Regulating Responsibility: Environmental Sustainability, Law, and the Platformisation of Waste Management

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The scope of Sustainable HCI research is expanding to include the broad sociotechnical and ecological contexts of computing. We examine the intersection of environmental sustainability, technology, and the law. By studying the legal dispute between a platform service that facilitates crowd-sourced waste disposal and the local government's regulation of waste management, we step through an evolving debate on the meaning of care and responsibility for the environment. When faced with the municipality's claimed monopoly on responsibility for waste management, the platform argues for the paradigms of individual responsibility, designing for user needs, and personalised and on-demand digital services. In arguing against this framing, the municipality highlights the gap between the law, its interpretation, and the idealistic values of technology-driven environmental care. We contribute to the framing of environmental care within Sustainable HCI as a locally constructed, regulated, and contested aspect of technology design and appropriation.

CCS Concepts: • **Human-centered computing → Empirical studies in collaborative and social computing**; **Empirical studies in HCI**; • **Social and professional topics → Governmental regulations**.

Additional Key Words and Phrases: waste management, platform economy, regulation, law, environmental sustainability

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1 INTRODUCTION

In 2017, Stockholm Municipality filed a legal case against the IT company Tiptapp, owner of a digital platform that matches on-demand workers with private actors who intend to dispose of household waste (e.g., bulky items). The legal case lasted for five years, and included a series of court decisions, appeals, and counter-appeals focused on the (re)interpretation of local and national waste laws in the light of technological advances, disputes concerning the actors that are allowed to do waste management, what it means 'to take care' of waste, and on how this connects to environmental protection. The digital platform was initially banned, but the final court decision was in favour of its use, with the result that the technology is now officially allowed in local processes of waste management.

In what follows, we use this case to investigate the intersection between environmental sustainability, digital technologies, and local infrastructures, particularly in view of how acts of care for the environment, in the form of waste management, are configured through the relations with local laws and regulations. Our analysis shows that the overarching questions framing the dispute are not merely legal (defining the different parties' rights, obligations, or wrong-doings); they also include an ethical dimension that contends with responsible waste care, its contextual and

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historical meanings, and questions about who (e.g., individuals, organisations) is allowed to foster it — or not. We argue that both legal facts and ethical stances should be considered when designing for environmental sustainability, and that we need new methods and strategies to include them in design processes.

The increasingly prominent feminist perspectives within Sustainable HCI [38, 41, 56] move the design and appropriation of digital technologies from individual, rational, choice-based intentionalities towards ecological and relational perspectives on how responsibility for, and acts of care for the environment are ecologically configured. Research, for instance, has shown that the adoption of more sustainable lifestyles intersects with both norms and physical infrastructure [27], and has argued for the need to consider historical, cultural, religious, and geographical relations with nature [10, 54], and alternatives to neoliberal market models [54, 58] as central to designs concerned with the climate and environmental crises. Connecting to the field of Environmental Studies [3, 48], past work [56] has introduced Digital Environmental Stewardship as a framework for understanding and designing acts of care for the environment in the context of waste management. This framework draws attention to the many actors (e.g., individuals, institutions, collectives), their motivations, and available capacities (e.g., local expertise and knowledge, financial resources, physical infrastructures, regulations, human assets) that are involved in collectively protecting and responsibly using the environment. The framework outlines the inter-dependencies between these dimensions to examine what can hinder acts of care for the environment, but also how they can be mobilised, and configured through digital technologies. In this paper, we extend these contextual framings of environmental sustainability by considering the intersection of digital technology with the law and regulation. Expanding this stewardship framing of environmental care, we zoom in on the interactions between technology, law, and infrastructures, and how these capacities mutually configure responsibilities in platform-mediated waste management.

The role of law and other regulations is clearly linked with foundational concepts in environmental sustainability such as defining pollution [37]. It is also connected with the spread and broad adoption of digital platforms [42, 51] which, through what has been termed the platformisation of infrastructures [68], are transforming city governance and policy for the provision of essential services. Nevertheless, although researchers working on issues of the platform economy in HCI and CSCW [15, 26, 31, 65] have made calls for better engagement with policy and policymakers, regulation has infrequently been directly considered in HCI [35], and specifically in Sustainable HCI [23, 67]. In this paper, we explore the legal contestation of waste management regulation in Stockholm, Sweden, through the case of a gig-economy platform for waste disposal, and the company's appeal against a ban from the local municipality on delivering their service. The platform, Tiptapp, allows private individuals to broker waste disposal by creating listings of items to dispose for a fee, collect for free, or to collect and donate to charity. After initial inquiries regarding its business operations, Tiptapp was banned by the city on the grounds of a perceived danger to environmental health, due to unregulated and uncontrolled transfers of waste from individuals to other individuals. Across five years of appeals, the ban on Tiptapp was overturned, impacting on the interpretation of waste management and environmental protection law, and the delivery of waste management services at local and national levels. Positioning our analysis as an a feminist ecological perspective on waste management, we seek to understand how digitally mediated waste management is made to work – or not work – from the perspective of a city, a municipality, and a digital service provider, and not individuals and citizens as it has been common in HCI.

Rather than contributing to a polarised discussion of the role of sharing platforms within urban infrastructures (e.g., revolutionary versus dystopian visions), we approach the legal case as a means to unpack the situated circumstances that brought attention to the platform, and the terms whereby the legal discussion was framed in the relations between the platform and a specific urban context. Our analysis is centred on the legal proceedings that were produced throughout

the five years of the court case, and that are publicly available at dedicate websites (see Section 4.1). It characterises the relations between environmental care, technology and the law through interpretations of the local and national waste regulations, accounts of how responsibility for waste management emerges historically and legally, and can be configured through designing waste actions, interactions, and urban waste systems. We conclude by discussing what this means in terms of design processes and practices, and what it would entail to include regulatory aspects in design.

2 RELATED WORK

This paper expands research that has argued for more holistic and relational approaches to Sustainable HCI, by specifically addressing the role of law and regulation in configuring technology-mediated practices of waste management. Below, we first introduce relevant perspectives within Sustainable HCI and, then, discuss previous research on waste management and on the interactions between regulations and digital innovation.

2.1 Relational Perspectives within Sustainable HCI

Expanding foundational contributions on different approaches to sustainability within HCI [24], and on how to achieve sustainability in and through design [16, 43], there have been many calls for HCI researchers to consider sustainability in broadly ecological and relational perspectives. This scholarship has commonly emphasised concerns to understand sustainable practices as political [33, 46], and entangled with both local governance [67] and diverse aspects of everyday life [17]. These include calls to move beyond notions of individual responsibility and rational choice [16] to see sustainability as something which is produced in complex and contextually performed practices [54]. These latter approaches have asked researchers and designers to look more closely at the social and material contexts in which sustainable (or unsustainable) actions occur, including scaling out to planetary levels [53]. In their scathing take on sustainability to date in HCI, Knowles and colleagues [33] emphasise the need to engage with and account for the political aspects of sustainability research and technology design. Their work calls for a move away from views of sustainability as the individual choices underlying persuasive technologies, rational models of change, and notions of responsibility. Previous studies [27] have, for instance, demonstrated that radical changes in lifestyle, such as giving up a car, are shaped by relations with societal norms, public infrastructures, and local policies. At the same time, work by Mohammad Rashidujjaman Rifat and colleagues [54] shows how HCI, by employing modernist logics towards optimisation, often overlooks long-established values towards sustainability that find their roots in religions, and that are embedded in the practices and social life of communities often marginalised in HCI and other scientific discourses. A turn away from modernist logics is also present in Bonnie Nardi's [46] argument for post-growth approaches, which emphasise both the political critique of capitalism as a defining logic and action towards changing the logical underpinning the design of systems, including technological systems. Such arguments, shared with the increasingly popular political economic perspective towards international taxation [49], suggest that greater regulation might be more beneficial than uncontrolled innovation prompting unsustainable consumption.

Approaches such as practice-centred theories [12, 61], ecological perspectives (e.g., permaculture [41]), and more-than-human perspectives [11, 40] have been proposed as alternatives to understand, design, and assess interventions for more sustainable futures in a more holistic manner. Permacultures are presented as instances of how to work alongside nature in mutually beneficial cooperations [41]. Research has also shown how attempts to reduce energy consumption are interwoven with local practices and shared cultural meanings (i.e., social understandings of cleanliness, comfort and convenience) [60], or with unexpected, collective behaviours, such as competing with others instead of cooperating to reduce energy consumption at a community level [30]. Related work [10] has also argued for the need to bring

nature into design processes, and to consider the historical and geographical relations that people have with the Land. As argued, this socio-ecological approach is essential to move away from views of the environment as a commodity to be used, away from the "dissociative sociomateriality of waste" [28, pp.2413], and to develop alternatives to the anthropocentric conceptualisations of design – an essential move to respond to the environmental and climate crisis (see also [2, 39, 63]).

Contributing to more ecological and relational approaches to SHCI, an emerging body of work has addressed the interactions between sustainability and economic systems, specifically neoliberal and capitalist markets in the Global North [38]. This research outlines how the ongoing environmental crisis calls us to challenge current economic systems, particularly economic models that are not necessarily based on ideals of growth, and that instead value environmental, social, and spiritual impact [34]. Resonating with this argument, recent HCI work has suggested [58] for including the social, environmental, and economic dimensions as fundamental pillars of SHCI research, and exploring how they become interconnected in concerns for more sustainable futures. This work has argued for a need to investigate alternatives to neoliberal market models, and for a reconsideration of the economies of production, distribution/consumption (see [4], for instance), and exchange.

