorities in the direction of commons-based governance of excess materials can significantly improve multi-stakeholder trust in social and environmental strategies for waste prevention. In the following section, I introduce the Reuse Commons toolkit as a concrete means to co-design policies to aid in that.

5.   Reuse Commons

Reuse Commons was developed as a toolkit for local agents to create systems to increase the reuse of goods and materials. It can be used as a guide to facilitate strategic workshops at the municipal scale or otherwise applied by individual organisations to identify potential tactics to promote systemic change in handling excess materials.

The first layer of the Reuse Commons is a generative mapping. It starts from a geographic map of the city or region, on top of which participants locate actors in multiple sectors that can potentially integrate the reuse commons: repair professionals, hardware stores, waste sorting centres, recycling facilities, second-hand shops, technical schools, and any other type of organisation that proves relevant for material reuse on a local scale.
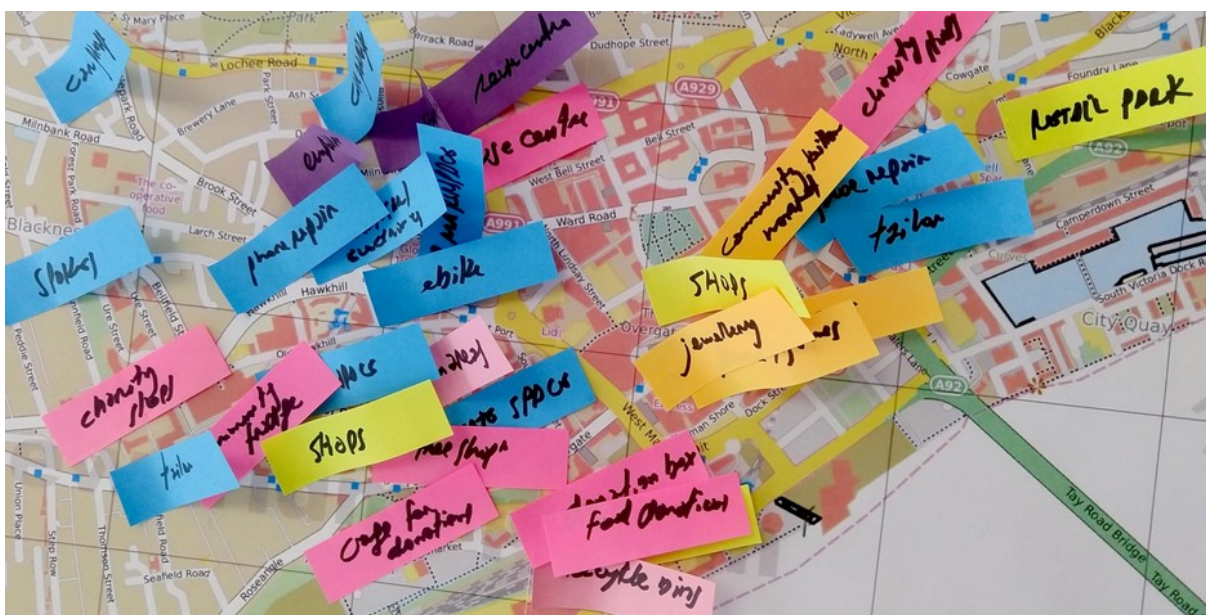

Figure 1: generative mapping.

On a second level, similarities and complementarity between agents are discussed. Profile descriptors are used to map offers and requests of each agent to the commons - for instance, tools, equipment, goods and materials. Current and desirable flows of materials and information are plotted back to the map.

Figure 2: Thematic cards.

Finally, thematic cards trigger conversations between participants and drive them to agree on strategies and future actions. Relevant gaps in data generation and availability, legislation, communication and other aspects can guide the development of novel responses on multiple levels - from policy to technology to infrastructure. Matters such as ownership of tools, governance of materials and the future evolution of the system are decided upon collectively.

Ideally, the Reuse Commons would be the environment on top of which other design concepts and prototypes I have worked on can come to life. These can feature as individual cards in the toolkit, to be applied where users see fit. That would be the case with the Universal Registry of Things, the Evaluation Interface, Point and Reuse and Transformation Labs, the Reuse Dataset and others.

Groups activated by the Reuse Commons can partner with initiatives under diverse framings such as Smart Cities, Doughnut Economy, Circular Economy and Zero Waste to design and implement policies that reinforce the importance of addressing climate change at a local level. Participatory local legislation on the Right to Repair can expand national or international policy ('Austria Launches a Nation-Wide Repair Bonus Scheme', 2022; 'EU Reaches Deal on Common Charger – Finally a Charger to Fit Them All!', n.d.; 'Germany Commits to Right to Repair - Civil Society Demands More', 2022; New York Passes

World's First Electronics Right to Repair Law | iFixit News, 2022; Mikolajczak, 2022) and improve the conditions for initiatives on the ground. Furthermore, technologies and collaborative methods can be used to track objects and ensure they have a longer lifetime, provide information about parts and components, and offer the means to reward individual or organisational behaviour that helps keep materials in use instead of discarding them. Participatory strategies that explicitly commit to addressing global change by setting the conservation of materials as a goal can foster innovative solutions based on the generation and use of open data.

6.   Conclusion

This paper draws connections between my research on waste prevention in Smart Cities and participatory policy-making. It introduces the concept of generous cities as an alternative approach for local initiatives to address the issue of waste in the urban context and its environmental and social implications. Instead of managing waste simply as a logistic operation, I propose to help prevent waste through collective and socially aware reuse practices - namely repair, upcycling, and re-circulation. Such practices should feature in and be supported by local policy. I present Reuse Commons as a toolkit to help local actors in cities and regions create their situated solutions in that area.

The focus on generous cities - regenerative both in social and environmental dimensions - allows Reuse Commons to promote potentially transformative dialogue for policy-making at a local level. It can shift the focus of waste management from an uncritical effort to speed up the pace of consumption and discard toward one in which care for humans and materials is central. This conjunction helps establish a new vocabulary setting cities as powerhouses of environmental regeneration in the context of a global climate emergency. Involving stakeholders every step of the way contributes to strengthening social ties and rebuilding trust in institutions.

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