Finally, drawing on the notion of Environmental Stewardship borrowed from Environmental Studies [3, 48], research [56] has illustrated how acts of care for the environment are continuously – and ecologically – reconfigured through the inter-dependencies between the many actors involved, their motivations, and their capacity to act – from social and cultural assets to context-specific practices, economic resources, local governance, and regulations. Zooming in on different examples of waste management practices, this research points to the need to consider how individual acts of care for the environments can add to and transform other environmental actions, and how, outcomes of digital interventions (e.g., the collection of waste data) can become resources to infrastructure other actions. Moving beyond motivational factors as the main causes of inaction, this work has also reflected on the role of capacity gaps (e.g., gaps in the infrastructure, legislation, or needed knowledge) as essential in considering the roots of inaction in the adoption of sustainable practices.

To sum up, this body of work urges us to consider sustainability within HCI more ecologically, by challenging anthropocentric design practices, and addressing both existing and emerging relationships between humans, digital technologies, and nature. Previous research within SCHI has considered the role of market design in endorsing more sustainable ways of living, and how gaps in the configuration of relations between actors, motivations, and enabling capacities can hinder acts of care for the environment. Despite the call for socio-ecological framings of sustainability, SHCI has not addressed the mutual relations between digital innovation, local regulations and governance. As our case illustrates, this last point is significant to understand the role of platforms in shaping the provision of environmentally sustainable urban services, particularly as IT companies challenge both the legislation and the role of municipalities in governing processes and practices such as waste management [1, 70]. As we show below, this lack of focus on governance and regulation is also reflected in previous work on waste and HCI.

2.1.1 Waste Management in Sustainable HCI. Predominantly shaped by concerns for sustainability "in" and "through" design [43], and mostly focusing on the interactions between humans and machines, HCI research has explored the role of digital technology in supporting waste practices in different contexts, such as private households [19, 21, 22], student housing [13, 66], public spaces, exhibitions, or cultural sites [36]. BinCam, for instance, was designed to change people's behaviours through negative reinforcement, reflection, and social influence [66]. Investigations of this prototype [13] have shown that household waste practices are shaped by habits rather than rational choices, and that sharing pictures

of waste on social media caused tensions between the participants' experience of their recycling attitudes and their actual behaviours. Waste Wizard [29] is another example of a digitally enhanced trashcan that uses machine leaning to sort waste in public spaces, while Close-the-Loop [8] uses micro-location technology to support proper recycling practices.

Although recycling practices and their regulation underlie the waste behaviour such technologies seek to endorse, their role is not explicitly addressed, and neither is how emerging micro practices of waste management relate to macro dynamics of waste – e.g., relations between digitally enhanced artefacts and physical infrastructures such as communal sorting facilities or local regulations. These interdependencies are neither easily captured nor structured through design. For instance, while owners and promoters of digital innovation may claim that waste data collected through platforms can shape waste policies and help municipalities enforce regulation to limit urban pollution, it is unclear how these dynamics of interactions are configured in real life (see [56]). Moreover, as brilliantly noted [37], the nexus between law and waste can be highly problematic, inherently defined by colonial relationships to land, and result in the level of damage that is allowed before being considered harmful.

2.2 Digital Platforms and the Law

A growing number of legal cases and research have drawn attention to how and where digital technology intersects with law and regulation. Clear examples include the introduction of the European Union's General Data Protection Regulation and its wide-ranging – but limited in practical terms [7] – implications for privacy and personal data. HCI researchers have long called for greater engagement with the law and public policy, though few papers do so directly. One example is that of Tenório and Bjørn [64], who examine the discursive presentation of chat technologies in legal cases in Brazil. By considering how these technologies are framed within legal cases, the researchers show how technologies mediate and are mediatised in the case of harassment.

The relations with laws and regulations are not a new issue for the diffusion of digital innovation [51] , with regulatory fields such as consumer protection, employment and labour, disability laws, or copyright protection providing various significant cases of what has been defined as the "regulation-innovation nexus" [42]. Over the last decade, an extensive body of research has addressed the challenges that sharing platforms cause for both economic practices and labour relations [26, 32, 65]. This scholarship has contributed to a critical discourse about the sharing economy and on-demand labour, and has called for the establishment of fair and transparent wages [55], new regulatory frameworks, and their reinforcement by local authorities [70].

More recently, however, and with relevance to our case, an emerging body of work has tackled the impact such platforms have on the provision of central urban services, their governance, and their regulation. Connected under the concepts of platform urbanism [70] and the platformisation of infrastructures [68], the recent technological developments have shown the infrastructural power of these platforms, and how they have resulted in an ecology of platform-centred services that directly involves public organisations, citizens, and private actors backed by venture capital. Overall, this body of work illustrates how platform-centred services develop infrastructural aspects, while new and existing infrastructures are reconfigured by platform mechanisms [50].

The large mobilisation of their user base has given platform companies an institutional power, with IT companies participating in processes of urban policymaking and regulatory change. Airbnb is a telling examples of how sharing platform companies can influence the deregulation of short-term rentals in metropolitan areas [20]. In a number of countries in the Global North, governments have collaborated with startups through the institution of 'regulatory sandboxes' that allow them to test their digital products under the supervision and guidance of regulators. This

experimentation grants entrepreneurs conditional and limited exemption from regulations, with the goal of minimising regulatory uncertainty, reducing consumers' risks, and enabling companies and regulators to learn from each other [51]. Writing from within the field of law studies and a US perspective, Orly Lobel [42] has addressed the complex nexus between digital innovation and local regulation. Her work has, for instance, discussed whether platform companies' success stems from providing competitive new services and business models, or from drawing on regulatory gaps to the advantage of their revenue. Her work provides overarching accounts of how digital platforms contribute to participatory governance – rather than top-down rule-making – where governments, industries, and society at large share stakes and responsibilities in policymaking.

3 CASE STUDY

Our interest in this case developed in the context of a broader project investigating the role of digital technologies in supporting waste management practices in urban contexts in the Global North. As we looked into our local context, we learned about the app Tiptapp which, at the time, was being broadly advertised – e.g., on subway adverts. Intrigued by the specific waste-disposal service provided by the platform, and its inherent narratives about platform-mediated labour, we soon found out about the ongoing legal dispute between the IT company and the local municipality, which we saw as a rich opportunity to study the relations between digital innovation and local regulations.

3.1 A Multi-stakeholder Perspective

Below, we briefly present the various actors involved in the dispute, and mentioned in the legal case with relevance to our analysis. Following this, we introduce a timeline of the dispute that highlights significant events and decisions taken between 2017 and 2021.

3.1.1 Tiptapp (TT). "Help's on the way"[1] is the main slogan promoting the use of the Tiptapp (Figure 1) . The platform reproduces dynamics of on-demand labour with the technology connecting 'helpers' – that is, workers picking up waste – to people who want to dispose of it. The website presents the service as quick, smooth, and centred on end-users' convenience, as bulky items or different types of waste can be collected and processed even if a car is not available in a certain household. Recently, and probably as a consequence of the legal dispute, a "safe recycling function" has gained visibility on the platform's website[2]. This function is designed to provide awareness about collected items, as helpers are required to document leaving items at communal recycling stations, using pictures, GPS coordinates, and time stamps. The IT company reinforces this requirement by delaying the payment until this information has been provided. Over the last year, Tiptapp has evolved its business model towards a circular economy model, and has sought to enable the exchange of any object that can be reused.

3.1.2 The Environmental Administration (EA). The Environmental Administration (EA) –– Miljöförvaltningen in Swedish – is the government agency responsible for environmental issues in a given municipality; in this case, Stockholm Municipality[3]. In the original language, this is referred to as Stockholmsstad, which translates directly as 'Stockholm City'. The agency is tasked with enacting the plans for environmental protection, primarily through planning, monitoring, and supervising the actors involved. Operationally, it has a focus on communication, planning, food safety,

[1] https://www.tiptapp.com/sv
[2] https://www.tiptapp.com/sv/about_recycling
[3] https://start.stockholm/om-stockholms-stad/organisation/fackforvaltningar/miljoforvaltningen/

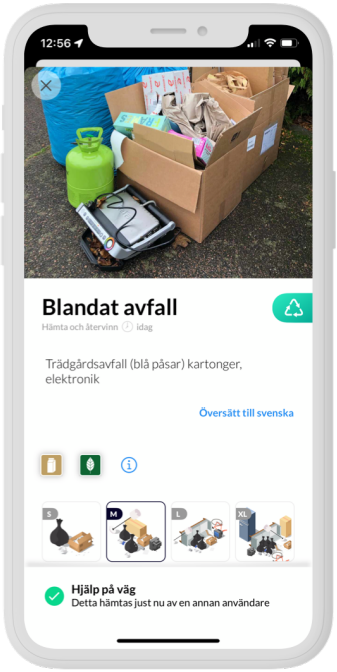

Fig. 1. A screenshot taken from the Tiptapp platform. The image shows an advert for an ongoing job. The text below the picture indicates that the collection includes garden waste, cardboard boxes, and electronics. The whole collection is marked as medium-sized. The image has been downloaded from https://www.tiptapp.com/sv

environmental analysis, air and noise monitoring, and health protection. There is no dedicated organisational body dealing specifically with waste management.

3.1.3 The Environment and Health Protection Board (EHPB). The Environment and Health Protection Board (EHPB)[4] – Miljö- och hälsoskyddsnämnden, in Swedish – is the politically appointed board with responsibility for the environment at municipality level (Stockholm City). The board decides on the plans and actions to be taken for environmental protection, and passes these to the EA to enact. The EHPB is made up of political representatives from the various political parties that are present in the municipal council. As they may not have specific expertise in environmental issues, they may rely on the EA for advice and guidance on specific questions, as happens throughout the discussed legal case. In this sense, the role of the EHPB is to ratify, and add a political perspective to, the advice given by the EA.

3.1.4 The County Administrative Board (CAB). The County Administrative Board (CAB) – Länsstyrelsen Stockholm, in Swedish – is the governing body for a county within Sweden. Each county – of which there are 21 in Sweden – acts as a mediator between actors at national and municipality levels. As a mediator, it is also the first point of appeal against municipal regulation. The CAB including Stockholm comprises 26 municipalities in total.

3.1.5 The Land and Environment Court (LEC). . As a government institution, the Land and Environment Court (LEC)[5] — Mark- och miljödomstolen in Swedish — is a district court that deals specifically with environmental cases, real estate,

[4]https://start.stockholm/om-stockholms-stad/politik-och-demokrati/namnder-och-bolagsstyrelser/facknamnder/miljo–och-halsoskyddsnamnden/
[5]https://www.domstol.se/mark–och-miljodomstolen-vid-nacka-tingsratt/

water and waste cases, or decisions on permits for hazardous activities. Closely connected to the LEC, the Land and Environment Court of Appeal (LECA) reviews and processes decisions that are contested.

3.1.6 The Environmental Protection Agency (EPA). The Environmental Protection Agency is the government agency with responsibility for national-level environmental policy and action. It acts in a similar way to the EA and the EHPB, only at national level. Its responsibilities include providing a position on legal cases and decisions impacting national environmental health and protection.

3.1.7 The Timeline of the Legal Dispute. This section provides an overview of the legal case which we have organised in a chronological order. Table 1 outlines key moments and outcomes from the legal case, and is based on the body of the legal proceedings we have collected.

4 METHODOLOGY

This study focuses on an analysis of legal documents as a way to understand how the sharing economy and services within it are understood, positioned, and regulated – in this context in relation to waste management.

4.1 Data Collection

Our analysis is based on secondary data, specifically the official proceedings documenting the legal dispute between Stockholm Municipality and the company Tiptapp. In Sweden, where the study was carried out, decisions made by government bodies are public documents, and are thus accessible through government portals. In the case at hand, the documents are available through Stockholm City[6], and its Environment and Health Protection Board[7]. Additional documents are also made available by a third party who later represented Tiptapp, the Centre for Justice [8].

The data collection spanned a period of almost two years, from the end of 2020 to August 2022. A total of twenty-eight documents have been collected, and they were all issued between December 2017 and 2021, when the legal case was, first, initiated, and, then, finally resolved. They vary between two and 22 pages in length. While we had been following the legal dispute from its inception, as it gained local media attention, we started a systematic and formal data collection process at the end of 2020. Due to the nature of the analysed sources, data collection has not been a steady process, with periods of inaction until new documents were shared publicly. At the time of writing, the legal dispute has ended, with Tiptapp being allowed to operate through a court decision that can no longer be appealed. We therefore assume that no more official proceedings regarding this case will become available.

Longer documents do not necessarily introduce only new contents; in line with the formalities of legal documentation, decisions generally include a summary of the contended facts, references to and discussions of relevant laws, and the court's reasoning that motivates its decision.

Three of the documents in our corpus include the governmental law regarding waste, including the Environmental code (1998:808) [9], the municipality's sanitation scheme [10], and the EU Directive on Waste [11]. All documents are written in Swedish. Excerpts quoted in the paper have been translated into English by the main author. As none of the authors are native Swedish speaker, a colleague – who speaks Swedish as a first language – occasionally helped with the

[6]https://insynsverige.se/stockholm-miljo
[7]https://start.stockholm/om-stockholms-stad/politik-och-demokrati/namnder-och-bolagsstyrelser/facknamnder/miljo–och-halsoskyddsnamnden/
[8]https://centrumforrattvisa.se/tiptapp-mot-stockholms-stad/
[9]https://www.riksdagen.se/sv/dokument-lagar/dokument/svensk-forfattningssamling/miljobalk-1998808_sfs-1998-808
[10]https://www.stockholmvattenochavfall.se/kunskap/avfallsplan/avfallsplan/
[11]https://eur-lex.europa.eu/legal\protect\discretionary{\char\hyphenchar\font}{}{}content/EN/TXT/?uri=CELEX%3A32008L0098

Table 1. Milestones in the timeline of the legal dispute.

Date	Source	Event
2015	-	The company Tiptapp is founded by four partners
2017	-	Tiptapp receives a legal decision that it must register as a waste management company.
Dec 4, 2017	EHPB	Stockholm City's Environment and Health Protection Board orders Tiptapp to provide information about its waste brokerage.
Dec 22, 2017	TT	Tiptapp appeals the decision to the County Administrative Board of Stockholm County.
Feb 2, 2018	CAB	Tiptapp is registered as a Waste Broker by the County Administrative Board.
Sep 10, 2018	EA	The Environmental Administration (EA) submits its assessment. It recommends that Tiptapp should be banned from mediating waste disposal, and that the decision is sent to the Ministry of the Environment and Energy.
Sep 25, 2018	EHPB	The Environment and Health Protection Board (EHPB) decides on the December 2017 appeal. The decision goes against Tiptapp, in that it is not allowed to operate and waste collection.
Nov 30, 2018	TT	Tiptapp appeals the ban to the County Administrative Board on the basis of accommodations for individual's responsibility, the impractical interpretation that individuals could not help each other, and the proportionality and justification of the ban.
May 27, 2019	EA	EA submits its opinion on Tiptapp's appeal and recommends thtat the EHPB should adopt it and appoint the head of administration as its representative.
Jun 11, 2019	EHPB	EHPB adopts the EA opinion of May 27 and appoints the head of the administration to represent it in the appeal to the CAB.
Oct 23, 2019	CAB	CAB rejects Tiptapp's appeal.
Dec 09, 2019	TT	Tiptapp appeals to the Land and Environment Court.
Feb 19, 2020	EA	EA submits it opinion to the EHPB on Tiptapp's appeal to the LEC.
Mar 26, 2020	TT	Tiptapp responds to the LEC that EA's opinion does not change its appeal.
May 26, 2020	LEC	LEC submits its decision to overturn the ban on Tiptapp's operations.
Aug 03, 2020.	EA	EA submits its opinion on an appeal to the EHPB.
Aug 26, 2020	EHPB	EHPB appeals the LEC decision to the Land and Environment Appeals Court. It submits the EA opinion as its appeal.
Oct 20, 2020	LECA	LECA grants the right to appeal.
Nov 12, 2020	TT	Tiptapp submits its position to the LECA and requests a trial.
Nov 20, 2020	EHPB	EHPB submits its position and rejects the need for a trial on the basis that it is a question of the interpretation of law, and that the case has already been ongoing for some time without enforcement of the ban.
Mar 31, 2021	EPA	The Environmental Protection Agency submits its opinion on the case. It suggests that Tiptapp's business is waste management, but that it falls outside the municipality's monopoly.
Apr 29, 2021	TT	Tiptapp provides an opinion on the EPA's position.
Dec 07, 2021	LECA	The LECA denies the EHPB appeal against the earlier decision by the LEC. The decision cannot be appealed further.

translation to clarify doubts, or the meaning of domain-specific words. The EU Directive is already made available in many languages.

As a way to better interpret the meanings of the legal documents and the consequences of the decisions made, we have also looked at Stockholm Vatten och Avfall's (SVoA) website and the Tiptapp's website. This has been useful in order to understand how waste management is both infrastructured and promoted as an urban service, and how the company that owns Tiptapp frames and scopes the role of the platform within such a service. Over the two years of data collection, both websites have undergone extensive redesigns. As a consequence, information about each person's

responsibility for managing their own waste is no longer available on SVoA's website, and the language used to scope the use of Tiptapp has been modified to promote the environmental impact of the service rather than its convenience. Relevant information available on the two websites had been documented by taking notes.

4.2 Data Analysis

The documents were analysed by means of qualitative content analysis [71] that was carried out iteratively, and that began while data collection was still ongoing.

The initial steps in the analysis consisted of a careful reading of the legal proceedings to familiarise ourselves with all the actors involved in the case – from direct stakeholders, such as the Tiptapp company and Stockholm Municipality, to indirect stakeholders, such as the Environmental Protection Agency – the grounds for the original ban and the consequent appeals, and any emergent narrative framing the dispute (e.g., individual responsibility for managing household waste, health risks, and concerns with on-demand labour). At this point, the analysis was quite open-ended, and was mostly centred on understanding the circumstances that had drawn attention to the platform, and the relationships between the legal case and the local context.

This inductive approach was instrumental in order to identify recurrent themes in the analysis, which we initially carried out in chronological order, from the oldest to the most recent. While this enabled us to gain an overview of how the case has evolved over time, identifying key themes has been a highly iterative process. This means that every time we noted a new issue in one of the later documents, we went back to the previous one, seeking to trace where it originated from, and its possible connections to other themes. In preparation for this article, we selected the final themes to be included in the analysis through a careful reading of the last and conclusive document. In so doing, we revisited our analysis to outline the path to the final decision, the grounds that support it, and the ones that have been dropped along the way. The first author had the main responsibility for examining the collected documents and inferring key themes from them. These themes were regularly discussed with the other author during monthly meetings. These conversations were helpful in order to continuously (re)consider our analytical focus, and how central issues evolved and related to one another.

Cohesion, coherence, intentionality, acceptability, informativity, situationality, and intertextuality have been regarded as main criteria for assessing both the relevance of context analysis and the quality of texts to which content analysis is applied to [71]. Our data collection has been defined by the time-frame of the legal case, and we have decided to collect and analyse all the documents published throughout. It was only after the publication of the final document, in December 2021, that we ended our data collection. As legal proceedings that provide public information about each court decisions (intentionality, informativity), the documents relate and add meaning to each other through explicit cross-references (intertextuality), form a coherent corpus contending with the same issue (coherence and cohesion), are formally recognised as official documents (acceptability), and explicitly account for the situational factors that support a certain decision. As such, they form a heterogeneous and relevant corpus for our analysis. However, we acknowledge the partial worldview provided by such texts, and we make no claims about the experience of the many involved stakeholders, which interview data would instead provide.

4.2.1 Reflections on Positionality. Our involvement with the legal case has its roots in our professional backgrounds, and our interest in understanding technology use and design ecologically, beyond a narrow focus on the interactions between people and digital artefacts. Complementing the visibility the dispute had gained in the local media, we learned about Tiptapp in the context of another study on household waste management, as the platform was mentioned by

several participants we interviewed. The ban preventing Tiptapp from collecting waste, and the convenience people saw in using the platform, sparked our curiosity about this local case.

In engaging with this study, we resonate with scholarship [15, 26, 31, 55, 65] that has been critical towards the exploitation of labour that sharing platforms can contribute to. The regulation of gig work is not, however, the focus of this paper. Despite concerns about on-demand labour being raised in some of the legal documents, they do not underlie the outcomes of the dispute, particularly the final decision to authorise Tiptapp to operate. While we are generally concerned about the role of capital and private enterprises in the provision of essential urban services, this paper mostly focuses on how law and regulations have been interpreted throughout the dispute, and how specific interpretations have reflected on the role of how waste disposal is also made to work through commercial, digital platforms.

5 ANALYSIS

In our analysis, we first provide a foundation for the Swedish legal context and then the opening grounds for appeal from Tiptapp. Following this, we develop thematic threads of argument across the remainder of the legal documents. We annotate specific moments using the date and actor, as shown in Table 1, and the acronyms introduced in section 3.1.

5.1 Foundations in the Local Framework Law for Waste Management

The law regarding waste management is set at a national level in the Environmental Code (EC, Miljöbalk, 1998:808). Here, waste management is specifically addressed in chapter 15, entitled "Waste" (Swedish: *Avfall*). As a result of the vastly different socio-technical and geographic make-up of regions in Sweden, from rural Arctic areas to the urban sprawl of cities such as Stockholm, the national law is a framework law – that is, it outlines the general principles of waste management, but not the specific requirements for its provision. Each municipality is thus expected to implement its own rules for dealing with all sorts of waste, at different stages of the process, called a sanitation code (Swedish: *Renhållningsordning*).

The interpretation of the historical production of the current law is important and will be discussed later, in section 5.5. For now, it is chiefly important to note that the national law specifies above all that the municipality (Swedish: *kommun*) is responsible for household waste management. Given the framework nature of the national law, and the need for municipalities to interpret it, the ambiguities of this interpretation and implementation of the regulation serve as a starting point for contesting the law, which is what emerges from the legal case in question. In this section, we briefly outline the main components of the law that will later arise in the legal case. The regulations regarding waste management defined in chapter 15 (*Avfall*), start with the definition of waste:

> "Waste, in this chapter, refers to any substance or object that the holder gets rid of, or intends to or is obliged to get rid of." (EC, chapter 15, §1)

Waste here is broadly defined here, and refers to household items or waste from other sources that are similar in nature to household waste. Although not discussed in the legal case, the definition excludes particular types of waste as clearly 'non-household waste', including manufacturing, agricultural or fishing waste. This wide-reaching definition of waste is unquestioned throughout the proceedings. While there is concern that some of the waste handled through Tiptapp may be hazardous, there is little disagreement on what waste is and agreement on what is not waste. As we explain below, it is the definition of intentionality in waste that is discussed and contested during the case.

Following the definition of waste, the national law defines managing waste, regardless of who does this, in the broadest terms as the set of actions and measures that are needed to move waste away from its source to recycle it, dispose of it, or transfer it to other owners:

> "In this chapter, managing waste means to: 1. collect, transport, sort, recycle, dispose of, or take other physical action with waste, or 2. take measures that do not involve physical handling of waste, but which aim to collect, transport, sort, recycle, dispose of or change owners or holders of waste." (EC, chapter 15, §5)

In section 20, the responsibility for managing macro processes of waste management is assigned solely to local municipalities:

> "Each municipality is responsible for recycling or disposing of household waste within the municipality." (EC, ch. 15, §20)

Following up on this, chapter 15 clarifies that this is conditional upon measures that encompass concerns for the well-being and health of both people and the environment, and also the requests of property owners (e.g., individuals, housing associations):

> "The municipality must transport the waste away from the property where the waste is located, if 1. removal is needed to satisfy both the protection of human health and the environment as well as individual interests, or 2. the property owner requests that the municipality transports the waste away and this is not unreasonable considering the circumstances." (EC, ch. 15, §20a).

It is worth noting that, in compliance with condition 2, the municipality offers a number of services, such as ad hoc collection of bulky items (this, however, includes an additional cost), or mobile recycling stations – these are lorries that periodically stop in specific areas to collect items such as light bulbs, batteries, and small electronics.

Within this framework, the extent of the monopoly on responsibility is total, and the handling of waste by any unauthorised third party is strictly forbidden:

> "If the municipality, according to section 20 or according to regulations that have been issued with the support of section 22, is to be responsible for a certain handling of waste, that handling may not be carried out by anyone other than the municipality or the person hired by the municipality." (EC, ch. 15, §24).

However, the section makes two allowances, one of which is relevant in this case, referring to the responsibility falling to the municipality. Here, again, concerns for both environmental and human health are regarded as decisive factors:

> "The first paragraph does not apply to a property owner who recycles or disposes of the waste on the property, if it is done without risk of danger to human health or the environment." (EC, ch. 15, §24).

As we will see, this allowance is, throughout the documents, understood by the municipality to mean that someone can, for instance, compost food waste on their own property.

5.1.1 Analysis. The foundation law implies a monopoly of responsibility for waste management for the municipalities. While there are some conditions on this, it has – up until this legal case – been assumed to be a total monopoly, excluding composting. The only exception to this is an official arrangement between the municipality and any third party that wishes to operate within local waste management processes. Concerns for the protection of human and environmental health are mentioned as central aspects in managing waste, as both a final goal and a condition of

proper waste handling. Importantly, in the provided definition of waste, although the act of getting rid of waste is given primacy in the description, the intention to get rid of waste arises first. The focus on intent is later established as the point at which a responsibility for waste management is declared to arise. During the final stages of the legal case, the municipality explicitly refers to the framework law, suggesting that interpretations contesting the monopoly of communal responsibilities will lead to significant changes in how all municipalities deal with waste management.

5.2 Grounds for Appeal

From the starting point of the foundational law, we will now demonstrate how interpretations of the law start to create a possibility for the Tiptapp company to continue to deliver its service. At first, the definition of 'waste' in the foundation law is used to attest that Tiptapp's service only partly relates to waste. The platform provides a service with the option to 'donate' or 'dispose' of waste. Items which are 'donated' are not *intended* to be disposed of, and therefore, should not be considered as 'waste' according to the definition in the Environmental Code (chapter 15, §1). This point is accepted by both sides, and later documents explicitly differentiate between the types of services provided.

More critically, the Tiptapp company claims that its practice is not one of waste disposal at all. While its goals and values align with environmental sustainability and visions to keep the environment free of litter, the company states that its business is selling advertisements. In line with Uber's claim to be an IT company and not a taxi company [55] [42], Tiptapp is not active in waste management and explicitly claims to be a 'passive actor' within this service. As will become important later, Tiptapp does not handle waste items, nor is it involved in any way in processing waste. The transactions facilitated by the platform involve the transfer of ownership of waste from one individual to another. Tiptapp argues that, as such, a ban on its service would have wide-reaching consequences for all networked services, including other advertising platforms popular in Sweden and small businesses operating in the circular economy, but it also extends to the reach of social groups on sites like Facebook. The quotation below, taken from one of the legal proceedings, indicates how Tiptapp's legal representatives frame this point. Blocket and Tradera are two online marketplaces that are commonly used in Sweden to sell or exchange used items.

> "If Tiptapp's operations are considered to constitute waste brokering, other types of advertising platforms such as Blocket or Tradera should probably also be covered by the term, at least with regard to certain segments of advertisements... There are also various local groups on Facebook that coordinates households to carpool to recycling centers. In the latter case, the question may arise as to whether Facebook, with regard to these groups, is not also to be considered a waste broker. The legislation would thereby hit actors who contribute to an improved environment and health, and to increased reuse and recycling and which were not intended to be covered by the legislation." (2017-12-22 TT)

Regardless of these claims, Stockholm Municipality considers Tiptapp to be a waste broker. A waste broker is a legally defined role in macro-processes of waste handling, which entails specific requirements including monitoring waste. Here, the municipality enacted its responsibility to monitor waste activity, and drawing on the framework law ("handling may not be carried out by anyone other than the municipality or a party hired by the municipality"), requesting Tiptapp to register as a waste management company, and provide data on the volume and nature of the waste it handles. Tiptapp was also asked to provide details of the individuals registered on the service who accept the on-demand jobs transporting waste. Tiptapp appealed this decision, but later withdrew the appeal and complied with the request to share some data, in February 2018.

Ultimately, and as a result of the data that Tiptapp shared in the context of the dispute, a recommendation was made by the Environmental Administration (see Section 3.1.2 for a summary of the tasks this agency is responsible for) to propose a ban on the collection of waste mediated by Tiptapp (2018-09-10, EA). The assessment was based on the fact that some carriers, that is the on-demand helpers working via the digital platform, return frequently and, as such, are carrying out professional waste management, which is regulated by law. As they are private individuals, they are assumed not to have a permit to deliver this service. And regardless of such a permit, it was judged that transferring waste from one private person to another is not allowed. This point was also reinforced in online documentation that was previously available on SVoA's[12] website, where it was stated that private individuals are directly responsible for (correctly) handling their own waste.

The Environment and Health Protection Board (EHPB, see section 3.1.3) ratified the ban (2018-09-25 EHPB), emphasising the legal and urgent need to monitor waste management in the municipality. As they claimed in their early filings:

> "The necessity to supervise waste disposal, particularly hazardous waste, means the decision to act cannot wait." (2017-12-04 EHPB)

The decision to ban Tiptapp from operating its waste removal service was followed in the legal document by special statements from two separate groups of political representatives from the EHPB. The first group, representing Sweden's Green, Social Democratic and Left parties (MP, S, V) suggested that while Tiptapp's intentions are in line with the city's own goals (e.g., protecting of the environment, keeping it free from waste), the law clearly states that the city has a monopoly on delivering waste services. By going outside the law, not only does Tiptapp increases the risk of illegal dumping and reduce the capacity for monitoring, but importantly creates unfavourable labour and market conditions for those who do follow the regulation. These political representatives endorsed the ban.

The second group, representing the more conservative Moderate, Central and Liberal parties (M, C, L), agreed with the assessment but used the opportunity to highlight the need for new services and 'smart digital solutions'. This, it was argued, requires changes to the current law, which is seen also as a means to ensure the legitimacy of the law. This group encouraged an appeal against the ban.

5.2.1 Analysis. The majority of claims made in this early phase of the legal dispute contested the foundation of what it means to do 'waste management', both in terms of what is 'waste' and what constitutes 'management' of that waste. While the definition of waste is broadly accepted, it is clear that some of Tiptapp's services do not relate to waste. This point is often underlined in the legal documents, when recounting the background to the continued proceedings, but the decision to focus solely on those other parts of the service relating to transporting waste to a tip or a recycling centre was effectively final. By contrast, the definition of 'management' continued to be addressed and led to further arguments about issues of employment, such as the 'professional' nature of the waste carriers, and other practices implied in the management of waste, particularly monitoring, quality assurance, and enacting responsibility.

5.3 Historical Contestation of Responsibility

The legal dispute, which focused on the definition and interpretations of the regulation, drew into question the historical evolution of the law. Such a development can be understood in terms of the disputes about jurisdication that occur – where questions arise about control over the when, who, and how of waste management [1]. In this case, the history

[12] SVoA stands for Stockholm Vatten och Avfall (Stockholm Water and Waste in English). This is the municipality-owned company with local responsibility for water and waste centred services, and with a strong focus on the well-being of the environment

of waste management is an accumulation of claims from various groups, such as nature conservation in the 1960s, regulation and resource recovery in the 1970s, anti-nuclear campaigners in the 1980s [13], while at the same time it is used as a story in itself to stake claims. Tiptapp used its telling of the story of waste management's evolution to show how certain contextual factors and regulations are co-produced. On the one hand, the municipality argued that the Swedish law is not contextually Swedish, and in fact is directly derived from the European Directive on Waste (Directive 2008/98/EC of the European Parliament and of the Council). On the other hand, Tiptapp argued for a historical interpretation as a means by which to contextualise the current standing of the law, and to argue for a reconsideration of the conditions through which responsibility, and allowance for individual responsibility, in waste handling should be framed.

According to Tiptapp's history and argument, the first national regulation on waste management was introduced in 1970. Prior to this, there was no national law, although municipalities could – and did – create monopolies for waste management through local regulation. During the 1970s, an inquiry was held to form the legislation concerning long-term management based on the current at the time. Some municipalities did not have monopolies, although it was expected that their involvement would increase. However, at that time simultaneous reorganisation and mergers were happening across municipalities, which led to national legislation being postponed. During the years that followed, the green movement began to emerge in Sweden and a significant part of its public narrative was the presence of litter in nature, particularly forests. The lack of a national monopoly was then associated with increasingly visible waste in natural environments, prompting pressure to introduce regulation as soon as possible. This would codify municipal monopolies and individuals' responsibility to hand waste over to the municipality.

However, this created practical difficulties with transportation and collection, particularly for people in sparsely populated, rural areas, and in 1974 changes to the legislation allowed for central collection points[14], and for some allowances in special cases – e.g., composting on one's own property. Central collection centres[15] were also established in rural areas, and continue to be present in rural and suburban areas today.

Yet this new regulation continued to cause problems. Specifically, the fixed nature of the monopoly and the requirements for municipalities meant that the new legislation introduced in 1979 allowed municipalities to decide for themselves how waste should be disposed of. The national law was therefore prepared following the character of a framework law (see Section 5.1). This meant that each municipality had to embark on a process to introduce its own regulation. The 1979 Sanitation Act introduced a provision that obliged the municipalities to take municipal members' opportunities to dispose of their waste in an acceptable manner from a health and environmental point of view into account when planning. This provision continues in the current Environmental Code.

5.3.1 Analysis. There have been revisions to the regulation since the 1970s. The focus of analysis in this theme is, however, how the historical and socio-geographic framings of waste management regulation and monopoly were utilised to argue for the digital service that exists today. In presenting the history of waste regulation, Tiptapp argued for a view that, like the pre-1979 Sanitation Act, draws together disparate socio-geographic configurations within Sweden, and utilises the context of rural Swedish life – including reduced access to infrastructures for waste management – to argue for the largely urban population of Tiptapp users. The changes in regulation – from largely deregulated, to a national monopoly, to a federated monopoly, followed by a participatory and bottom-up approach to regulation – are in

[13] A full history is beyond the scope of this paper, but interested readers can find some history on the development of waste infrastructure in Sweden in [44].
[14] Återvinningsstation in Swedish. These are areas, often located alongside streets, equipped with several bins for garbage collection and recycling
[15] These are large recycling centres were waste is sorted and collected in large quantities, and then moved away

stark contrast to the de-localised model of the platform economy. Yet at the same time, Tiptapp's argument that changes in the law, including a stipulation to consider individuals' needs, points to the neeed for a market-driven service which can be used as and when it is needed. The very nature of the platform economy, between the market and infrastructure, means that it can and does respond to individuals' needs. It is precisely with this reasoning that political members in one of the EHPB groups argued that the current law does not reflect current urban contexts, and encouraged an appeal against the ban decision.

5.4 Defining Responsibility in Waste Management

Across the appeals and counter-appeals against the ban, the legal case highlights a contested interpretation of the responsibility for waste management. Tiptapp began its appeals by aligning itself and its users (both the helpers and those who buy the service) with the values of environmental protection, rejecting the characterisation by the municipality. As seen in 5.2, one of the political groups in the EHPB had described Tiptapp as facilitating illegal dumping, and unfavourable working conditions. In response to the description of its activities by the municipality, Tiptapp replied:

> "The Board's (EHPB) description of Tiptapp's operations is concise, partly incorrect, and contains nothing about the environmental and climate philosophy that characterises the operations." (2017-12-22 TT)

While there is an emphasis on the environmental and sustainability concerns embedded in the socio-technical mechanisms of the platform, the assumed alignment here between the philosophy of the organisation, its actions, and impacts is extended to its users. The users of Tiptapp are also characterised as environmentally conscious, and it is a form of care for the environment that underlies the announcements of waste items to be disposed of:

> "The typical Tiptapp user cares for the environment and uses the advertising platform precisely to contribute to an environmentally responsible handling of what is advertised". (2017-12-22 TT)

These two characterisations positioned 'care' and 'responsibility' for the environment as values and affective commitments. While Tiptapp tied itself and its users' values to environmental responsibility, the municipality questioned this move, particularly with regard to the people who transport waste away:

> "It can generally be assumed that the very person who has produced the waste, and probably also people who are privately familiar with them, feel a greater personal responsibility for handling the waste, than a stranger who accepts the waste for payment. Unfortunately, this is also supported by the incidents of dumping waste and littering that have come to light, both to the supervisory authority and in the media" (2020-02-19 EA)

In the quotation above, the municipality explicitly refers to past incidents where collected litter has been wrongly disposed of by Tiptapp helpers. As suggested, responsibility – as both as an affective commitment and a driver to act with care – becomes degraded by distance from waste production. At once, the municipality implies a need for constant closeness for responsibility and, at the same time, constrains it to its source of origin. Unlike Tiptapp's characterisation of itself as environmentally conscious, the municipality questions the chains of responsibility supporting platform-mediated waste disposal: Individuals are responsible for the waste they produce!

However, and somehow contradicting this point, the municipality's legal strategy also draws into dispute what it means 'to do waste management' by insisting on the possibility to do so at a distance – which is what the municipality effectively does by hiring registered contractors to collect household waste. To hold Tiptapp accountable within its framework of waste management, the municipality seeks to define Tiptapp as an agent within its area of responsibility.

In question is what it means to be a 'waste broker' who takes waste away. This creates a conflict with the affective and hands-on form of care to which households are held. Tiptapp's appeal against defining itself as a 'waste broker' is made on the grounds that it is not an active participant in waste management, but rather a 'passive' advertising platform. Here, the company refers to the European waste regulation, and specifically claims that under the EU Directive's definition of a waste broker, from which the Swedish law is derived, it does not 'take care of' ('ombesörjer' in Swedish) waste, emphasising that care requires proximity and direct contact.

However, the Environmental Administration rejected this interpretation. Rather than focusing on the Swedish term, and the consequent definition of a 'waste broker', as necessitating physical contact, they argue for a broader interpretation of what it means to 'take care of'. In part, the EA employs a linguistic erasure – the Swedish term ('ombesörjer',that is 'to to take care') is 'to arrange' in the English version of the EU directive, and 'to organise' in French. Both these terms are positioned as more directly linked to management and mediation practices, regardless of physical contact with waste. This clarification should not even be required, as the EU Directive specifically acknowledges that no physical contact is required, as does the national law. Consequently, the municipality did not argue to extend the concept of care within the Swedish context, but to explicitly replace it with management practices – first with organising (Swedish: 'organisering'), and later with 'mediating' (Swedish:'förmedling'). This transformation from 'to take care of' to 'to mediate', means that care and responsibility can be delivered not only without physical contact but even by non-humans, which is what the Tiptapp platform claims it does. The Environmental Administration argued that the digital mediation is irrelevant, and that Tiptapp is still accountable as an unofficial waste operator:

> "According to the administration, the fact that the mediation takes place through algorithms, and not through staff who mediate the contacts, is irrelevant." (2019-05-27 EA)

In this sense, waste management becomes an abstracted work, which is itself distanced from the affective concerns for care. This position contradicts some of the earlier concerns from the EA that waste management received the most care and had the strongest responsibility attached to it, when the physical transfer of waste is between households and the municipality. By arguing that responsibility transcends the practicalities of doing, and instead is characterised by its overall goal – in this case, of environmental protection – the municipality suggested that its responsibility for waste management is total:

> "Since the municipal monopoly is not as narrow as the Land and Environmental Court perceived, it is correspondingly a misconception that there would be an unregulated area of responsibility for waste management that falls outside the municipality's area of responsibility." (2020-08-03 EA)

5.4.1 Analysis. Care has been discussed in HCI, following authors like Trento and Puig de la Bellacasa, in terms of the dual practical and affective notions of care and their significant overlap in the ethics and politics of care. While care can be understood to transform matters of public fact or concern, the municipality's interpretation – including the possibility for algorithmic care for waste management – took a pragmatic perspective. This presented a paradox for Tiptapp. On the one hand, Tiptapp distanced itself from the political (and arguably ethical) responsibility to be doing care work, while maintaining a claim to the affective caring for the environment. Although we might envisage this conflict as problematic for the company, this distinction – between 'to care about' and 'to care of/for' – is a useful tool to position the company as a facilitator, as a service, and not itself as an agent of waste management.

5.5 Actions, Interactions, and Systems

As we have seen, Tiptapp and the municipality disagreed on what constitutes active participation in waste management. Tiptapp characterised itself as an advertising platform engaged not only in waste management. In so doing, Tiptapp described a non-symmetrical set of 'transactions' which distanced the platform (and the company) from waste. While Tiptapp's transactions were with users and carriers in relation to adverts, the transfer of waste actually occured between individuals. They compared this arrangement to other services, including Facebook, to demonstrate the extent to which a ban on such transactions would affect society. They went as far as to argue that a foundation of the interpretation against them was that the law bans people from helping each other. By contrast, there is clear allowance for individuals to transport their own waste (bulk waste):

> "That individuals are allowed to help each other with transport to recycling centers increase the opportunities to recycle waste and lowers the costs of waste management, which has been one of the purposes of the design of the sanitation legislation. The municipality has not given any principled reasons for one arrangement which means that private persons are entrusted with transporting their own solid waste but not that of others." (2018-11-30 TT)

However, the municipality strongly characterised the responsibility for environmental health as active care, including through processes of monitoring, which might otherwise be considered passive. When the appeal reached to the County Administrative Board (CAB), they made it clear that although Tiptapp's service was both in-demand and likely necessary, in the specific case of waste management it was illegal:

> "Tiptapp's services are generally legal from a general point of view, and are an expression of how digital technology has created opportunities for individuals to assist each other. With regard to waste collection, however, there are currently no legal conditions for conducting collection and transport of household waste for the respective mediation of such transports to anyone other than the municipal waste management authority and its contractors." (2019-10-23 CAB)

The board characterises the actions and interactions mediated through Tiptapp's service as only legible within the specific context of waste management. Although it seems commonsense to argue that people helping each other would be good for the environment, the municipality insisted it was not allowed in that waste was not allowed to be handled personally:

> "The administration can understand the point of view [that the law cannot prohibit someone from helping someone else]. Everyone who owns waste has an obligation to manage the waste in an environmentally acceptable manner. However, the legislation is designed in such a way that the possibility of taking care of the transportation and disposal of waste yourself is personal." (2020-02-19 EA)

When Tiptapp later appealed to the higher court of the Land and Environment Court, the appeal was made on the same grounds as before – that they were not waste brokers, and that the ban exceeded any proportionality. However, in this appeal they foregrounded the fact that the EHPB did NOT consider whether it was legal for individuals to help each other.

> "If the Land and Environment Court rules that private individuals may assist each other with such transportation, there is no basis for the municipality to prohibit Tiptapp's mediation thereof." (2019-12-09 TT)

Tiptapp argued that even if the court found that the interpretation is correct, the decision should not be upheld because the board would be overstepping its authority from the government – namely to ensure environmental health. Banning people from helping each other would be against such a goal. Here, Tiptapp echoed the early commitment to environmental values (see Section 5.2).

However, at this point the municipality was more focused on a redefinition of what its responsibility is. Rather than seeing waste management as a series of transactions and interactions, it positions its work as that of system building. This brought back both the definition of waste and the nature of the municipality's responsibility. Regarding the definition of waste, the municipality highlighted that 'waste' arises with the 'intention' to discard.

> "That the consideration of the environmental and health-related need for transport takes place in this order is partly a prerequisite for the municipality to be able to assume its responsibility and partly the core of what the municipal monopoly aims to regulate, namely that it should not be up to the individual to decide whether or not the waste needs to be taken care of. The municipality's exclusive right thus arises at the same moment that the individual wants to dispose of it." (2020-08-03 EA)

If the municipality were to be responsible for all interactions, then it would need to consider each individual needs as it arises. This is impractical, and so the municipality did so, as it was required to, in the planning phase. This requirement to consider individual needs was part of the historical emergence of the current regulation, which Tiptapp previously relied on (see Section).

To add to this, the municipality characterised this planning as relating to systems design. That is, the municipality did not consider waste management narrowly (i.e., micro-practices), but broadly:

> "The board wishes to emphasise that from chapter 15, Section 20 of the Environmental Code states that the municipality is responsible for the waste being recycled and disposed of. In the committee's opinion, it is clear that the wording cannot be interpreted in any other way than that the municipality's responsibility is to ensure that the waste is recycled and disposed of, i.e. the municipality is responsible for providing a system that ensures that the waste is recycled and disposed of." (2020-08-03-EA)

5.5.1 Analysis. Although demarcating the responsibility for waste management as a pragmatic concern, the EHPB and the EA also moved to define their remit beyond any particular action. In so doing, they excluded common-sense interpretations of what an environmentally friendly action might be – namely, individuals helping each other. This transforms the practice of waste management from a sequence of actions and interactions (or transactions) to one of planning and systems design. It might be convenient to see the sociotechnical intervention of Tiptapp serving both a user need and a market need, but as far as the municipality was concerned this was not within the regulatory framework of the waste management system.

5.6 Digitalisation of Responsibility

The legal case appears, to a certain extent, to derive from two issues. First, Tiptapp had become popular and been presented in the popular media for its good and bad impacts. Second, the digitalisation of waste management that Tiptapp was involved in revealed a set of waste management practices which would likely otherwise evade monitoring. In particular, the claims by both sides with regard to individuals helping each other with waste management, and the broader connections to forms of social media and advertising platforms, indicated an underlying set of waste management practices that exist but are not regulated. It is this latter visibility through digitalisation that was a recurring and contested aspect of waste management in the legal case. As the Environmental Administration stated:

> "For environmental reasons, there is a need to regulate the handling so that there are reasonable conditions to exercise supervision." (2020-02-19 EA)

In the very first instance, it was the municipality's request for data on waste carriers that gave rise to the dispute. The municipality asked Tiptapp to register as a waste management company, which would have a legal requirement to keep records of its transactions. This alone was problematic. One on hand, Tiptapp had much – but not all – of this data readily available. At the same time, it argued that it was prevented from sharing private information under the EU General Data Protection Regulation. This was a potential catch-22 situation for the municipality. If it requests information about private individuals, it must also recognise that those carrying out Tiptapp transactions are, just that: private individuals. This was presented as problematic in the case for non-hazardous waste, in that Tiptapp maintained that this constituted the bulk of the waste managed through its service – there was no need for Tiptapp to record information about the transportation of non-hazardous waste. Consequently, Tiptapp argued that it could not comply with the order to provide such data, and it was not legally possible to do so. Although, the municipality believed that private individuals should not be carrying out waste transportation, at this stage of the argument it was made to appear that the very nature of the data confirmed Tiptapp's legal responsibilities.

At the same time, Tiptapp made a number of concessions in its design which aimed to both further digitise its record keeping in line with its new position as a waste management company, and quell public and media representations of its potential environmental damage. Tiptapp introduced new features and restrictions, including a GPS location and photograph of the waste transported to an appropriate waste disposal venue accompanying any payment for processing. From an early stage of the service's development, there was an option to 'Show waste disposal' with a photo and a GPS marker. This, Tiptapp argued, led to a high level of environmental awareness among its users. This feature was later mandated within the app, with waste carriers only receiving compensation after it had happened. Financial restrictions were also introduced to cap the amount of income available to people transporting waste. Through these digital mediations, Tiptapp extended its monitoring responsibilities, while also redefining the scope of its users – waste transporters were no longer considered on the axis of professional/amateur, but on the scale of capped income.

The digitalisation of responsibility came in a final form when, despite Tiptapp's claims that financial restriction leads to non-professional waste management, the municipality insisted that regardless of the professional nature or otherwise, all waste transport must have a permit. The municipality argued that, in the case of private individuals, it is highly unlikely that such permits exist. Moreover, it argued that is was not infeasible for them to track such permits on the kind of scale operated by Tiptapp. In response to the Land and Environment Court's overturning of the ban on Tiptapp's operatoins, the municipality argued strongly against the unregulated transportation that the platform relies on:

> "The board's view is that, if the Land and Environment Court's judgement stands, it will be practically impossible to exercise supervision over all transporters and how they handle the waste. There is a significant risk that, among other things, hazardous waste will go astray. In the board's opinion, the judgement thereby means that the door is opened to handling that is not compatible with the intentions of the waste legislation and the purpose of the waste monopoly." (2020-08-03 EA)

That the municipality regarded supervision as being infeasible was in stark contrast to both its request for data from Tiptapp and Tiptapp's ability, reluctant or otherwise, to produce it.

5.6.1 Analysis. Tiptapp is a digital service that allows connections to waste management infrastructures to be scaled up and personalised. This construction of waste as information [47] is both grounds for the ban on Tiptapp and the justification for the impossibility of regulating it. While the municipality struggled to envisage a more data-driven delivery of its own service, Tiptapp incrementally introduced more datafication in order to comply with the regulation. Adding GPS tracking and photographs was more than the municipality or its contractors could do. This was another issue that the municipality did not consider within its waste management system (see Section 5.5).

6 DISCUSSION

Our analysis has illustrated how relationships between environmental sustainability, the adoption of a digital platform, and concerns for local waste regulations have been configured throughout a legal case. Through the outlined themes, we have shown the grounds on which the court dispute was framed, and how it can influence environmental policy, waste governance, and the contextual adoption of digital technologies.

Digital platforms do not merely compete with more regulated businesses; they also create new markets, norms, and behaviours [1, 42]. The participation of private actors, such as waste collection operators, is highly regulated, and only registered waste contractors are allowed to cooperate with public institutions in waste processes. The formalisation of Tiptapp's operations in accordance with the established practices of waste management [1] was a main foundation for the case, and an official request in one of the first court decisions in 2017, which Tiptapp eventually agreed to conform with. Nonetheless, this act did not mark the end of the dispute, which also extended to contested concepts such as responsibility and care in waste management.

As we have noted, besides being open to interpretations, *'responsibility'* was highly politicised throughout the case, in that it justified the municipality's monopoly in waste management processes, it underlay regulation, motivated the appeals against regulation, and shaped the discussion about the digitalisation of waste management. While the national framework law (Section 5.1) delegates the responsibility to define the governance and provision of waste-centred services to municipalities, citizens are responsible for proper waste management, and for ensuring that each item is correctly disposed of. Allowing others to collect and transport waste through a digital platform undermines both these instantiations of responsibility, as third-party intermediaries become involved in the process.

This politicisation of responsibility has important consequences for the ecological perspective afforded by the framework of Digital Environmental Stewardship [56]. First, it shows that becoming an authorised actor is not enough to be allowed to take care of waste. Second, it brings to light how ecosystems of waste management infrastructure are made to work as digitalisation practices intersect with existing physical infrastructures (e.g., recycling centres), and they ways such practices can be understood as resourceful, contested, and historically defined (Section 5.5). A recycling centre, for instance, is not only a fixed (municipal) resource that can be counted, mapped, and utilised. It is also one that is maintained, and that has different historical meanings for different actors. We have seen that when centralised recycling centres were introduced in Sweden, for instance, they were positioned as a necessity to keep forests clear of litter, and were directed by efforts to preserve an ideal image of closeness to nature. Thus, recycling centres as infrastructure perform the practical role of collecting waste. However, as the legal case between Tiptapp and Stockholm Municipality shows, they also signal individual and communal responsibility for caring for local nature and how this has been framed historically, through local regulations of waste governance.

This point expands previous work that has contributed relational perspectives within SHCI [56], and that has illustrated the role of digital environmental stewardship in configuring acts of care for the environment in waste management. Extending these previous analyses, the legal proceedings show how care for the environment in waste

management is configured *in* and *through* the relations between the technology, the roles of the many actors involved (from Tiptapp and Stockholm Municipality to the various boards and agencies shaping the narratives of the dispute), their motivations to protect the environment (from historical accounts of responsibilities to the convenience and effectiveness of quick waste disposal), and their capacities to act. The focus on capacity is particularly interesting, as it shows how transitions towards environmental sustainability are political (see [17, 25]), and can be contested through the dynamics of interactions between platforms and their owners, municipalities and governance, physical infrastructures, and existing laws and regulations. With this in mind, we now discuss the relevance of the legal case for HCI research.

6.1 Framing Interactions Between Actors, Technologies, and Urban Infrastructures through Notions of Responsibility

Analysing the legal proceedings has shown how interpretations of the law can interrelate emergent sociotechnical practices, people, local institutions, and urban infrastructures. While the early grounds for appeal resemble critical narratives and disputes about the fairness and legality of the platform economy [42], there is a specific focus here on responsibility and care. Defining responsibilities in waste management, what it means to take care of waste, and who is allowed to take care of waste are central to the dispute. Thinking with feminist theorisations of care [52, 62], the dispute contends with identifying and contesting relations of care for waste management at the interactions of humans, machines, local actors, and infrastructures. In so doing, (digital) technologies of waste management are made viable through legal interpretations of the context and conditions for their use.

Environmental Stewardship is defined as acts of care for the environment [3], and this paper has shown that, by zooming in on the relations between technology and local regulation, that taking care of waste management can be characterised as configurations of responsibilities. Our analysis indicates that national and local regulations are foundational capacities to define what constitutes waste, to describe the municipality's monopoly on the governance and provision of waste services, and to outline concerns for both environmental and human health. Yet, an assumption for a monolithic 'law' is not met. Instead, the law becomes a means for interpretating technology in context. An historical lens on regulations is used to justify the monopoly and its attachments to environmental care, and that new circumstances require changes in the law and more diversified waste services. Environmental responsibility is also defined as a duty for individuals, an abstract quality of the waste carriers (they are concerned about the environment!), and as inherent in Tiptapp's operations. The redesign of the platform, requiring the documentation of items disposed of, marks a step towards enacting responsibility. At the same time, however, prioritising roles such as 'organiser' rather than 'care-taker' of waste allows for the platformisation of waste management that is already ongoing.

The legal case shows us what it can mean to 'take care' in different contexts, and how localisation, language, culture, infrastructures, and regulation can impact on the practical and affective ways in which care in handling waste is produced. Consequently, it matters to ask what it means to 'take care' [37]. The Swedish law ties care to responsibility, and the interpretation from municipal actors is that the forms of responsibility are not only to take care directly, but also to arrange and organise care work. We – as designers of technology – and the digital technologies that we design to mediate environmental care are, therefore, implicated in this doing of care work. This transformation away from a seemingly direct action of putting waste in a bin, to where even mediation at a distance or by algorithm is understood as doing waste management and therefore care work, corresponds to the call to see and centre action in environmental care [56] – care and responsibility for the environment are enacted in different forms. This has consequences for what and how we design for environmental sustainability, not least in this case, where designing for waste management might contravene the legal basis to do so.

The digital mediation of waste management – whether the ongoing platformisation through Tiptapp, or the imagined digitalisation and datafication of the municipality – points to new ways in which care as environmental stewardship is enacted. The municipality claimed that its responsibility is total, and includes the need to monitor all waste disposal, particularly with respect to collection, transportation, and final disposal. Knowing who does the collection is also part of this responsibility, to the extent that – as Tiptapp argued and the municipality and its political representatives recognised – even helping others becomes problematic. Control ensures that responsibility is enacted at a system level. The municipality's waste stewardship entails surveillance. As they argued, it cannot be left up to the individual carriers to ensure that waste is taken away properly. By contrast, Tiptapp offers – and profits from – a service that is on-demand, and user-centred. It claims to align its profit-driven goals with the goals and values of sustainability, whether these relate to the local municipality, Sustainable HCI, or the UN's Sustainable Development Goals (see goal 11, for instance). Its ability to track and make visible waste management responds to the need to make the trajectories of waste visible [5], even while hiding the labour and the risks for the waste transporters.

These dynamics of (re)regulation invite us to consider the relations between digital innovation, urbanism, and environmental sustainability (specifically in this case, limiting littering and dumping) by avoiding polarised narratives of innovation and control. This is also relevant to discourses on sustainable cities, as the platformisation of urban infrastructures [68] can encompass processes of digitalisation that occur in a top-down fashion, as part of municipal planning, and from the bottom-up, driven by venture capital and sometimes introducing disruptive elements. Relatedly, as noted in the analysis, two groups of political representatives in Stockholm Municipality (one representing the left orientation of the city council, and the other the right) were involved in the court case, through the actions of the EHPB. Not only were these groups actors involved in the dispute, the recommendation for Tiptapp to appeal the ban also shows that, even at a municipality level, there are different forces at play, that they are officially accounted for in the legal proceedings, and that they actively shape the course of the case and its intermediate and final outcomes.

6.2 Designing with the Law: Exploring Interactions Between Human, Computers, and Urban Infrastructures

Resembling legal studies of the platform economy [42], inquiries into the regulation-innovation nexus within digital environmental stewardship require careful analysis of the advantages and disadvantages of both public interventions and the changes to regulation that digital platforms might determine. This extends to both analytical and design work.

TUsing Tiptapp seems to fill a capacity and motivational gap, as people might not have the means of transportation needed to go to recycling centres, or might simply not be motivated to do so. This aligns with Tiptapp's focus on both the convenience of its service and the environmental concerns it addresses. Contextually, it also relates to the need for new solutions mentioned by one of the political groups of the EHPB and, arguably, to the lack of a similar municipal service to help people get rid of bulky waste. (This is a recent service that is not included in regular taxation.) The Tiptapp case sets a precedent for how related cases might be handled in the future, and directly influences both IT companies' and municipalities' strategies for growing and developing. In this case, it is not the unquestionable legality of waste management that shapes design, but how we interpret the law. Acts of care for the environment can be contested and controversial [6, 69], and we invite designers within SHCI to explore how and where digital advances can create frictions between sociotechnical practices and infrastructural capacities.

Scholarship on the platform economy has illustrated the increasing efforts made by startups to hire legal consultants to help them manage political aspects of their work [51]. While in profit-driven ventures there is a risk this might be limited to constructing a public image, this trend speaks to emerging HCI concerns to include regulatory aspects and

law as early as during design processes. As our case indicates, this is particularly important when digital technology interacts with local institutions and urban infrastructures, both physical and regulatory. The fact that the ban on Tiptapp was ruled but not enforced created a type of sandbox in which to extend, tailor, and re-design key features of the platform-mediated waste service. Responding to the concerns for individual responsibility and the responsibility of the platform, design features to document disposal have recently been added and advertised on the platform's website. This means that helpers cannot receive any payment for their job unless pictures of the disposed item and the corresponding GPS coordinates are shared. Relatedly, contrasting with the contested role of waste broker, the company is highlighting narratives about its role in contributing to environmental sustainability, and to a more circular economy. Over the last year, its website has emphasised how the services provided also encourage the re-use of items that would otherwise go to waste. On the other hand, Stockholm Municipality – through the city-owned organisation Stockholm Water and Waste – does now provide a similar on-demand service that can be bought by private individuals. Regulatory sandboxes have become common in processes of co-governance whereby private enterprises participate in processes of policymaking, with the goal of supervising and regulating digital advances [51]. Concerns about the power dynamics that can stem from these experimentations, along with the economic and regulatory benefits that might be gained by the venture capital organisations (and their clients) invited to take part in them have, however, been raised. While we resonate with these critiques, we regard sandboxes as a relevant instance for scoping design as a long-term process, and we call for explorations of how this approach could be tailored to SHCI research and design concerns [59]. Moving the focus away from technological solutionism, this could entail, for instance, longitudinal design explorations of the relationships between actors, technologies and infrastructures, and how the configuration of such relationships reflects on reconsidering main functionalities, the overarching role of technologies, and the proliferation of related, digitally mediated services.

While HCI researchers have long argued for the need to engage with policy and policy-making [35, 59], we argue that there is a need for SHCI to engage with the law in design processes. This is not just a matter of designing interactions, but a more fundamental question of how to investigate the systemic conditions for digitally enabling care for the environment, and the extent to which it can be scaled, and reproduced. This is a legal but also an ethical problem, as initiatives to collect waste can reproduce colonial relationships to land (see [37] on this point). Developing methods that draw on regulation-centred prototypes, law-storming techniques, or law sensitive design cards could, for instance, contribute to a transition towards SHCI practices that are more sensitive towards the relationships between local actors (single and collective), technologies, and infrastructural aspects. Resonating with [9], we warn against any standardisation of techniques or tool-based procedures that could be unproblematically employed for different issues, and across different contexts.

6.3 Platforms, Waste Data, and the Possible Legal Consequences of Design

Our case has drawn attention to the interactions between a digital platform enabling waste disposal, local infrastructures (particularly existing regulations around micro and macro-processes of waste management), and the role of public services in providing similar services. Recent studies [56] have, however, illustrated how waste data collected through sharing platforms can become a resource used by local municipalities to enforce new legislation and taxation as a means to protect the environment. While this can be seen as a successful instance of participatory governance, additional research is needed to understand how relationships between citizens using the platform, platform companies, and local authorities are created and develop.

As Sadowski argues [57], data is its own form of capital, despite having its roots in economic capital. As capital, data allows for forms of exchange and the production of value. Platforms, for instance, facilitate the collection and analysis of extensive data sets which are then used as assets in data-based evidence [70]. Tiptapp has initiated arguments that disposing of waste requires advertising services, that waste ownership can be exchanged, and that the personal, societal, and environmental value of its services are derived from these exchanges. However, when turning our attention to municipal and government agencies, there is no immediate incentive to consider the economic extraction or accumulation of data. Such data-intensive practices do not fit with activities (e.g., waste monitoring processes) within the framework of municipal work as it is often configured (see also [18]). So, while data and transactions can be seen as something for Tiptapp to earn more from, they simply involve more work for the municipality. It is 'unfeasible' for the municipality to manage such data. While data and environmental monitoring are core aspects of the work of environmental protection at local and national levels, it is not yet at the scale of platforms.

Instead, the municipality relies on data that Tiptapp provides to monitor the distributed waste workers. We see a concern here to carefully investigate what these data might not say [45], how representative such data can be, whose interests and purposes they serve, and where the companies that own the platform should – or could – rectify any information asymmetry or biases stemming from the very technology that generates such data [42]. The data in this case comes to define things far beyond what waste is, including setting an earnings limit for waste transporters, and how much someone might need to earn to be considered a professional. Reversing Rossitto's idea of "folding in action" [56], we can see that waste data, like other data [14], may already have actions folded in. The question of what type of data 'waste' also involves asking what can be done with it at the level of governance and regulation.

For instance, just as has happened with housing, urban transport, and other domains, digital platforms such as Tiptapp and Litterati show that IT companies are already changing the provision of waste services through uncoordinated, rather than centralised, processes of digitalisation. Tiptapp promotes care for the environment by helping people to get rid of bulky household items in exchange for economic compensation; Litterati structures groups of people and public actors to organise collective clean-ups, and calls for municipalities to enforce stricter policies on private companies that contribute to urban pollution. While such digital advances provide opportunities to expand capacities and capabilities for environmental care, they contest and reconfigure municipalities', citizens', and other actors' responsibilities towards waste processes. The contestations of jurisdiction [1] over waste management as a practice highlight the ways in which technology design and IT have come to permeate the 'work' of civic society. IT companies are interested in the work of waste management in ways that involve both doing and not doing the work which is currently within the jurisdication of professional waste management. As Abbott argues, the definition of a profession is a contextually dependent abstraction, one that in this case allows Tiptapp to be doing the work of waste brokerage through software, but not to be doing the work of taking care of waste.

As we turn our attention to ecological framings in Sustainable HCI [2, 56], the sometimes subtle redistributions of capital and capacity that technology can result in have significant ramifications for our environment. Hultman and Corvellac [28] have argued that the technologies of waste management, whether landfills or apps, promote a dissociation from the environment. In this paper, we have looked at how enabling two individuals to mediate waste transport reshapes not only the micro-waste management, but also the macro-practices and design of waste management systems. Echoing Hultman and Corvellac (*ibid*), the municipality strongly argues that as waste moves further away from the person producing it, responsibility diminishes. While at one point the legal case leant towards the interpretation that all forms of social media could or should be banned due to their potential for brokering waste – an interpretation acknowledged as extreme, but not beyond possibility by all parties involved – it is worth noting that the counterargument

is for the total deregulation of waste management and environmental care. The legal case, including arguments put forward by Tiptapp, political representatives of Sweden's conservative and right-wing political parties, and ultimately the judgement by the court, suggests that the promise, convenience, and with it the perception of common sense, of technological mediation, wins in the face of regulation and arguments for the protection of the environment.

7 CONCLUSIONS

As HCI research continues to expand its focus beyond the mere interactions between humans and digital artefacts, this paper has illustrated a concern not only to develop the argument for holistic perspectives, but also to pay attention to specific relational perspectives within the field. Our study has examined how digital technology and the law become entangled in the delivery and regulation of waste management services, and come to contest the concepts of responsibility, monopolies, and what it means to do waste management. Digital technology and innovation will always push the boundaries of the current regulatory context, and HCI researchers have strongly argued for engaging with policymakers and policymaking activities [35, 67]. We have taken an alternative approach to understand how the existence of a digital technology becomes contested, banned, and later permitted through interpretation of the law. Rather than pointing at processes of reregulation, the document analysis outlines processes of (re)interpretation that interconnect framework laws, local regulations and European directives, and that eventually justify Tiptapp's right to operate locally. In so doing, we highlight concerns about how the specific local, linguistic, historical, and infrastructural aspects come to define what technology is and can do when protecting the environment is a concern. Here, we caution that technology, in its globalising forms, can erode, manipulate, and evade regulation [42]. And while the values and goals of Tiptapp, its users, and waste carriers may align with those of the municipality, we, as technology designers, ask if that is enough. As designers working in this field and in this context, we are surprised to find that, prior to this legal case, it was, not enough at the legal level. Designing for environmental responsibility in waste management is not only affective, enacted, and ethical, it is also legal. We urge HCI researchers, and particularly those working in SHCI, to begin now – if they have not already done so – to understand the legal context of technological systems for more sustainable lives.

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